Annual Report for Assessment of Outcomes 2012-13

Subject Area Committee Name: Automotive Service Technology
Contact person: Bart Ouchida/Scott Morgan
For LDC/DE: Core outcome(s) assessed:
For CTE: Degree or certificate* assessed: Associate of Applied Science, 2 Year Certificate
*Please attach a table showing the alignment of the degree or certificate outcomes with the College Core Outcomes

Please address the questions below and send to *learningassessment@pcc.edu* **by June 21, 2013 with** Annual Report in the subject line

Note: Information provided in this report may be inserted into or summarized in Section 2C Program Review Outline.

1. Describe changes that have been implemented towards improving students' attainment of outcomes that resulted from recent outcome assessments. These may include but are not limited to changes to content, materials, instruction, pedagogy etc. Please be sure to **describe the connection** between the assessment results and the changes made.

In response to last years assessment results and the Automotive Departments ongoing accreditation process through the National Automobile Technicians Education Foundation (NATEF), the educational institution certifying body of the National Institute for Automotive Service Excellence (ASE), we are currently in the 2 ½ year self-review cycle. This process requires that we look again at all of the credentialing and standards of the full 5 year review but instead of outside assessment, will utilize our own advisory committee and internal audits of department faculty and staff. The review consists of many aspects including facilities, tools, supplies, teaching aids, safety, advising, recruitment and retention efforts as well as faculty continued training requirements and NATEF curriculum content standards. The largest portion of the review consists of aligning course materials and curriculum to the "P" standards as outlined by NATEF. Each automotive subject area (A1 – Engine Repair, A2 – Automatic Transmission and Transaxle, A3 – Manual Drivetrain and Axles, A4 – Suspension and Steering, A5 – Brakes, A6 – Electrical/Electronic Systems, A7 – Heating and Air Conditioning, A8 – Engine Performance) includes required tasks and/or content that must be covered in a specified ratio.

Attached is a copy of the 2012 NATEF Master Automobile Service Technology Task List (MAST), a 29-page document that covers all of these tasks and the distribution of P-1, P-2, and P-3 tasks. Also attached is the 139-page 2012 Auto Program Standards document that outlines all of the requirements needed for NATEF accreditation. These standards were changed as of 2010 and we are currently in the process of making sure the program meets and indeed we hope, exceed the basic requirements for the Master Automotive Service Technology (MAST) certification. Below is a breakdown of the tasks and the percentages of each that must be met in order to be eligible for certification:

Master Automobile Service Technology

P-1 = 179 95% = 170 tasks

P-2 = 102 80% = 82 tasks

P-3 = 58 50% = 29 tasks

Required Supplemental Tasks = 26

The automotive department feels that the results from last years TSA show that we fulfill the basic outcomes of the program as set forth from our industry/outside accrediting body. Of our 28 graduating students (our sample is all completers), only one did not meet the outcomes in one of the 8 ASE certification areas. This shows that overall; we are giving our students adequate instruction and hands on experience during their time in the program, thus equipping them with the technical skills necessary to enter the job market at an apprentice level. We personally feel that we hope to give our students more skills, especially those in the "soft" category, which will prepare them for greater advancement and continued excellence in the field. We have no evidence to show that we need to make any changes to address lack of outcome attainment. We do however, feel very strongly that we wish to gain more useful and relevant data of soft skills and make a point of having weekly department meetings to discuss perceived shortfalls within the program. Unfortunately, we have no way to perform a direct assessment of student communication and human relations skills within the shop environment. This has been an ongoing (20 plus year) struggle.

One benefit to program changes we have found is that the addition of the automotive capstone courses has "brought to light" the very "green" status of many of our soon to be completing students. During the program, we deliver to each student the basic information and skills practice needed to meet NATEF requirements but have long realized and now have anecdotal evidence to show, the time needed to practice these skills is lacking. We feel that the capstone courses help students to gain more confidence and practice the skills they have "forgotten" before entering the workforce. We do realize, however, that the only way to build the skills is continued daily practice and can only truly be found "in industry." We provide to each student what we can with the time and resources we have available.
Please see attached "Section 1 Supplements" folder for more information.

For <u>each outcome assessed this year</u>:

2. Describe the assessment design (tool and processes) used. Include relevant information about:
    - The nature of the assessment (e.g., written work, project, portfolio, exam, survey, performance etc.) and if it is direct (assesses evidence mastery of outcomes) or indirect (student's perception of mastery). Please give rationale for indirect assessments (direct assessments are preferable).
    - The student sample assessed (including sample size relative to the targeted student population for the assessment activity) process and rationale for selection of the student sample. Why was this group of students and/or courses chosen?
    - Any rubrics, checklists, surveys or other tools that were used to evaluate the student work. (Please include with your report – OK to include in appendix). Where appropriate, identify benchmarks.
    - How you analyzed results, including steps taken to ensure that results are reliable (consistent from one evaluator to another.

This year, we are again making a direct assessment using the TSA as the basis for the Automotive Program outcomes. The TSA is administered by NATEF and is known as the ASE Student Certification (a name change from last year) that mimics the ASE Technician Certification used in industry. The assessment is computer based and limited to only one try per ASE subject area (A1-A8).

The automotive program has chosen to assess each completing student in the capstone courses (AM 201, 202 and 203) each year. Each student must complete all automotive capstone courses (AM 201, 202 and 203) in order to graduate. Our sample is ALL 28 completing/graduating AST Degree and Certificate students in order to gain the most complete and full program picture. This assessment includes both the TSA and Automotive Repair Orders.

Attached is the ASE Student Certification Task Breakdown, which lists all of the NATEF subject area tasks, and the number of assessed task questions asked in each test area. Also attached is the test technical data and interpretation handbook, which explains percentile rankings as well as test reliability and validity information.

Because this test is independently assessed by an outside agency, we do not need to utilize any specific steps to ensure reliability beyond what is already built into the product. Again, please see attached documentation in the "Section 2 Supplements" folder.

3. Provide information about the results (i.e., what did you learn about how well students are meeting the outcomes)?
   - If scored (e.g., if a rubric or other scaled tool is used), please report the data, and relate to any appropriate benchmarks.
   - Results should be broken down in a way that is meaningful and useful for making improvements to teaching/learning. Please show those specific results.

Please see the attached testing spreadsheet for AST results 2012/2013. As indicated by each ASE/NATEF subject area (A1-A8), the results show that overall; our students meet if not exceed industry certification standards. We feel that because no particular area is shown to be "failing," we have adequately met the basic requirements for accreditation. As a department, we do feel as though mean percentages in the 70% to 80% ranges are far too low and we are working to increase student practice in order to bolster/further reinforce skills and techniques covered in core/theory courses.

Unfortunately, when contacting NATEF we were told that disaggregated data from the TSA would not be provided. As such, program improvement is relegated to the information obtained through the automotive capstone courses. Please see attached documentation in the "Section 3 Supplements" folder for more information.

4. Identify any changes that should, as a result of this assessment, be implemented to help improve students' attainment of outcomes. (These may include, but are not limited to, changes in curriculum, content, materials, instruction, pedagogy etc).

Again, we feel that we are meeting the basic program requirements but hope to see improvements by increasing the time students "practice" core class theory skills in a real shop environment. Without disaggregated data, we can only reinforce the NATEF subject areas taught in the program through continued practice in live shop like settings in order to build cognitive and kinesthetic skills.

5. Reflect on the effectiveness of this assessment tool and assessment process. Please describe any changes to assessment methodology that would lead to more meaningful results if this assessment were to be repeated (or adapted to another outcome). Is there a different kind of assessment tool or process that the SAC would like to use for this outcome in the future? If the assessment tool and processes does not need to be revised, please indicate this.

Information obtained from last years assessment have resulted in more questions and concerns of "what we are looking for" than anything else. The department has identified that the ultimate goal of the program is to provide each student the skills and resources necessary to be gainfully employed and prepared for further education and learning as the industry changes and adapts to new technology. We feel that the program outcomes are the goals that we wish to both accomplish and assess. Along these lines, we discovered that from both informal assessments conducted last year and direct formal assessments (the TSA), we needed to find ways to assess all of the automotive program outcomes and obtain relevant and reliable quantitative data. The results of this and last years TSA's showed us that overall our students meet (with only one exception each year) the majority of the outcomes of our program. As such, we are attempting to further our knowledge and understand better the areas in which we are deficient and assess these aspects of our outcomes.

AAS: Automotive Service Technology Program Outcomes

1. Repair cars and light trucks with limited supervision and to customer satisfaction.
2. Access and utilize repair information in a rapidly changing technology.
3. Communicate effectively with employers, customers and co-workers.
4. Implement strategies and processes to solve the vehicle's repair problems.
5. Perform vehicle repair to the highest professional and ethical standards.

Assessment methodologies used in the Automotive Program (current and proposed):

1. ASE Student Certification **(Current)** – Aggregate data for overall pass rates of each NATEF sub-areas. This aligns with outcomes 1, 2, 4, and 5 with an emphasis on 4 and 5.

2. Rubric and Norming process for Auto Department Repair Orders. **(Proposed)** Proposal is for a 3-point scale that addresses outcomes 1, 3 and 4. This was conducted at the Spring 2013 Automotive Advisory meeting with mixed results. Although the attendance was very good, an attempt was made to "norm" the group and then gather data on 24 anonymous student repair orders from at least 4 advisory members. The return was virtually zero because we received no responses from the advisory members in their evaluation of the student repair orders and so we have no real useable information to utilize. Further discussion within the department and with the advisory committee president will need to take place in order to find a time to review in a more "captured" environment to secure the needed rate of return.

3. Rubric and Norming process for information gathering. **(Proposed)** Proposal is for a 3-point scale that addresses outcome 2. Changes are being made to the Automotive Department repair order template that will address these communication and information areas. Please see attached copy. This will allow further assessment by the advisory committee to analyze student repair orders using the rubric supplied below. This should be able to be done concurrently with section #2.

4. Student Exit Survey that gives the department an indirect assessment of the students perceived skill level and level of attainment for each of the Automotive Departments Outcomes. **(Proposed)** This will be conducted in the final capstone course (AM 203) and will be uploaded and stored in the new department online "Homeroom" within Desire2Learn. This homeroom will be a place for all capstone students to submit their most professional and polished repair orders for advisory committee assessment as well as the place to reflect on their time in the program using the exit survey and assessment tool. This is still very much in the development stage and the department is currently debating the relevance of this idea and in particular, wonders about the value added for the student.

See "Section 5 Supplements" folder for more information.

Rubric for Outcomes #1 (repair), #2 (Information Gathering), #3 (Communication), #4 (strategies for solving issues)

3	2	1	
Students show portfolio repairs in all 5 ASE subject areas. Evidence of 2 or more tasks in each area.	Students show portfolio repairs in all 4 ASE subject areas. Evidence of at least 1 task in each area.	Students show portfolio repairs in fewer than 4 ASE subject areas or no or limited tasks in each area.	
Student utilizes all available industry recognized information sources in order to diagnose and repair vehicle concerns. Student was resourceful and critical in evaluation of information.	Student utilizes multiple information sources, classmates and/or instructor to diagnose and repair vehicle concerns. Student was resourceful in obtaining appropriate information.	Student utilizes instructor only in order to diagnose and repair vehicle concerns. Student was unable to find repair information without close instructor supervision.	
Meets industry standards for completeness and clarity of the following elements of a repair order: 1. Customer Concern 2. Explains cause of customer concern. 3. Documents diagnosis and repair. 4. Accurate customer and vehicle information.	Meets industry standards but lacks detail of the following elements of a repair order: 1. Customer Concern 2. Explains cause of customer concern. 3. Documents diagnosis and repair. 4. Accurate customer and vehicle information.	Incomplete repair order.	
Student verified customer concern. Uses effective diagnostic strategy. Showed persistence in find the root cause of customer concern. Used appropriate diagnostic equipment in repair. Verified repair.	Student is able to repair customer concern but does not demonstrate an effective diagnostic strategy. They got lucky!	Unable to solve problem without close instructor supervision.	

CTE Assessment Plan **AAS** or Certificate:

_____Automotive Service Technology_____ *Submit to learningassessment@pcc.edu by November 15, 2010*

1. Outcome	2. Maps to a Core Outcome?	3. Assessment Setting/Method	4. When will assessment take place?
Repair cars and light trucks with limited supervision.	• Professional Competence • Communication • Critical Thinking and Problem Solving	Assessment Methods include: Repair order evidence of successful vehicle repairs during Auto Shop Lab Capstone courses which simulate a live repair shop and CWE when available. (a rubric for grading CWE is in consideration).	Years 1 and 2
Access and utilize –(use) repair information in a rapidly changing technology.	• Professional Competence • Critical Thinking and Problem Solving	Assessment Methods include: Repair order evidence in AST student capstone course submission that documents repair information resources used such as: wiring diagrams, description and operations of systems, diagnostic trouble charts, etc.	
Communicate effectively with employers, customers and co-workers.	• Professional Competence • Communication • Cultural Awareness	Assessment Methods include: Repair Order evidence gathered in "live" Auto Shop Lab courses. Informally done during student oral and written presentations in specific courses (a formal feedback rubric will be developed to help in assessment by the department). Completion of CG 209 that includes: basic portfolio, resume, "mock" interviews and formation of exit interview questions.	
Implement – (use) strategies and processes to solve the vehicle's repair problems.	• Professional Competence • Critical Thinking and Problem Solving	Evidence gathered at multiple points during program. Assessment Methods include: ASE style Technical Skills Assessment (compiled by ASE to include state, program, course and individual scores) and Repair Order evidence of diagnostic procedures	

		compiled in Auto Shop Lab.	
Perform vehicle repair to the highest professional and ethical standards.	• Professional Competence • Community and Environmental Responsibility • Self-Reflection	Assessment Methods include: review of student repair orders for accuracy of labor times and parts markup during program during various "live" laboratory courses. Final assessment will be during the capstone course using the unaltered submission. A review by the CWE partner addresses professional and ethical standards in the workplace (an assessment criteria is already in place in the CWE workbook that has the employer evaluate these qualities. The department will further compile this information for review).	
Be prepared to transfer to a college or university for upper level studies in business or management.	• Professional Competence • Communication • Critical Thinking and Problem Solving • Cultural Awareness • Self-Reflection	Successful completion of AAS degree general education courses approved by the Automotive Department.	During General Education Courses.

CTE Assessment Plan AAS or **Certificate**:

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NATEF PROGRAM ACCREDITATION STANDARDS

Automobile

Administered By:

National Automotive Technicians Education Foundation (NATEF)
101 Blue Seal Drive, S.E.
Suite 101
Leesburg, VA 20175
(703) 669-6650

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POLICIES

AUTOMOBILE TECHNICIAN TRAINING ACCREDITATION PROGRAM

The Board of Trustees of the National Automotive Technicians Education Foundation (NATEF) is responsible for accreditation of automotive (automobile, collision repair & refinish, medium/heavy truck) programs at secondary and post-secondary levels. NATEF will grant accreditation to programs that comply with the evaluation procedure, meet established standards, and adhere to the policies in this document. Program accreditation is under the direct supervision of the NATEF Board of Trustees and such personnel designated or employed by NATEF.

History

On January 1, 2011, NATEF assumed the role of accreditation of automotive programs as an extension of its role as the evaluation organization with the family of organizations of the National Institute for Automotive Service Excellence (ASE). The ASE standards for automobile program certification were introduced in 1982. Standards for collision repair & refinish programs were launched in 1989 and truck standards followed in 1992. NATEF's role in the process was to work with industry and education to update the standards on a regular basis and evaluate programs against those standards. Based on a positive evaluation, programs were "certified" by ASE for a period of five (5) years.

Effective January 1, 2011, all programs that held current ASE program certification, were grandfathered as accredited by NATEF until such time that they were due to renew their accreditation.

After a lengthy process that included discussions with industry, employers, and educators, NATEF conducted a series of workshops and webinars to review the automobile standards. In June 2012 NATEF published a new model for automobile program standards. This new model introduced standards based on three (3) levels rather than by automobile area (brakes, electrical/electronic systems, etc). The three levels are: **Maintenance & Light Repair (MLR)**, **Automobile Service Technician (AST)**, and **Master Automobile Service Technician (MAST)**. Each successive level includes all the tasks of the previous level in addition to newly designated tasks. In other words, the AST task list includes all of the MLR tasks plus additional tasks. The MAST task list includes all of AST tasks plus additional tasks specifically for MAST.

The cost to each program for accreditation will be as reasonable as possible to encourage program participation. This cost will include self-evaluation materials, application (processing) fee, on-site team evaluation materials, and the honorarium and expenses of the Evaluation Team Leader (ETL).

OPTIONAL LIGHT/MEDIUM DUTY CNG/LPG

The CNG/LPG standards are temporarily unavailable under the new model. Programs that are accredited in the CNG/LPG areas will be recognized as accredited until the program is due for accreditation renewal.

ACCREDITATION PROCESS

Program Self-Evaluation

The accreditation process begins with an extensive self-evaluation performed by training program instructors, administrators, and advisory committee members. Members of this group compare the program to national standards, and have the opportunity to make improvements before submitting the application and a summary of the evaluation to NATEF.

NATEF Review

The application for initial accreditation or renewal of accreditation is sent to NATEF, where it is reviewed to determine if the program qualifies for an on-site team evaluation.

Programs will have a maximum of 18 months to complete the accreditation process from the date that their Application for Accreditation or Application for Renewal of Accreditation is received by the NATEF office (this timeframe may be shortened when applying under standards that are in the process of being phased out).

Once a program is approved for an on-site evaluation, a letter will be sent to the designated point of contact, stating the date the program must complete the entire accreditation/renewal of accreditation process.

On-Site Evaluation

If the program qualifies, an Evaluation Team Leader (ETL), an educator certified by ASE and trained by NATEF, is assigned to the program and an on-site visit is conducted.

Recommendation for Accreditation

When the standards are met, the program will become accredited for a period of five years.

Programs that let the accreditation expire for two or more years will be required to follow the procedures for initial accreditation.

Please note: Expired programs will be allowed to submit the 'renewal of accreditation' forms versus 'initial' accreditation forms up to 18 months past their expiration date (applications for renewal of accreditation submitted 18 months or more after program expiration will be returned). Furthermore, expired programs must complete the entire renewal process within two years of their expiration date. This timeframe may be shortened when applying under standards that are in the process of being phased out.

Programs having difficulty in meeting the hours or tools & equipment accreditation requirements should consider the following options:

A. Borrowing equipment needed for instruction from a manufacturer, dealership or independent repair shop.

B. Arranging for instruction on tasks requiring equipment not available in the school program at a dealership or independent repair shop.

Programs choosing option A or B are required to show documentation on where the tasks are taught, by whom, and how students are evaluated.

AUTOMOBILE STANDARDS STATEMENTS

STANDARD 1 – PURPOSE

The automobile technician training program should have clearly stated program goals, related to the needs of the students and employers served.

STANDARD 2 – ADMINISTRATION

Program administration should ensure that instructional activities support and promote the goals of the program.

STANDARD 3 – LEARNING RESOURCES

Support material, consistent with both program goals and performance objectives, should be available to staff and students.

STANDARD 4 – FINANCES

Funding should be provided to meet the program goals and performance objectives.

STANDARD 5 – STUDENT SERVICES

Systematic skills assessment, interviews, counseling services, placement, and follow-up procedures should be used.

STANDARD 6 – INSTRUCTION

Instruction must be systematic and reflect program goals. A task list and specific performance objectives with criterion referenced measures must be used.

STANDARD 7 – EQUIPMENT

Equipment and tools used must be of the type and quality found in the repair industry and must also be the type needed to provide training to meet the program goals and performance objectives.

STANDARD 8 – FACILITIES

The physical facilities must be adequate to permit achievement of the program goals and performance objectives.

STANDARD 9 – INSTRUCTIONAL STAFF

The instructional staff must have technical competency and meet all state and local requirements for accreditation.

STANDARD 10 – COOPERATIVE AGREEMENTS

Written policies and procedures should be used for cooperative and apprenticeship training programs. (This applies only to programs that offer cooperative/apprenticeship training.)

STANDARD 11 – E-LEARNING

Written policies and procedures must be followed when e-learning curricular materials are used outside of scheduled classroom/lab/shop time for the purpose of meeting NATEF instructional hour requirements. (This applies only to programs that are using e-learning to meet program hour requirements. This is a go/no go Standard that requires validation of a 'yes' response to each of the criteria.)

AUTOMOBILE MINIMUM REQUIREMENTS

1. The minimum program requirements are identical for initial accreditation and for renewal of accreditation.

2. Programs must meet the following hour requirements based on the level of accreditation sought.

Maintenance & Light Repair	**540 hours** combined classroom and lab/shop instructional activities
Automobile Service Technology	**840 hours** combined classroom and lab/shop instructional activities
Master Automobile Service Technology	**1080 hours** combined classroom and lab/shop instructional activities

4. **The average rating on each of Standards 6, 7, 8, and 9 must be a four** on the five-point scale. The program will not be approved for an on-site evaluation if the average is less than 4 on any of those standards. The program should make improvements before submitting the application to NATEF for review. **A program will be denied accreditation if the on-site evaluation team average on Standards 6, 7, 8, or 9 is less than four.**

5. A 'YES' response must be achieved on all six (6) criteria in Standard 11 if the program is using it to meet the instructional hour requirements for the purpose of accreditation. The program will not be approved for an on-site evaluation if it cannot support a 'YES' response to each criterion on the self-evaluation. ***A program will be denied accreditation if the on-site evaluation team does not give a 'YES' response to all six (6) criteria in Standard 11. This applies only to programs using the provisions in Standard 11 for the purpose of meeting instructional hour requirements.***

6. A program may not be approved for an on-site evaluation if the average rating on Standards 1- 5 and 10 is less than a four on the five-point scale. **A program may be denied accreditation if the on-site evaluation team average on Standards 1 - 5 and 10 is less than four.** Approval for on-site evaluation or accreditation will be made by NATEF, based on the number of standards rated at 4 or 5 as well as the individual rating on any standard rated less than four.

7. All MLR instructors must be ASE certified in A4, A5, A6, and A8. All AST and MAST instructors must hold current ASE certification in A6 and in the automobile area(s) (A1, A2, A3, A4, A5, A7, and A8) they teach.

8. All instructors must attend a minimum of 20 hours per year of recognized industry update training relevant to their program.

9. The program Advisory Committee must conduct at least two working meetings a year and must have a minimum of 5 people (excluding school personnel) on the committee. Minutes of the meetings must be provided to the on-site evaluation team for review and must reflect relevant areas of the standards as having been considered by the Advisory Committee.

10. The NATEF Standards recognize that program content requirements vary by program type and by regional employment needs. Therefore, flexibility has been built into the NATEF task list by assigning each task a priority number. A program must include in their curriculum the designated percentage of tasks in each priority numbered category (P-1, P-2, and P-3) in order to be accredited. The following percentages are required:

    95% of all Priority 1 (P-1) tasks must be taught
    80% of all Priority 2 (P-2) tasks must be taught
    50% of all Priority 3 (P-3) tasks must be taught

12. The concern for safety is paramount to the learning environment. Each program level has the following safety requirement preceding all related tasks:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

INFORMATION ABOUT EVALUATION TEAM LEADERS (ETLs)

Evaluation Team Leaders (ETLs) are educators who have been trained by NATEF to lead the on-site evaluation. The NATEF office will assign an ETL once a program has been approved for an on-site evaluation. Every effort will be made to assign an ETL located close to the school to reduce the cost for the evaluation. Three additional team members, selected by the program and approved by the ETL, are required for an automobile program on-site evaluation (see the following page for additional information about team members and on-site teams).

Persons selected as ETLs must:

1. have a minimum of six years of combined experience as an automobile technician and automobile instructor (at least three years experience as an automobile technician is required);
2. have a B.A. or B.S. in Education from a college or university recognized for teacher training by the state; and
3. be a current ASE certified master automobile technician (A1-A8).

Or, if a state does not require automobile instructors to have a B.A. or B.S. degree, the following qualifications will apply:

1. six years experience as an automobile technician,
2. four years automobile teaching experience at the secondary or post-secondary level, and
3. current ASE certified master automobile technician (A1-A8).

ETL candidates who are active instructors must be directly associated with an accredited program. ETL candidates who are inactive instructors must have formerly been directly associated with an accredited program.

ETL training is valid for three years. However, automatic three-year renewal is granted every time an ETL conducts an on-site evaluation. ETLs are required to attend additional training sessions or serve as a team member if they have not conducted an on-site evaluation within three years. This additional training is required even though the individual holds current ASE certification.

Anyone interested in becoming an Evaluation Team Leader should contact the NATEF office at (703) 669-6650 or their state Trade & Industrial Supervisor for more details.

INFORMATION ABOUT ON-SITE EVALUATION TEAM MEMBERS

The program requesting accreditation is responsible for recruiting and recommending on-site evaluation team members. The ETL must approve individuals recommended by the program. The on-site evaluation team members must be practicing automobile technicians, service managers or shop owners from businesses in the area served by the training program. For initial accreditation only, one team member may be an automobile instructor from another school district/system.*

Team members must have:

1. a high school diploma or the equivalent (industry or military training may be considered as the equivalent), and
2. at least seven years full-time experience as a general automobile technician.

ASE automobile certification is recommended but not required.

* An automobile instructor from another school district/system must have a minimum total of seven years experience, which must include three or more years full-time experience as an automobile technician and three or more years of post high school training.

The **initial** accreditation evaluation team is composed of four individuals: the ETL and three team members. Two team members must be from industry (one from a dealership and one from an independent repair facility). The third member may be from one of the following: a dealership, an independent repair facility or an automobile training program.

The **renewal of accreditation** evaluation team is composed of three individuals: the ETL and two team members. One team member must be from a dealership and one team member must be from an independent repair facility.

Each program requesting initial accreditation or renewal of accreditation must identify their choices for evaluation team members on the On-Site Evaluation Team Member List. An alternate team member choice must be identified on the On-Site Evaluation Team Member List in the event that one of the team members is unable to conduct the on-site evaluation. **The alternate team member must be from either a dealership or from an independent repair facility.**

Team members must not be advisory committee members, former instructors or graduates of the program within the past ten years or relatives of the administrator or instructor.

TASK LIST INFORMATION

An essential element of any curriculum or training program is a valid task list. Automobile technician instructors need a well-developed task list that serves as a solid base for course of study outlines and facilitates communication and articulation of their training programs with other institutions in the region.

It is a NATEF policy that the task list developed by the National Institute for Automotive Service Excellence (ASE) serves as the basis for the NATEF task list. Panels of technical service experts from the automotive service industry and career technical education are called upon to develop and validate the ASE and NATEF task lists.

The NATEF task list is used to develop the NA3SA test (formerly the End-of-Program test), which was pilot tested in the spring of 1996, and became available for use nationwide in the spring of 1997. The ASE task list is used to develop the ASE certification examination, a nationally recognized symbol of competence in diagnosing and repairing vehicle problems.

Additional information on the development of the NATEF task list can be found in the Task List section.

All tasks have a Priority designation. NATEF Standards recognize that program content requirements vary by program type and regional employment needs. Therefore, flexibility has been built into the NATEF task list by assigning each task a priority number. The priority number simply indicates the minimum percentage of tasks that a program must include in their curriculum in order to be accredited.

- **Ninety-five percent (95%) of Priority 1 (P-1) tasks must be taught.**
- **Eighty percent (80%) of Priority 2 (P-2) tasks must be taught.**
- **Fifty percent (50%) of the Priority 3 (P-3) tasks must be taught.**

TOOLS AND EQUIPMENT INFORMATION

The basic tools and equipment that must be available for use in the automobile program are listed in the Tools and Equipment section. Many tools and much of the equipment are the same for some or all of the three levels. However, some equipment is specialized and must be available for use in the selected program level. The AST and MAST lists are included in the Tools and Equipment section.

The student hand tool list covers all program levels. This list indicates the tools a student will need to own to be successful.

Although no brand names are listed, the equipment and tools must address the following programmatic issues:

1. Safety - Equipment and tools must have all shields, guards, and other safety devices in place, operable, and used.
2. Type and Quality - The tools and equipment used in an accredited program must be of the type and quality found in industry. They must also be adequate and in sufficient quantity to meet the program goals and student performance objectives.
3. Consumable Supplies - Supplies should be in sufficient quantity to assure continuous instruction. Consumable supplies, such as solvents, sand paper, etc. are not listed.
4. Maintenance - A preventive maintenance schedule should be used to minimize equipment down time.
5. Replacement - A systematic schedule for replacement should be used to maintain up-to-date tools and equipment at industry and safety standards. Information gained from student program evaluations as well as advisory committee input should be used in the replacement process.
6. Inventory - An inventory system should be used to account for tools, equipment, parts, and supplies.
7. Parts Purchasing - A systematic parts-purchasing system should be used from work order to supplier.
8. Hand Tools - Each student should be encouraged to purchase a hand tool set during the period of instruction.
9. Storage - Adequate storage of tools should be provided. Space for storage of the students' hand tools should be provided.

AUTOMOBILE PROGRAM EVALUATION

NATEF Standards for Initial Accreditation and Renewal of Accreditation are identical. Items listed below are considered **Go/No Go** items, and are critical for accreditation and are in **bold** print in the Automobile Program Self-Evaluation materials.

2.5 A	**Does the Advisory Committee, with at least five (5) in attendance, convene a minimum of two working meetings per year?**
5.5 F	**Does the Advisory Committee review information from the annual follow-up procedure and provides input for modifications to the training program?**
6.5 A	**Does the automobile program provide theory and "hands-on" training for 95% of the P-1, 80% of the P-2, and 50% of the P-3 tasks, as evidenced by cross-referencing the course of study, lesson plans, job sheets, and student progress charts?**
6.5 B	**Are the tools and equipment available for the tasks taught at the program level being accredited?**
7.1 A	**Are all shields, guards, and other safety devices in place, operable, and used?**
7.1 B	**Do all students, instructors, and visitors wear safety glasses in the lab/shop area while lab is in session?**
9.1 D	**Do instructors hold current ASE certification appropriate for the program level being accredited?**
9.3 B	**Do instructors attend a minimum of 20 hours per year of recognized industry update training relevant to the program?**

For programs using e-learning for the purpose of meeting NATEF instructional hour requirements, support for a 'YES' response must be provided for each criterion below:

11.1 A	**Is there documentation that students have access to appropriate technology for e-learning purposes?**
11.2 A	**Are the content/tasks that are to be delivered via e-learning clearly highlighted in the course of study?**
11.2 B	**Is there documentation that e-learning is incorporated into the content/tasks in the program plan?**
11.2 C	**Do the instructional hours to be credited toward meeting up to 25 percent of the program hour requirements correlate with the vendor's average completion time for each instructional module?**
11.2 D	**Is there documentation of the implementation and use of e-learning instructional materials as evidenced in a Learning Management System (LMS)?**
11.3 A	**Are Advisory Committee meeting minutes available to confirm that the committee has discussed and approved e-learning?**

Programs must be able to support a yes response for all eight items (fourteen items if using Standard 11 – E-learning). Programs must also meet the hour requirements listed in item 2 on

page 7 appropriate for the level of accreditation sought. **If these responses are not achieved, do not apply for accreditation at this time.**

In addition, an on-site evaluation will not be scheduled unless the average score on each of Standards 6, 7, 8, and 9 is at least a 4 on the Automobile Program Self-Evaluation. Please refer to the Automobile Program Requirements for more information.

Instructors must be ASE certified in accordance with the requirements for the program level being accredited. Please refer to item 7 on page 7.

NATEF POLICIES ON ARTICULATION AGREEMENTS

There is no provision for articulated accreditation for automobile training programs under the 2012 Automobile program standards. Regardless, NATEF Trustee action, as well as language in the Carl D. Perkins Vocational Education Act, encourages articulation between programs at the secondary and post-secondary levels.

Articulation agreements may be entered into between any consenting institutions, and are generally defined by a formal written agreement. This agreement usually defines the terms of the articulation, including, but not limited to, the terms under which a student completing specific coursework at one institution may receive credit* from the other institution. Articulation agreements encourage, but cannot require, graduates of secondary programs to go on to post-secondary education.

* Credit is defined as a form of recognition for work that has been completed at the secondary level. It includes, but is not limited to, granting: academic credit, advanced placement, task completion, etc.

RECOGNITION FOR ACCREDITATION

A program approved for accreditation or renewal of accreditation will receive a plaque that includes, the school's name and the expiration date of accreditation. A statement will read:

"THE INSTRUCTION, COURSE OF STUDY, FACILITIES AND EQUIPMENT OF THIS INSTITUTION HAVE BEEN EVALUATED BY THE NATIONAL AUTOMOTIVE TECHNICIANS EDUCATION FOUNDATION AND MEET STANDARDS OF QUALITY FOR THE TRAINING OF AUTOMOBILE TECHNICIANS AT THE FOLLOWING LEVEL:

_____

Institutions receiving NATEF accreditation are encouraged to put the following statement on the graduate's diploma or certificate:

> "The person holding this diploma has participated in an automobile technician training program that was accredited by the National Automotive Technicians Education Foundation and has completed instruction at the following level:

_____

A screened NATEF logo may be overprinted with the above statement and placed on the graduate's diploma. A camera-ready logo is provided in the promotional material a program receives upon accreditation.

Programs granted initial accreditation will also receive a 24"x30" sign indicating that the training program is NATEF accredited.

INTEGRATED ACADEMIC SKILLS RECOGNITION

An automotive technician's job description consists of far more than the performance of manipulative tasks required to service today's complex vehicles. Successful technicians must possess an array of workplace skills and a unique blend of academic and technical skills.

To that end, the NATEF Board of Trustees has approved an updated version of integrated academic skills in the disciplines of English, mathematics, and science for automotive technicians. This document includes a listing of communication, math, and science skills required of automotive technicians to effectively analyze, diagnose, service and/or repair today's technically sophisticated automobiles.

Furthermore, the integrated academic skills have been correlated with comparable national standards for English, mathematics, and science as published respectively by the International Reading Association/National Council of Teachers of English, the National Council of Teachers of Mathematics, and the National Science Teachers Association. Such correlations add credibility to the multi-disciplinary approach to training automotive technicians.

NATEF will issue a certificate of excellence to those programs that provide documentation including, but not limited to, student assignments or activities, classroom/lab instructional materials, student performance records, and interviews with academic instructors.

Programs that wish to receive recognition must complete the Integrated Academic Skills Recognition form and return it with the application for accreditation or renewal of accreditation. Documentation on integrated academic skills activities must be available for the ETL at the time of the on-site evaluation.

Programs may receive recognition in English, Mathematics, Science, or any combination of the three areas.

To receive a copy of the *Integrated Academic Skills* manual for automobile technicians, please go to the NATEF website at www.natef.org to access the order form, or contact the NATEF office.

APPEALS AND ACTION FOR REVOCATION

APPEALS: PROGRAMS APPLYING FOR ACCREDITATION

A complaint received from any school concerning the procedures, evaluation or accreditation of the automobile technician training program must be made in writing to the ASE office in Leesburg, VA. It will be immediately referred to the Grievance Examiner who will acknowledge receipt of the complaint in writing to the complainants. Thereafter, the Grievance Examiner will investigate the complaint and prepare a report. A copy of the report will be given to the complainants and to an Appeals Committee within thirty (30) days of the receipt of the complaint.

The Appeals Committee will review the findings and recommendations of the Grievance Examiner, together with the complaint and any data supplied in connection therewith. The Appeals Committee will be empowered to dismiss the matter or to initiate such action as it may deem appropriate.

If the complainants desire to review the Appeals Committee's evaluation, they may do so at the office of the Grievance Examiner in Leesburg, VA. However, they will not be permitted to make copies of the results.

ACTION FOR REVOCATION: NATEF ACCREDITED PROGRAMS

The Appeals Committee will also advise the NATEF President of its judgments and recommendations for action in any cases of malpractice or misrepresentation involving the misuse of NATEF accreditation for an automobile technician training program. Upon receipt of a complaint alleging misuse or misrepresentation by an accredited program, the Grievance Examiner will be notified. The Grievance Examiner will notify the parties against whom the complaint has been filed, in writing, indicating the alleged wrongdoing. The parties will be further advised that they may submit a written explanation concerning the circumstances of the complaint within thirty (30) days. After the Grievance Examiner has considered the complaint and received the explanation, if any, the Grievance Examiner will determine whether there is a reasonable basis for a possible wrongdoing. If the Grievance Examiner finds such a basis, the Grievance Examiner will inform the parties of the findings. At that time, the Grievance Examiner will inform the parties of their right to a hearing before the Appeals Committee. The parties will have fifteen (15) days to notify the Grievance Examiner, in writing, of their decision.

In the event the involved parties elect to be bound by the findings of the Grievance Examiner without a hearing, the Grievance Examiner will submit a written report with recommendations to the Chair of the Appeals Committee. This report will be submitted within sixty (60) days of the receipt of the waiver of a hearing. The Chair of the Appeals Committee will mail a copy of the Grievance Examiner's findings and recommendations to the parties. In the event that the involved parties elect to appear at a hearing, the Chair of the Appeals Committee will call a Board of Inquiry. This Board will consist of four ASE/NATEF Board members. The Board of Inquiry will be convened in Leesburg, VA at a date and time determined by the Chair. The Board will notify the involved parties, in writing, regarding the time and place of the hearing.

The Grievance Examiner will be responsible for investigating and presenting all matters pertinent to the alleged wrongdoing to the Board of Inquiry. The involved parties will be entitled to be at the hearings with or without counsel. The parties will be given an opportunity to present such evidence or testimony as they deem appropriate.

The Board of Inquiry will notify the Chair of the Appeals Committee of its findings and recommendations in writing within ten (10) days after the hearing is completed.

The Appeals Committee will review the findings and recommendations of either the Grievance Examiner if a hearing was waived, or the Board of Inquiry if a hearing was held. The Appeals Committee will determine if the record on the complaint supports a finding of conduct contrary to or in violation of reasonable practices. If two-thirds of the Appeals Committee so find, the Committee will recommend to the NATEF President the appropriate sanctions or courses of action against the parties charged.

DEFINITIONS – EDUCATIONAL TERMS

1. **CURRICULUM:** All the objectives of the lesson plan with respect to the content and learning activities, arranged in a sequence for a particular instructional area. An orderly arrangement of integrated subjects, activities, time allocations, and experiences which students pursue for the attainment of a specific educational goal.

2. **COMPETENCY: (Hands On)** - Performance of task to the level or degree specified in the performance standard and curriculum for the task.

3. **COMPETENCY: (Written)** – Understanding of task to the level or degree specified in the performance standard and curriculum for the task.

4. **CRITERION REFERENCED MEASURE(S):** An exercise based on a performance objective for a task, and designed to measure attainment of that objective. (Also called performance test(s) or criterion-referenced test.)

5. **E-LEARNING:** An electronically-based instructor-managed and student-driven process that enhances and/or supplements learning—outside the regularly scheduled classroom and lab/shop timeframe—*and includes integrated and scored auditable assessment and reporting* in compliance with NATEF's e-learning general framework criteria.

6. **GOAL:** A statement of the intended outcome of participation in the training program.

7. **LEARNING MANAGEMENT SYSTEM (LMS):** An electronically based, instructor managed, and student driven process that enhances and/or supplements learning—outside the regularly scheduled classroom and lab/shop time frame—*and includes integrated and scored auditable assessment and reporting* in compliance with NATEF's e-learning general framework criteria.

8. **MASTERY:** (See Competency - Hands On and Competency - Written).

9. **OBJECTIVE, PERFORMANCE:** A written statement describing an intended outcome (competent task performance) in terms of student performance. (Also called "behavioral" objective or instructional objective) R.F. Mager Associates, 13245 Rhoda Drive, Los Altos Hill, California.

10. **ON-VEHICLE SERVICE AND REPAIR WORK:** The processing, assignment and student performance of the appropriate tasks on vehicles donated by manufacturers or other sources, customer-owned, and other training vehicles.

11. **PERSONAL CHARACTERISTIC:** Attributes that are not readily measurable and are generally in the affective or cognitive domains.

12. **PRIORITY RATINGS:** Indicates the minimum percentage of tasks that a program must include in its curriculum in order to be accredited.

13. **STANDARD:** "...Something established for use as a rule or basis of comparison in measuring or judging capacity, quantity, content, extent, value, quality, etc." Webster's New World Dictionary (1991)

14. **STANDARD – (PERFORMANCE):** A written specification of the results of acceptable task performance.

15. **STANDARD – (PERSONAL):** An attribute or characteristic of an individual that facilitates entry into or advancement within an occupation.

16. **STANDARD – (PROGRAM):** A specific quality or desired characteristic of a training program designed to prepare individuals for employment or advancement.

17. **TASK:** A psychomotor or cognitive entry-level learning activity consisting of one or more measureable steps accomplished through an instructor presentation, demonstration, visualization or a student application.

18. **TRAINING STATION:** An area with appropriate tools and equipment, large enough to allow the development of both safety and competency in task performance.

****

Must or shall is an imperative need, duty or requirement; an essential or indispensable item; mandatory.

Should is used to express a recommendation, not mandatory but attainment would increase program quality.

May or could expresses freedom to follow a suggested alternative.

PROCEDURES FOR ACCREDITATION/RENEWAL OF ACCREDITATION

Process Overview

NOTE: NATEF recommends that programs maintain a file containing copies of all reference and documentation materials developed during all phases of the accreditation process.

1. Purchase application materials

The program requesting accreditation must purchase self-evaluation materials from NATEF in Leesburg, VA. To begin the accreditation process, the program must return the following items from the evaluation materials packet:

Application for Accreditation or Renewal of Accreditation to include:

- Self-Evaluation Summary Sheet
- On-site Evaluation Team Member List
- Instructor Qualifications Forms and Instructor Training Forms
- Advisory Committee List
- Applied Academics Recognition Forms (optional)
- Payment Worksheet—Purchase Order, Check, or Credit Card Authorization for Application Fee and On-Site Evaluation Team Packets (applications will be returned if received without payment)

2. NATEF review of application

The national office will review the materials within 30 days. Following the review, the Program Administrator and the state Trade & Industrial Supervisor will be notified about the status of the program. The program will be identified as one of the following:

a. Qualified for on-site evaluation for the level listed on the application.
b. Not qualified for an on-site evaluation at that time. NATEF will indicate specific improvements that must be made before the on-site evaluation can be scheduled.

3. Evaluation Team Leader (ETL) assigned, Program Coordinator makes contacts

NATEF will assign an Evaluation Team Leader (ETL) to the program, and notify the program of its selection providing the necessary ETL contact information. Included with the notification of ETL assignment will be an On-site Evaluation Agreement. The On-site Evaluation Agreement will be sent with instructions that outline the plans for the local administration and the costs for the ETL's services and expenses. All costs will be paid by the institution requesting accreditation. This agreement must be completed and returned to the ETL after the on-site date has been established.

With a legitimate reason, the Program Coordinator may contact the NATEF office to request a different ETL. A request for a different ETL must be in writing and specific as to the reason for the request. (The ETL assigned must NOT be a present or former teacher or administrator of the program to be evaluated.) The Program Coordinator must contact the ETL to arrange a date for the on-site evaluation.

4. Send on-site application, course of study, and list of on-site evaluation team members to ETL

The On-site Evaluation Agreement, signed by the program administrator, must be sent to the ETL. A copy of the course of study, Advisory Committee minutes (one year's worth for initial accreditation; five year's worth for renewal of accreditation) and this agreement must be received by the ETL at least two weeks prior to the on-site evaluation or the on-site must be rescheduled.

The course of study should include the following items:

a. Syllabus for each class
b. Tasks to be taught specified according to Priority designations P-1, P-2, P-3
c. Number of contact hours
d. Sequence of instruction to be included in the program
e. List of training materials used in training
f. Sample evaluation form used to track student progress

For programs using e-learning (Standard 11) to meet NATEF hour requirements the following must be included in addition to the above:

g. Tasks and information to be taught using e-learning materials outside of classroom/lab/shop time
h. Number of hours allocated to using e-learning instructional materials outside of classroom/lab/shop time correlated with vendor/developer's average completion time for each module
i. Sample of the Learning Management System (LMS) used to track student progress

The On-site Evaluation Team Member List must be included for the ETL to review and approve. Once a date has been set and the on-site evaluation team members have been approved by the ETL, the program coordinator must contact the on-site evaluation team members to make arrangements for the evaluation day(s).

5. On-site evaluation

Initial accreditation requires 2 consecutive days while students are in class for the on-site evaluation review of all the standards. However, if more than one program is applying for accreditation (general automotive and GM ASEP, for example), additional team members and additional days may be required to complete the on-site evaluation. The NATEF office will determine the need for additional team members and days.

Renewal of Accreditation requires a 1-day on-site evaluation while students are in class. The on-site evaluation team reviews Standards 6-9 (and Standard 11 if applicable) as well as all **go/no-go** (critical) items. However, if the Advisory Committee average on Standards 1-5 or Standard 10 is less than 4, the on-site evaluation team must also review these standards. The NATEF office will determine whether an additional day or additional team members will be required to complete the evaluation.

6. ETL reports results to NATEF

The ETL will submit all on-site evaluation materials and a final report to NATEF with a recommendation for or against program accreditation.

7. Program accreditation

The national office will review the final report and all additional evaluation materials to determine whether the program meets the requirements for accreditation and will make their recommendation to the NATEF Board of Trustees. The NATEF President will approve accreditation as sanctioned by the Board of Trustees.

Programs that do not earn accreditation will be given a written report specifying improvements that must be made to qualify for accreditation. The decision at the national level will be final unless appealed to the NATEF Board of Trustees. Appeals will be heard only at regular meetings of the Board.

The Program Administrator and the state Trade & Industrial Supervisor will be notified of all decisions regarding the accreditation status of all programs applying for NATEF accreditation.

8. Display and reporting of accreditation materials

A wall plaque identifying the accredited level will be forwarded from the national office to the program administrator. Schools **must** accurately report the level of NATEF accreditation.

9. Accredited Technician Training Program List

The NATEF office maintains a current listing of all NATEF accredited programs. The list is made available on the NATEF website.

10. Compliance report

A program will be accredited for five years. A compliance report is required after 2½ years. The compliance report will be used to verify that a program is maintaining its standards. NATEF will notify the program administrator of the compliance date and will send the appropriate compliance review forms at that time. The Advisory Committee must complete the report and the program administrator must return the forms to the NATEF office.

NATEF may randomly select programs at the 2½-year period for an on-site compliance review by an ETL and NATEF Trustees, staff, consultants, or other designated representatives. The selected programs will be notified, in advance, of the on-site review by the NATEF office. Programs should be prepared to provide documentation on how they are maintaining the standards. All costs for this on-site review will be paid by NATEF.

11. Renewal of Accreditation

The NATEF office will contact the program eleven (11) months prior to the accreditation expiration date. Programs must formally request renewal of accreditation materials and follow the process outlined above.

On-site Evaluation Cost Sheet

AUTOMOBILE

	ACCREDITATION	RENEWAL OF ACCREDITATION
Program Accreditation Documents	$94.00	$82.00
Application Fee	$315.00	$315.00
On-site Evaluation Team Manuals (minimum of 4 sets for initial documents and 3 sets for renewal @ $65 each.)	$260.00	$195.00
Honorarium for Evaluation Team Leader (ETL) @ $250/day ***Please see below**	*$500.00	*$250.00
Estimated mileage, hotel, and meal expenses for the ETL ****Please see below**	$150.00	$100.00
ESTIMATED TOTAL COSTS	$1319.00	$942.00

NOTE: It is anticipated that team members recruited from local independent repair facilities and dealerships will serve without charge to the institution.

The NATEF office must receive the application fee and payment for the on-site evaluation team packets with the completed application. Applications received without these payments will be returned to the program for resubmission with payment.

***ETLs are to receive an additional honorarium of $100 per additional program when evaluating multiple programs at one location. Example: An ETL evaluates one general program and one manufacturer-specific program during an initial accreditation on-site evaluation. The honorarium paid to the ETL would be $500 for the standard two-day honorarium plus $100 for the additional program, for a total honorarium of $600.**

ETLs are paid as independent contractors, not as school employees.

****Mileage is to be reimbursed at the "business purpose" rate specified by the IRS. Please visit IRS.gov for the current mileage reimbursement rate.**

Costs of accreditation/renewal of accreditation are subject to change. Contact the NATEF office for current information.

AUTOMOBILE PROGRAM STANDARDS

STANDARD 1 - PURPOSE

THE AUTOMOBILE TECHNICIAN TRAINING PROGRAM SHOULD HAVE CLEARLY STATED PROGRAM GOALS, RELATED TO THE NEEDS OF THE STUDENTS AND EMPLOYERS SERVED.

Standard 1.1 - Employment Potential
The employment potential for automobile technicians, trained to the level for the specialty or general areas outlined in the program goals, should exist in the geographic area served by the program.

Standard 1.2 - Program Description/Goals
The written description/goals of the program should be shared with potential students and should include admission requirements, employment potential, area(s) of specialty training offered, and the cost of all tuition and fees. Technical qualifications of the faculty and the overall goal(s) of the program should also be included.

STANDARD 2 - ADMINISTRATION

PROGRAM ADMINISTRATION SHOULD ENSURE THAT INSTRUCTIONAL ACTIVITIES SUPPORT AND PROMOTE THE GOALS OF THE PROGRAM.

Standard 2.1 - Student Competency Certification
The certificate or diploma a student receives upon program completion should clearly specify the area(s) of demonstrated competency.

Standard 2.2 - Chain of Command
An organizational chart should be used to indicate the responsibilities for instruction, administration, and support services.

Standard 2.3 - Administrative Support
Positive administrative support from institutional and local governing bodies should be demonstrated. Indicators of administrative support would include: support for staff in-service and update training; provision of appropriate facilities; up-to-date tools, equipment, training support materials, and curriculum.

Standard 2.4 - Written Policies
Written policies should be adopted by the administration and policy board for use in decision-making situations and to provide guidance in achieving the program goals. Policies regarding safety, liability, and lab/shop operation should be written and prominently displayed as well as provided to all students and instructors.

Standard 2.5 - Advisory Committee
An Advisory Committee consisting of at least five (5) members (not including school personnel), must convene at least two times a year and be utilized to provide counsel, assistance, and information from the community served by the training program. This Committee should be broadly based and include former students, employed technicians, employers, and representatives for consumers' interests.

Standard 2.6 - Public/Community Relations
An organized plan should be used to provide the community at large information regarding the training program, its graduates, its plans, and any services provided to the community.

Standard 2.7 – Customer Vehicle Work
A systematic method of collecting, documenting, and disbursing customer vehicle work repair receipts should be used. Instructional staff should not be required to collect payment for customer vehicle work repairs. (This applies only to programs that accept customer vehicles for instruction.)

STANDARD 3 - LEARNING RESOURCES

SUPPORT MATERIAL CONSISTENT WITH BOTH PROGRAM GOALS AND PERFORMANCE OBJECTIVES SHOULD BE AVAILABLE TO STAFF AND STUDENTS.

Standard 3.1 - Service Information
Service information with current manufacturer's service procedures and specification data for vehicles manufactured within the last ten (10) years should be available. This information should be accessible to students while working in the lab/shop area.

Standard 3.2 - Multimedia
Appropriate up-to-date multimedia materials such and technology should be readily available and utilized in the training process.

Standard 3.3 - Instructional Development Services
The service of professional instructional development personnel should be used when available. At a minimum, equipment and supplies should be available for copying or printing. Instructional development personnel should conduct in-service and/or training in curriculum and media development.

Standard 3.4 - Periodicals
Current general and technical automobile magazines and newspapers should be available for student and instructor use.

Standard 3.5 - Student Materials
Pertinent instructional texts, resources, and e-learning materials should be available for each student to satisfy the objectives of the mode of instruction used. Basic and specialty textbooks should have copyright dates that are not over six (6) years old.

STANDARD 4 - FINANCES

FUNDING SHOULD BE PROVIDED TO MEET THE PROGRAM GOALS AND PERFORMANCE OBJECTIVES.

Standard 4.1 - Program Training Cost
The enrollment in the program or program area should be sufficient to keep the per-student training costs to a realistic figure.

Standard 4.2 - Budget
An adequate annual budget should be developed, allocated, and used for the operation of the program.

Standard 4.3 - Budget Preparation
The budget should be prepared by the institutional administration in conjunction with the program faculty.

Standard 4.4 - Status Reports
Budget status reports should be made available to program staff at least quarterly.

STANDARD 5 - STUDENT SERVICES

SYSTEMATIC SKILLS ASSESSMENT, INTERVIEWS, COUNSELING SERVICES, PLACEMENT, AND FOLLOW-UP PROCEDURES SHOULD BE USED.

Standard 5.1 – Skills Assessment
For students to develop the skills and knowledge required to service today's automobiles, each student must possess, or be given the opportunity to develop, essential foundation skills in reading, mathematics, science, and mechanical aptitude. To this end, a formal skills assessment instrument (process) for these fundamental skills should be used to evaluate students to ensure that each student has a reasonable probability of success as an automobile technician. Testing procedures and how the test results will be used (e.g., placement, assessment of student's developmental needs, etc.) should be stated in program explanatory material, and justification for all requirements should be available.

Standard 5.2 - Pre-admission Counseling
Prior to program admission, a student should be counseled regarding automotive careers.

Standard 5.3 - Student Records
Permanent records of all students, former and current, should be available, preferably in one central location, and kept confidential.

Standard 5.4 - Placement
A systematic student placement system should be used to assist program graduates to obtain employment in the automobile industry.

Standard 5.5 – Annual Follow-up
A follow-up system should be used to determine students' employment location and for feedback regarding the efficiency, effectiveness, and appropriateness of training. The follow-up procedure should be designed to assure feedback regarding needed additions to or deletions from the training curriculum, program, and tools and equipment. Follow-up of graduates employed outside of the automobile industry should indicate reasons for non-automobile service employment. When applicable, this information should be used to modify the training quality and/or content.

Standard 5.6 - Legal Requirements
The training program should meet all applicable local, state, and federal requirements.

STANDARD 6 - INSTRUCTION

INSTRUCTION MUST BE SYSTEMATIC AND REFLECT PROGRAM GOALS. A TASK LIST AND SPECIFIC PERFORMANCE OBJECTIVES WITH CRITERION REFERENCED MEASURES MUST BE USED.

Standard 6.1 - Program Plan
The training plan should progress in logical steps, provide for alternate sequences, where applicable, and be made available to each student.

Standard 6.2 - Student Training Plan
A training plan for each student should be developed and used, indicating the student's training goal(s) and specific steps needed to meet that goal. Students should be given a copy of their training plan.

Standard 6.3 - Preparation Time
Adequate time should be provided for teacher preparation and program development.

Standard 6.4 - Teaching Load
The instructor/student ratio and class contact hours should allow time for interaction on a one-to-one basis.

Standard 6.5 - Curriculum
All tasks have been given a priority rating. Ninety-five percent (95%) of the tasks designated as Priority 1 (P-1) must be taught in the curriculum. Eighty percent (80%) of the tasks designated as Priority 2 (P-2) must be taught in the curriculum. Fifty percent (50%) of the tasks designated as Priority 3 (P-3) must be taught in the curriculum. Additional tasks may be included to meet the needs of local employers. All additional tasks should be approved by the Advisory Committee.

Instruction on the legal aspects and responsibilities of the automobile technician in areas such as Environmental Protection Agency regulations, safety regulations, OSHA regulations, and other appropriate requirements should be included in the curriculum. Instruction and practice in filling out work order forms, ordering parts, and basic record keeping should be a part of the training program.

Tools and equipment must be available to perform the tasks in each of the areas for which accreditation is requested.

Standard 6.6 - Student Progress
A record of each student's progress should be maintained through the use of a progress chart or other recording device. The record should indicate tasks required for program completion and those tasks the student has mastered.

Standard 6.7 - Performance Standards
All instruction should be performance based, with an acceptable performance standard stated for each task. These standards should be shared with students and potential employers. Students should demonstrate "hands-on competency" of a task before the instructor verifies a student's performance.

Standard 6.8 - Safety Standards
Safety instruction should be given prior to lab/shop work and be an integral part of the training program. A safety test should be included in the training program. Students and instructors should comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Standard 6.9 - Personal Characteristics
All training activities and instructional material should emphasize the importance of maintaining high personal standards.

Standard 6.10 - Work Habits/Ethics
The training program should be organized in such a manner that work habits and ethical practices required on the job are an integral part of the instruction.

Standard 6.11 - Provision for Individual Differences
The training program should be structured in such a manner that students with different levels of cognitive and psychomotor skills can be accommodated.

Standard 6.12 - Related Instruction
Instruction in related mathematics, science, communications, and interpersonal relations should be provided and coordinated with ongoing instruction in the training program. This instruction should be provided by a qualified instructor.

Standard 6.13 - Testing
Both written and performance based tests should be used to validate student competency. Students should be encouraged to take certification tests that are publicly recognized indicators of capabilities.

Standard 6.14 - Evaluation of Instruction
Instructional procedures should be evaluated in a systematic manner. This evaluation should be through regular reviews by students and the administration. Self-evaluation of instruction should also be utilized on a systematic and regular basis. This system should include input from former students and the Advisory Committee members. Instructional procedures should show responsiveness to the feedback from these evaluations.

Standard 6.15 – On-Vehicle Service and Repair Work
On-vehicle service and repair work should be scheduled to benefit the student and supplement ongoing instruction on items specified in the NATEF task list. A student should have had instruction and practice on a specific repair task before on-vehicle service and repair work requiring that task is assigned. Vehicles donated by the manufacturers or other sources, customer-owned vehicles, and other training vehicles may be used as the primary source of on-vehicle service and repair work. Training program student-owned vehicles, school buses, and other vehicles owned and operated by the governing body of the school should not be the primary source of on-vehicle service and repair work vehicles. All vehicles in the lab/shop should have a completed industry-type work order attached to or on the vehicle.

Standard 6.16 - Articulation
Agreements between programs with equivalent competencies should be used to eliminate unnecessary duplication of instruction and foster continued study.

STANDARD 7 - EQUIPMENT

EQUIPMENT AND TOOLS USED MUST BE OF THE TYPE AND QUALITY FOUND IN THE REPAIR INDUSTRY AND MUST ALSO BE THE TYPE NEEDED TO PROVIDE TRAINING TO MEET THE PROGRAM GOALS AND PERFORMANCE OBJECTIVES.

Standard 7.1 - Safety
Equipment and tools used in the training program must have all shields, guards, and other safety devices in place, operable, and used. Safety glasses must be worn by all students, instructors, and visitors in the lab/shop area while lab is in session.

Standard 7.2 - Quantity and Quality
The tools and equipment used in the training program should reflect the program goals and performance objectives. Sufficient tools and equipment should be available for the training offered. The tools and equipment should meet industry quality standards.

Standard 7.3 - Consumable Supplies
Sufficient consumable supplies should be readily available to assure continuous instruction.

Standard 7.4 - Maintenance
A preventive maintenance schedule should be used to minimize equipment down-time.

Standard 7.5 - Replacement
An annual review process should be used to maintain up-to-date tools and equipment at industry and safety standards. Student follow-up and Advisory Committee input should be used in this process.

Standard 7.6 - Inventory
An inventory system should be used to account for tools, equipment, parts, and supplies.

Standard 7.7 - Parts Purchasing
A systematic parts purchasing system, from work order - to parts specialist - to jobber, should be used. Task performance should not be unreasonably delayed due to lack of replacement parts.

Standard 7.8 - Hand Tools
Each student should have access to basic hand tools comparable to tools required for employment. Students should be encouraged to purchase a hand tool set during the period of instruction.

STANDARD 8 - FACILITIES

THE PHYSICAL FACILITIES MUST BE ADEQUATE TO PERMIT ACHIEVEMENT OF THE PROGRAM GOALS AND PERFORMANCE OBJECTIVES.

Standard 8.1 - Training Stations
Training stations (bench and on-vehicle service and repair work) should be available in the type and number required for the performance of tasks outlined in the program goals and performance objectives.

Standard 8.2 - Safety
The facilities should meet all applicable safety standards and an emergency plan should be in place and posted in all classrooms and lab/shop areas.

Standard 8.3 - Maintenance
A written facilities maintenance program should be used to ensure facilities are suitable when required for instruction.

Standard 8.4 - Housekeeping
The classroom(s), lab/shop, and support area(s) should be kept clean and orderly.

Standard 8.5 - Office Space
An area separate from the lab/shop should be available and convenient for the instructor(s) to use as an office.

Standard 8.6 - Instructional Area
A classroom convenient to, but separate from, the lab/shop area should be available for instruction and other non-lab/shop activities.

Standard 8.7 - Storage
Storage areas for tools, parts, supplies, and automobiles should be sufficient to support the activities outlined in the program goals and performance objectives. Security should be provided to prevent pilferage and vandalism.

Standard 8.8 - Support Facilities
Restrooms and clean-up areas should be provided for both male and female students and should be convenient to the instructional area.

Standard 8.9 - Ventilation
An adequate exhaust fume removal system should be in place and operational. When appropriate, heating and cooling systems should be used to provide sufficient comfort for learning.

Standard 8.10 - First Aid
A first aid kit should be in place and should comply with local regulations and school policy.

Standard 8.11 - Facility Evaluation
The Advisory Committee should conduct an annual evaluation of the facilities to assure adequacy to meet program goals.

STANDARD 9 - INSTRUCTIONAL STAFF

THE INSTRUCTIONAL STAFF MUST HAVE TECHNICAL COMPETENCY AND MEET ALL STATE AND LOCAL REQUIREMENTS FOR ACCREDITATION.

Standard 9.1 - Technical Competency
Instructors must hold current ASE certification to meet the requirements for the level of program accreditation sought (MLR, AST or MAST).

Standard 9.2 - Instructional Competency/Certification
Instructors should meet all state certifying requirements.

Standard 9.3 - Technical Updating
Faculty members should be provided technical materials required to maintain their competency. Instructors must attend a minimum of 20 hours of technical update training each year.

Standard 9.4 - First Aid
The program should have a written policy, approved by the administrator of the school, on First Aid procedures.

Standard 9.5 - Substitutes
A systematic method of obtaining "substitute" instructors should be used to assure instructional continuity. An orientation session for substitutes should be held on a regular basis. The substitute should be a competent automobile instructor.

STANDARD 10 - COOPERATIVE AGREEMENTS

WRITTEN POLICIES AND PROCEDURES SHOULD BE USED FOR COOPERATIVE AND APPRENTICESHIP TRAINING PROGRAMS. (This applies only to programs that offer cooperative/apprenticeship training.)

Standard 10.1 - Standards
The student training plan and performance standards should be developed and coordinated by the automobile instructor.

Standard 10.2 - Agreements
All agreements should be written and legally binding.

Standard 10.3 - Supervision
A supervising automobile instructor or supervising co-op coordinator should be assigned responsibility, authority, and time to coordinate and monitor automobile cooperative/apprenticeship programs.

STANDARD 11 – E-LEARNING

WRITTEN POLICIES AND PROCEDURES MUST BE FOLLOWED WHEN E-LEARNING CURRICULAR MATERIALS ARE USED OUTSIDE OF SCHEDULED CLASSROOM/LAB/SHOP TIME FOR THE PURPOSE OF MEETING NATEF INSTRUCTIONAL HOUR REQUIREMENTS. (This applies only to programs that are using e-learning to meet program hour requirements. This is a go/no go Standard that requires validation of a 'yes' response to each of the criteria.)

Standard 11.1 – Access
Students must have access to the appropriate technology needed to access e-learning materials.

Standard 11.2 – Curriculum and Student Progress
All content/tasks taught by e-learning must be identified and a record of each student's progress must be maintained through the use of a Learning Management System (LMS).

Standard 11.3 – Advisory Committee Input
E-learning, for the purpose of meeting NATEF hour requirements, must be discussed and approved by the Advisory Committee.

TASK LIST AND ASSUMPTIONS

The NATEF task list was reviewed and updated during the 2011-2012 school year. After a lengthy process that included discussions with industry, employers, and educators, NATEF conducted a series of workshops and webinars. These workshops and webinars included educators at the secondary and post-secondary levels; automobile repair shop owners and technicians; and representatives from the automobile manufacturers.

During the workshops and webinars, the group reviewed the NATEF task list, tools and equipment list, program hours, and instructor qualifications. The group was also provided the most current National Institute for Automotive Service Excellence (ASE) Automobile Technician Tests Task Lists for reference purposes. In June 2012, NATEF introduced a new model for automobile program standards.

The tasks are divided into three levels: **Maintenance & Light Repair (MLR)**, **Automobile Service Technician (AST)**, and **Master Automobile Service Technician (MAST)**. Tasks in each level are assigned a priority number: P-1, P-2, or P-3. Please refer to the Task List Information in the Policies section for additional information on the requirements for instruction on tasks. ***Note: A task is a psychomotor or cognitive entry-level learning activity consisting of one or more measureable steps accomplished through an instructor presentation, demonstration, visualization or a student application.***

Theory instruction and hands-on performance of all the basic tasks will provide initial training for **entry-level** employment in the automotive service field or further training in any or all of the specialty areas. Competency in the tasks will indicate to employers that the graduate is skilled in that area.

1. It is assumed that:

   * in all areas, appropriate theory, safety, and support instruction will be required for performing each task;
   * the instruction has included identification and use of appropriate tools and testing and measurement equipment required to accomplish certain tasks;
   * the student has received the necessary training to locate and use current reference and training materials from accepted industry publications and resources;
   * in all areas, the student has demonstrated the ability to write work orders and warranty reports, to include information regarding problem resolution and the results of the work performed for the customer and the manufacturer. The writing process will incorporate the "Three C's" (concern, cause and correction) as a format to communicate this information.

2. It is assumed that all diagnostic and repair tasks described in this document are to be accomplished in accordance with manufacturer's recommended procedures and safety precautions as published.

3. It is assumed that:

* individual training programs being evaluated for accreditation should have written and detailed performance standards for each task covered and taught in the curriculum;
* the learning progress of students will be monitored and evaluated against these performance standards;
* a system is in place that informs all students of their individual progress through all phases of the training program.

4. It is assumed that:

* individual courses of study will differ across automobile technician training programs;
* development of appropriate learning delivery systems and tests which monitor student progress will be the responsibility of the individual training program.

5. It is assumed that:

* all students will receive instruction in the storage, handling, and use of Hazardous Materials as required in Hazard Communication Title 29, Code of Federal Regulation Part 1910.1200, 'Right to Know Law', and state and local requirements;
* hazardous and toxic materials will be handled, removed and recycled or disposed of according to federal, state, and local regulations.

DEFINITIONS – TECHNICAL TERMS

A. ADJUST - To bring components to specified operational settings.

B. ALIGN - To restore the proper position of components.

C. ANALYZE - Assess the condition of a component or system.

D. ASSEMBLE (REASSEMBLE) - To fit together the components of a device or system.

E. BALANCE - To establish correct linear, rotational or weight relationship.

F. BLEED - To remove air from a closed system.

G. CAN – Controller Area Network. CAN is a network protocol (SAE J2284/ISO 15765-4) used to interconnect a network of electronic control modules.

H. CHARGE - To bring to a specified state, e.g., battery or air conditioning system.

I. CHECK - To verify condition by performing an operational or comparative examination.

J. CLEAN - To rid component of foreign matter for the purpose of reconditioning, repairing, measuring or reassembling.

K. DEGLAZE – To remove a smooth glossy surface.

L. DETERMINE - To establish the procedure to be used to perform the necessary repair.

M. DETERMINE NECESSARY ACTION – Indicates that the diagnostic routine(s) is the primary emphasis of a task. The student is required to perform the diagnostic steps and communicate the diagnostic outcomes and corrective actions required addressing the concern or problem. The training program determines the communication method (worksheet, test, verbal communication, or other means deemed appropriate) and whether the corrective procedures for these tasks are actually performed.

N. DIAGNOSE - To identify the cause of a problem.

O. DISASSEMBLE - To separate a component's parts as a preparation for cleaning, inspection or service.

P. DISCHARGE - To empty a storage device or system.

Q. EVACUATE - To remove air, fluid or vapor from a closed system by use of a vacuum pump.

R. FLUSH - To internally clean a component or system.

S. HIGH VOLTAGE – Voltages of 50 volts and higher.

T. HONE - To restore or resize a bore by using rotating cutting stones.

U. JUMP START - To use an auxiliary power supply to assist a battery to crank an engine.

V. LOCATE – Determine or establish a specific spot or area.

W. MEASURE - To determine existing dimensions/values for comparison to specifications.

X. NETWORK - A system of interconnected electrical modules or devices.

Y. ON-BOARD DIAGNOSTICS (OBD) - Diagnostic protocol which monitors computer inputs and outputs for failures.

Z. PARASITIC DRAW - Electrical loads which are still present when the ignition circuit is OFF.

AA. PERFORM - To accomplish a procedure in accordance with established methods and standards.

BB. PERFORM NECESSARY ACTION – Indicates that the student is to perform the diagnostic routine(s) and perform the corrective action item. Where various scenarios (conditions or situations) are presented in a single task, at least one of the scenarios must be accomplished.

CC. PURGE - To remove air or fluid from a closed system.

DD. REMOVE - To disconnect and separate a component from a system.

EE. REPAIR - To restore a malfunctioning component or system to operating condition.

FF. REPLACE - To exchange a component; to reinstall a component.

GG. RESURFACE – To restore correct finish.

HH. SERVICE - To perform a procedure as specified in the owner's or service manual.

II. TEST - To verify condition through the use of meters, gauges or instruments.

JJ. TORQUE - To tighten a fastener to specified degree or tightness (in a given order or pattern if multiple fasteners are involved on a single component).

KK. VERIFY - To confirm that a problem exists after hearing the customer's concern; or, to confirm the effectiveness of a repair.

LL. VOLTAGE DROP - A reduction in voltage (electrical pressure) caused by the resistance in a component or circuit.

NATEF TASK LIST

MAINTENANCE AND LIGHT REPAIR

For every task required for Maintenance and Light Repair programs, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

ENGINE REPAIR

General

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

2. Verify operation of the instrument panel engine warning indicators. P-1

3. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-1

4. Install engine covers using gaskets, seals, and sealers as required. P-1

5. Remove and replace timing belt; verify correct camshaft timing. P-1

6. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-1

7. Identify hybrid vehicle internal combustion engine service precautions. P-3

ENGINE REPAIR

Cylinder Head and Valve Train

1. Adjust valves (mechanical or hydraulic lifters). P-1

ENGINE REPAIR

Lubrication and Cooling Systems

1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core; determine necessary action. P-1

2. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1

3. Remove, inspect, and replace thermostat and gasket/seal. P-1

4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. P-1

5. Perform engine oil and filter change. P-1

AUTOMATIC TRANSMISSION AND TRANSAXLE

General

1. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

2. Check fluid level in a transmission or a transaxle equipped with a dip-stick. P-1

3. Check fluid level in a transmission or a transaxle not equipped with a dip-stick. P-1

4. Check transmission fluid condition; check for leaks. P-2

AUTOMATIC TRANSMISSION AND TRANSAXLE

In-Vehicle Transmission/Transaxle

1. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch. P-2

2. Inspect for leakage at external seals, gaskets, and bushings. P-2

3. Inspect power train mounts. P-2

4. Drain and replace fluid and filter(s). P-1

AUTOMATIC TRANSMISSION AND TRANSAXLE

Off-Vehicle Transmission and Transaxle

1. Describe the operational characteristics of a continuously variable transmission (CVT). P-3

2. Describe the operational characteristics of a hybrid vehicle drive train. P-3

MANUAL DRIVE TRAIN AND AXLES

General

1. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

2. Drain and refill manual transmission/transaxle and final drive unit. P-1

3. Check fluid condition; check for leaks. P-2

MANUAL DRIVE TRAIN AND AXLES

Clutch

1. Check and adjust clutch master cylinder fluid level. P-1

2. Check for system leaks. P-1

MANUAL DRIVE TRAIN AND AXLES

Transmission/Transaxle

1. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. P-3

MANUAL DRIVE TRAIN AND AXLES

Drive Shaft, Half Shafts, Universal and Constant-Velocity (CV) Joints

1. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals. P-2

2. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints. P-2

MANUAL DRIVE TRAIN AND AXLES

Differential Case Assembly

1. Clean and inspect differential housing; check for leaks; inspect housing vent. P-2

2. Check and adjust differential housing fluid level. P-1

3. Drain and refill differential housing. P-1

Drive Axles

1. Inspect and replace drive axle wheel studs. P-2

MANUAL DRIVE TRAIN AND AXLES

Four-wheel Drive/All-wheel Drive

1. Inspect front-wheel bearings and locking hubs. P-3

2. Check for leaks at drive assembly seals; check vents; check lube level. P-2

SUSPENSION AND STEERING SYSTEMS

General

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

2. Disable and enable supplemental restraint system (SRS). P-1

SUSPENSION AND STEERING

Related Suspension and Steering Service

1. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.	P-1
2. Determine proper power steering fluid type; inspect fluid level and condition.	P-1
3. Flush, fill, and bleed power steering system.	P-2
4. Inspect for power steering fluid leakage; determine necessary action.	P-1
5. Remove, inspect, replace, and adjust power steering pump drive belt.	P-1
6. Inspect and replace power steering hoses and fittings.	P-2
7. Replace power steering pump filter(s).	P-2
8. Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.	P-1
9. Inspect tie rod ends (sockets), tie rod sleeves, and clamps.	P-1
10. Inspect upper and lower control arms, bushings, and shafts.	P-1
11. Inspect and replace rebound and jounce bumpers.	P-1
12. Inspect track bar, strut rods/radius arms, and related mounts and bushings.	P-1
13. Inspect upper and lower ball joints (with or without wear indicators).	P-1
14. Inspect suspension system coil springs and spring insulators (silencers).	P-1
15. Inspect suspension system torsion bars and mounts.	P-1
16. Inspect and replace front stabilizer bar (sway bar) bushings, brackets, and links.	P-1
17. Inspect strut cartridge or assembly.	P-1
18. Inspect front strut bearing and mount.	P-1
19. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms.	P-1

20. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts. P-1

21. Inspect, remove, and replace shock absorbers; inspect mounts and bushings. P-1

22. Inspect electric power-assisted steering. P-3

23. Identify hybrid vehicle power steering system electrical circuits and safety precautions. P-2

24. Describe the function of the power steering pressure switch. P-3

SUSPENSION AND STEERING

Wheel Alignment

1. Perform prealignment inspection and measure vehicle ride height; determine necessary action. P-1

SUSPENSION AND STEERING

Wheels and Tires

1. Inspect tire condition; identify tire wear patterns; check for correct size and application (load and speed ratings) and adjust air pressure; determine necessary action. P-1

2. Rotate tires according to manufacturer's recommendations. P-1

3. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic). P-1

4. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. P-2

5. Inspect tire and wheel assembly for air loss; perform necessary action. P-1

6. Repair tire using internal patch. P-1

7. Identify and test tire pressure monitoring systems (indirect and direct) for operation; verify operation of instrument panel lamps. P-2

8. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system. P-2

BRAKES

General

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

2. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS). P-1

BRAKES

Hydraulic System

1. Measure brake pedal height, travel, and free play (as applicable); determine necessary action. P-1

2. Check master cylinder for external leaks and proper operation. P-1

3. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, loose fittings and supports; determine necessary action. P-1

4. Select, handle, store, and fill brake fluids to proper level. P-1

5. Identify components of brake warning light system. P-3

6. Bleed and/or flush brake system. P-1

7. Test brake fluid for contamination. P-1

BRAKES

Drum Brakes

1. Remove, clean, inspect, and measure brake drum diameter; determine necessary action. P-1

2. Refinish brake drum and measure final drum diameter; compare with specifications. P-1

3. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1

4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. P-2

5. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments. P-2

6. Install wheel and torque lug nuts. P-1

BRAKES

Disc Brakes

1. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action. P-1

2. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action. P-1

3. Remove, inspect, and replace pads and retaining hardware; determine necessary action. P-1

4. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks. P-1

5. Clean and inspect rotor, measure rotor thickness, thickness variation, and lateral runout; determine necessary action. P-1

6. Remove and reinstall rotor. P-1

7. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications. P-1

8. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications. P-1

9. Retract and re-adjust caliper piston on an integral parking brake system. P-3

10. Check brake pad wear indicator; determine necessary action. P-2

11. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations. P-1

BRAKES

Power-Assist Units

1. Check brake pedal travel with, and without, engine running to verify proper power booster operation. P-2

2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1

BRAKES

Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.)

1. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. P-1

2. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed. P-2

3. Check parking brake operation and parking brake indicator light system operation; determine necessary action. P-1

4. Check operation of brake stop light system. P-1

5. Replace wheel bearing and race. P-2

BRAKES

Electronic Brakes, and Traction and Stability Control Systems

1. Identify traction control/vehicle stability control system components. P-3

2. Describe the operation of a regenerative braking system. P-3

ELECTRICAL/ELECTRONIC SYSTEMS

General

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1

3. Use wiring diagrams to trace electrical/electronic circuits. P-1

4. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. P-1

5. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-2

6. Check operation of electrical circuits with a test light. P-2

7. Check operation of electrical circuits with fused jumper wires. P-2

8. Measure key-off battery drain (parasitic draw). P-1

9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1

10. Perform solder repair of electrical wiring. P-1

11. Replace electrical connectors and terminal ends. P-1

ELECTRICAL/ELECTRONIC SYSTEMS

Battery Service

1. Perform battery state-of-charge test; determine necessary action. P-1

2. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action. P-1

3. Maintain or restore electronic memory functions. P-1

4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. P-1

5. Perform slow/fast battery charge according to manufacturer's recommendations. P-1

6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1

7. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions. P-3

8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1

9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-3

ELECTRICAL/ELECTRONIC SYSTEMS

Starting System

1. Perform starter current draw test; determine necessary action. P-1

2. Perform starter circuit voltage drop tests; determine necessary action. P-1

3. Inspect and test starter relays and solenoids; determine necessary action. P-2

4. Remove and install starter in a vehicle. P-1

5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action. P-2

ELECTRICAL/ELECTRONIC SYSTEMS

Charging System

1. Perform charging system output test; determine necessary action. P-1

2. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1

3. Remove, inspect, and re-install generator (alternator). P-2

4. Perform charging circuit voltage drop tests; determine necessary action. P-1

ELECTRICAL/ELECTRONIC SYSTEMS

Lighting Systems

1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1
2. Aim headlights. P-2
3. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-2

ELECTRICAL/ELECTRONIC SYSTEMS

Accessories

1. Disable and enable airbag system for vehicle service; verify indicator lamp operation. P-1
2. Remove and reinstall door panel. P-1
3. Describe the operation of keyless entry/remote-start systems. P-3
4. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. P-1
5. Verify windshield wiper and washer operation; replace wiper blades. P-1

HEATING AND AIR CONDITIONING

General

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

HEATING AND AIR CONDITIONING

Refrigeration System Components

1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action. P-1
2. Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions. P-2

3. Inspect A/C condenser for airflow restrictions; determine necessary action. P-1

HEATING AND AIR CONDITIONING

Heating, Ventilation, and Engine Cooling Systems

1. Inspect engine cooling and heater systems hoses; perform necessary action. P-1

HEATING AND AIR CONDITIONING

Operating Systems and Related Controls

1. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action. P-1

2. Identify the source of A/C system odors. P-2

ENGINE PERFORMANCE

General

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

2. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. P-1

3. Perform cylinder power balance test; determine necessary action. P-2

4. Perform cylinder cranking and running compression tests; determine necessary action. P-1

5. Perform cylinder leakage test; determine necessary action. P-1

6. Verify engine operating temperature. P-1

7. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-1

ENGINE PERFORMANCE

Computerized Engine Controls

1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. P-1

2. Describe the importance of operating all OBDII monitors for repair verification. P-1

ENGINE PERFORMANCE

Fuel, Air Induction, and Exhaust Systems

1. Replace fuel filter(s). P-1

2. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1

3. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action. P-1

4. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed. P-1

5. Check and refill diesel exhaust fluid (DEF). P-3

ENGINE PERFORMANCE

Emissions Control Systems

1. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. P-2

REQUIRED SUPPLEMENTAL TASKS

Shop and Personal Safety

1. Identify general shop safety rules and procedures.

2. Utilize safe procedures for handling of tools and equipment.

3. Identify and use proper placement of floor jacks and jack stands.

4. Identify and use proper procedures for safe lift operation.

5. Utilize proper ventilation procedures for working within the lab/shop area.

6. Identify marked safety areas.

7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.

8. Identify the location and use of eye wash stations.

9. Identify the location of the posted evacuation routes.

10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.

11. Identify and wear appropriate clothing for lab/shop activities.

12. Secure hair and jewelry for lab/shop activities.

13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.

14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).

15. Locate and demonstrate knowledge of material safety data sheets (MSDS).

Tools and Equipment

1. Identify tools and their usage in automotive applications.

2. Identify standard and metric designation.

3. Demonstrate safe handling and use of appropriate tools.

4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.

5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

Preparing Vehicle for Service

1. Identify information needed and the service requested on a repair order.

2. Identify purpose and demonstrate proper use of fender covers, mats.

3. Demonstrate use of the three C's (concern, cause, and correction).

4. Review vehicle service history.

5. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

Preparing Vehicle for Customer

1. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

Automobile Service Technology
Task List

ENGINE REPAIR
General: Engine Diagnosis; Removal and Reinstallation (R & R)

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
2. Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins. P-1
3. Verify operation of the instrument panel engine warning indicators. P-1
4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-1
5. Install engine covers using gaskets, seals, and sealers as required. P-1
6. Remove and replace timing belt; verify correct camshaft timing. P-1
7. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-1
8. Inspect, remove and replace engine mounts. P-2
9. Identify hybrid vehicle internal combustion engine service precautions. P-3

ENGINE REPAIR
Cylinder Head and Valve Train Diagnosis and Repair

1. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specifications and procedures. P-1
2. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition. P-1
3. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action. P-2

4. Adjust valves (mechanical or hydraulic lifters). P-1

5. Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing. P-1

6. Establish camshaft position sensor indexing. P-1

ENGINE REPAIR
Engine Block Assembly Diagnosis and Repair

1. Remove, inspect, or replace crankshaft vibration damper (harmonic balancer). P-2

ENGINE REPAIR
Lubrication and Cooling Systems Diagnosis and Repair

1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core; determine necessary action. P-1

2. Identify causes of engine overheating. P-1

3. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1

4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. P-1

5. Inspect, remove, and replace water pump. P-2

6. Remove and replace radiator. P-2

7. Remove, inspect, and replace thermostat and gasket/seal. P-1

8. Inspect and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams. P-1

9. Perform oil pressure tests; determine necessary action. P-1

10. Perform engine oil and filter change. P-1

11. Inspect auxiliary coolers; determine necessary action. P-3

12. Inspect, test, and replace oil temperature and pressure switches and sensors. P-2

AUTOMATIC TRANSMISSION AND TRANSAXLE

General: Transmission and Transaxle Diagnosis

1. Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action. P-1

2. Research applicable vehicle and service information fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

3. Diagnose fluid loss and condition concerns; determine necessary action. P-1

4. Check fluid level in a transmission or a transaxle equipped with a dip-stick. P-1

5. Check fluid level in a transmission or a transaxle not equipped with a dip-stick. P-1

6. Perform stall test; determine necessary action. P-3

7. Perform lock-up converter system tests; determine necessary action. P-3

8. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles. P-1

9. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law). P-2

AUTOMATIC TRANSMISSION AND TRANSAXLE
In-Vehicle Transmission/Transaxle Maintenance and Repair

1. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch. P-2
2. Inspect for leakage; replace external seals, gaskets, and bushings. P-2
3. Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses. P-1
4. Drain and replace fluid and filter(s). P-1
5. Inspect powertrain mounts. P-2

AUTOMATIC TRANSMISSION AND TRANSAXLE
Off-Vehicle Transmission and Transaxle Repair

1. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces. P-1
2. Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings. P-1
3. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore. P-2
4. Describe the operational characteristics of a continuously variable transmission (CVT). P-3
5. Describe the operational characteristics of a hybrid vehicle drive train. P-3

MANUAL DRIVE TRAIN AND AXLES
General: Drive Train Diagnosis

1. Identify and interpret drive train concerns; determine necessary action. P-1
2. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

3. Check fluid condition; check for leaks; determine necessary action. P-1

4. Drain and refill manual transmission/transaxle and final drive unit. P-1

MANUAL DRIVE TRAIN AND AXLES
Clutch Diagnosis and Repair

1. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action. P-1

2. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action. P-1

3. Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable). P-1

4. Bleed clutch hydraulic system. P-1

5. Check and adjust clutch master cylinder fluid level; check for leaks. P-1

6. Inspect flywheel and ring gear for wear and cracks; determine necessary action. P-1

7. Measure flywheel runout and crankshaft end play; determine necessary action. P-2

MANUAL DRIVE TRAIN AND AXLES
Transmission/Transaxle Diagnosis and Repair

1. Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers. P-2

2. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. P-3

MANUAL DRIVE TRAIN AND AXLES

Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair

1. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action. P-1
2. Diagnose universal joint noise and vibration concerns; perform necessary action. P-2
3. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals. P-1
4. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints. P-1
5. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles. P-2

MANUAL DRIVE TRAIN AND AXLES

Drive Axle Diagnosis and Repair

Ring and Pinion Gears and Differential Case Assembly

1. Clean and inspect differential housing; check for leaks; inspect housing vent. P-2
2. Check and adjust differential housing fluid level. P-1
3. Drain and refill differential housing. P-1
4. Inspect and replace companion flange and pinion seal; measure companion flange runout. P-2

Drive Axles

1. Inspect and replace drive axle wheel studs. P-1
2. Remove and replace drive axle shafts. P-1
3. Inspect and replace drive axle shaft seals, bearings, and retainers. P-2
4. Measure drive axle flange runout and shaft end play; determine necessary action. P-2

MANUAL DRIVE TRAIN AND AXLES
Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair

1. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. P-3
2. Inspect front-wheel bearings and locking hubs; perform necessary action(s). P-3
3. Check for leaks at drive assembly seals; check vents; check lube level. P-3
4. Identify concerns related to variations in tire circumference and/or final drive ratios. P-3

SUSPENSION AND STEERING
General: Suspension and Steering Systems

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

SUSPENSION AND STEERING
Steering Systems Diagnosis and Repair

1. Disable and enable supplemental restraint system (SRS). P-1
2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring). P-1
3. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action. P-2
4. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. P-2
5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. P-2
6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action. P-2

7. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets. P-2

8. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed. P-2

9. Determine proper power steering fluid type; inspect fluid level and condition. P-1

10. Flush, fill, and bleed power steering system. P-2

11. Inspect for power steering fluid leakage; determine necessary action. P-1

12. Remove, inspect, replace, and adjust power steering pump drive belt. P-1

13. Remove and reinstall power steering pump. P-2

14. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment. P-2

15. Inspect and replace power steering hoses and fittings. P-2

16. Replace power steering pump filter(s). P-1

17. Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper. P-2

18. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps. P-1

19. Identify hybrid vehicle power steering system electrical circuits and safety precautions. P-2

SUSPENSION AND STEERING

Suspension Systems Diagnosis and Repair

1. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action. P-1

2. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action. P-1

3. Inspect, remove and install upper and lower control arms, bushings, shafts, and rebound bumpers. P-3

4. Inspect, remove and install strut rods and bushings. P-3

5. Inspect, remove and install upper and/or lower ball joints (with or witout wear indicators). P-2

6. Inspect, remove and install steering knuckle assemblies. P-3

7. Inspect, remove and install short and long arm suspension system coil springs and spring insulators. P-3

8. Inspect, remove and install torsion bars and mounts. P-3

9. Inspect, remove and install front stabilizer bar (sway bar) bushings, brackets, and links. P-3

10. Inspect, remove and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount. P-3

11. Inspect, remove and install track bar, strut rods/radius arms, and related mounts and bushings. P-3

12. Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts. P-1

13. Inspect electric power-assisted steering. P-3

SUSPENSION AND STEERING
Related Suspension and Steering Service

1. Inspect, remove, and replace shock absorbers; inspect mounts and bushings. P-1

2. Remove, inspect, and service or replace front and rear wheel bearings. P-1

3. Describe the function of the power steering pressure switch. P-3

SUSPENSION AND STEERING
Wheel Alignment Diagnosis, Adjustment, and Repair

1. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action. P-1
2. Perform prealignment inspection and measure vehicle ride height; perform necessary action. P-1
3. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber, and toe as required; center steering wheel. P-1
4. Check toe-out-on-turns (turning radius); determine necessary action. P-2
5. Check SAI (steering axis inclination) and included angle; determine necessary action. P-2
6. Check rear wheel thrust angle; determine necessary action. P-1
7. Check for front wheel setback; determine necessary action. P-2
8. Check front and/or rear cradle (subframe) alignment; determine necessary action. P-3

SUSPENSION AND STEERING
Wheels and Tires Diagnosis and Repair

1. Inspect tire condition; identify tire wear patterns; check for correct tire size and application (load and speed ratings) and adjust air pressure; determine necessary action. P-1
2. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action. P-2
3. Rotate tires according to manufacturer's recommendations. P-1
4. Measure wheel, tire, axle flange, and hub runout; determine necessary action. P-2
5. Diagnose tire pull problems; determine necessary action. P-2
6. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic). P-1

7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. P-2

8. Inspect tire and wheel assembly for air loss; perform necessary action. P-1

9. Repair tire using internal patch. P-1

10. Identify and test tire pressure monitoring system (indirect and direct) for operation; verify operation of instrument panel lamps. P-2

11. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system. P-1

BRAKES
General: Brake Systems Diagnosis

1. Identify and interpret brake system concerns; determine necessary action. P-1

2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

3. Describe procedure for performing a road test to check brake system operation; including an anti-lock brake system (ABS). P-1

BRAKES
Hydraulic System Diagnosis and Repair

1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law). P-1

2. Measure brake pedal height, travel, and free play (as applicable); determine necessary action. P-1

3. Check master cylinder for internal/external leaks and proper operation; determine necessary action. P-1

4. Remove, bench bleed, and reinstall master cylinder. P-1

5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action. P-3

6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, and wear; check for loose fittings and supports; determine necessary action. P-1

7. Replace brake lines, hoses, fittings, and supports. P-2

8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types). P-2

9. Select, handle, store, and fill brake fluids to proper level. P-1

10. Inspect, test, and/or replace components of brake warning light system. P-3

11. Identify components of brake warning light system. P-2

12. Bleed and/or flush brake system. P-1

13. Test brake fluid for contamination. P-1

BRAKES
Drum Brake Diagnosis and Repair

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action. P-1

2. Remove, clean, inspect, and measure brake drum diameter; determine necessary action. P-1

3. Refinish brake drum and measure final drum diameter; compare with specifications. P-1

4. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1

5. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. P-2

6. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments. P-2

7. Install wheel and torque lug nuts. P-1

BRAKES

Disc Brake Diagnosis and Repair

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine necessary action.	P-1
2. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action.	P-1
3. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.	P-1
4. Remove, inspect, and replace pads and retaining hardware; determine necessary action.	P-1
5. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.	P-1
6. Clean and inspect rotor; measure rotor thickness, thickness variation, and lateral runout; determine necessary action.	P-1
7. Remove and reinstall rotor.	P-1
8. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.	P-1
9. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.	P-1
10. Retract and re-adjust caliper piston on an integrated parking brake system.	P-3
11. Check brake pad wear indicator; determine necessary action.	P-2
12. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.	P-1

BRAKES

Power-Assist Units Diagnosis and Repair

1. Check brake pedal travel with, and without, engine running to verify proper power booster operation. P-2
2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1
3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine necessary action. P-1
4. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine necessary action. P-3
5. Measure and adjust master cylinder pushrod length. P-3

BRAKES

Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair

1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action. P-3
2. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. P-1
3. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed. P-2
4. Check parking brake operation and parking brake indicator light system operation; determine necessary action. P-1
5. Check operation of brake stop light system. P-1
6. Replace wheel bearing and race. P-2
7. Remove and reinstall sealed wheel bearing assembly. P-2

BRAKES

Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair

1. Identify and inspect electronic brake control system components; determine necessary action. P-1

2. Identify traction control/vehicle stability control system components. P-3

3. Describe the operation of a regenerative braking system. P-3

ELECTRICAL/ELECTRONIC SYSTEMS

General: Electrical System Diagnosis

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1

3. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance. P-1

4. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1

5. Check operation of electrical circuits with a test light. P-1

6. Check operation of electrical circuits with fused jumper wires. P-1

7. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems. P-1

8. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action. P-1

9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1

10. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action. P-1

11. Replace electrical connectors and terminal ends. P-1

12. Repair wiring harness. P-3

13. Perform solder repair of electrical wiring. P-1

ELECTRICAL/ELECTRONIC SYSTEMS
Battery Diagnosis and Service

1. Perform battery state-of-charge test; determine necessary action. P-1

2. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action. P-1

3. Maintain or restore electronic memory functions. P-1

4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. P-1

5. Perform slow/fast battery charge according to manufacturer's recommendations. P-1

6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1

7. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions. P-3

8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1

9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-3

ELECTRICAL/ELECTRONIC SYSTEMS
Starting System Diagnosis and Repair

1. Perform starter current draw tests; determine necessary action. P-1

2. Perform starter circuit voltage drop tests; determine necessary action. P-1

3. Inspect and test starter relays and solenoids; determine necessary action. P-2

4. Remove and install starter in a vehicle. P-1

5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action. P-2

6. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition. P-2

ELECTRICAL/ELECTRONIC SYSTEMS
Charging System Diagnosis and Repair

1. Perform charging system output test; determine necessary action. P-1

2. Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions. P-1

3. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1

4. Remove, inspect, and re-install generator (alternator). P-1

5. Perform charging circuit voltage drop tests; determine necessary action. P-1

ELECTRICAL/ELECTRONIC SYSTEMS
Lighting Systems Diagnosis and Repair

1. Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine necessary action. P-1

2. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1

3. Aim headlights. P-2

4. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-2

ELECTRICAL/ELECTRONIC SYSTEMS
Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair

1. Inspect and test gauges and gauge sending units for causes of abnormal gauge readings; determine necessary action. P-2

2. Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine necessary action. P-2

ELECTRICAL/ELECTRONIC SYSTEMS
Horn and Wiper/Washer Diagnosis and Repair

1. Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action. P-1

2. Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action. P-2

3. Diagnose (troubleshoot) windshield washer problems; perform necessary action. P-2

ELECTRICAL/ELECTRONIC SYSTEMS
Accessories Diagnosis and Repair

1. Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action. P-2

2. Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action. P-2

3. Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action. P-3

4. Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action. P-2

5. Disable and enable an airbag system for vehicle service; verify indicator lamp operation. P-1

6. Remove and reinstall door panel. P-1

7. Check for module communication errors (including CAN/BUS systems) using a scan tool. P-2

8. Describe the operation of keyless entry/remote-start systems. P-3

9. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. P-1

10. Verify windshield wiper and washer operation, replace wiper blades. P-1

HEATING AND AIR CONDITIONING
General: A/C System Diagnosis and Repair

1. Identify and interpret heating and air conditioning problems; determine necessary action. P-1

2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

3. Performance test A/C system; identify problems. P-1

4. Identify abnormal operating noises in the A/C system; determine necessary action. P-2

5. Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings. P-1

6. Leak test A/C system; determine necessary action. P-1

7. Inspect condition of refrigerant oil removed from A/C system; determine necessary action. P-2

8. Determine recommended oil and oil capacity for system application. P-1

9. Using a scan tool, observe and record related HVAC data and trouble codes. P-3

HEATING AND AIR CONDITIONING
Refrigeration System Component Diagnosis and Repair

1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action. P-1

2. Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed. P-2

3. Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil quantity. P-2

4. Identify hybrid vehicle A/C system electrical circuits and service/safety precautions. P-2

5. Determine need for an additional A/C system filter; perform necessary action. P-3

6. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action. P-2

7. Inspect A/C condenser for airflow restrictions; perform necessary action. P-1

8. Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil quantity. P-2

9. Remove, inspect, and install expansion valve or orifice (expansion) tube. P-1

10. Inspect evaporator housing water drain; perform necessary action. P-1

HEATING AND AIR CONDITIONING
Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

1. Inspect engine cooling and heater systems hoses; perform necessary action. P-1

2. Inspect and test heater control valve(s); perform necessary action. P-2

HEATING AND AIR CONDITIONING
Operating Systems and Related Controls Diagnosis and Repair

1. Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and protection devices; perform necessary action. P-1

2. Diagnose A/C compressor clutch control systems; determine necessary action. P-2

3. Diagnose malfunctions in the vacuum, mechanical, and electrical components and the electrical controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action. P-2

4. Inspect and test A/C-heater control panel assembly; determine necessary action. P-3

5. Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action. P-3

6. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action. P-1

7. Identify the source of A/C system odors. P-2

8. Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action. P-2

HEATING AND AIR CONDITIONING
Refrigerant Recovery, Recycling, and Handling

1. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards. P-1

2. Identify and recover A/C system refrigerant. P-1

3. Recycle, label, and store refrigerant. P-1

4. Evacuate and charge A/C system; add refrigerant oil as required. P-1

ENGINE PERFORMANCE
General: Engine Diagnosis

1. Identify and interpret engine performance concerns; determine necessary action. P-1

2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

3. Diagnose abnormal engine noises or vibration concerns; determine necessary action. P-3

4. Diagnose abnormal exhaust color, odor, and sound; determine necessary action. P-2

5. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. P-1

6. Perform cylinder power balance test; determine necessary action. P-2

7. Perform cylinder cranking and running compression tests; determine necessary action. P-1

8. Perform cylinder leakage test; determine necessary action. P-1

9. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action. P-2

10. Verify engine operating temperature; determine necessary action. P-1

11. Verify correct camshaft timing. P-1

ENGINE PERFORMANCE
Computerized Engine Controls Diagnosis and Repair

1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. P-1

2. Access and use service information to perform step-by-step (troubleshooting) diagnosis. P-1

3. Perform active tests of actuators using a scan tool; determine necessary action. P-2

4. Describe the importance of running all OBDII monitors for repair verification. P-1

ENGINE PERFORMANCE
Ignition System Diagnosis and Repair

1. Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action. P-2

2. Inspect and test crankshaft and camshaft position sensor(s); perform necessary action. P-1

3. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary. P-3

4. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-1

ENGINE PERFORMANCE
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair

1. Check fuel for contaminants; determine necessary action. P-2

2. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action. P-1

3. Replace fuel filter(s). P-1

4. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1

5. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air. P-2

6. Inspect and test fuel injectors. P-2

7. Verify idle control operation. P-1

8. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform necessary action. P-1

9. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed. P-1

10. Perform exhaust system back-pressure test; determine necessary action. P-2

11. Check and refill diesel exhaust fluid (DEF). P-3

ENGINE PERFORMANCE
Emissions Control Systems Diagnosis and Repair

1. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action. P-3

2. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.	P-2
3. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action.	P-3
4. Inspect, test, service, and replace components of the EGR system including tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary action.	P-2
5. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.	P-3
6. Inspect and test catalytic converter efficiency.	P-2
7. Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.	P-1
8. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.	P-3

Master Automobile Service Technology
Task List

ENGINE REPAIR
General: Engine Diagnosis; Removal and Reinstallation (R & R)

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
2. Research applicable vehicle and service information, such as internal engine operation**,** vehicle service history, service precautions, and technical service bulletins. P-1
3. Verify operation of the instrument panel engine warning indicators. P-1
4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-1
5. Install engine covers using gaskets, seals, and sealers as required. P-1
6. Remove and replace timing belt; verify correct camshaft timing. P-1
7. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-1
8. Inspect, remove and replace engine mounts. P-2
9. Identify hybrid vehicle internal combustion engine service precautions. P-3

ENGINE REPAIR
Cylinder Head and Valve Train Diagnosis and Repair

1. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specifications and procedures. P-1
2. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition. P-1
3. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action. P-2

4. Adjust valves (mechanical or hydraulic lifters). P-1

5. Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing. P-1

6. Establish camshaft position sensor indexing. P-1

ENGINE REPAIR
Engine Block Assembly Diagnosis and Repair

1. Remove, inspect, or replace crankshaft vibration damper (harmonic balancer). P-2

ENGINE REPAIR
Lubrication and Cooling Systems Diagnosis and Repair

1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core; determine necessary action. P-1

2. Identify causes of engine overheating. P-1

3. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1

4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. P-1

5. Inspect, remove, and replace water pump. P-2

6. Remove and replace radiator. P-2

7. Remove, inspect, and replace thermostat and gasket/seal. P-1

8. Inspect and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams. P-1

9. Perform oil pressure tests; determine necessary action. P-1

10. Perform engine oil and filter change. P-1

11. Inspect auxiliary coolers; determine necessary action. P-3

12. Inspect, test, and replace oil temperature and pressure switches and sensors. P-2

AUTOMATIC TRANSMISSION AND TRANSAXLE
General: Transmission and Transaxle Diagnosis

1. Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action. P-1

2. Research applicable vehicle and service information fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

3. Diagnose fluid loss and condition concerns; determine necessary action. P-1

4. Check fluid level in a transmission or a transaxle equipped with a dip-stick. P-1

5. Check fluid level in a transmission or a transaxle not equipped with a dip-stick. P-1

6. Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine necessary action. P-1

7. Diagnose noise and vibration concerns; determine necessary action. P-2

8. Perform stall test; determine necessary action. P-3

9. Perform lock-up converter system tests; determine necessary action. P-3

10. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles. P-1

11. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information. P-1

12. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law). P-2

AUTOMATIC TRANSMISSION AND TRANSAXLE
In-Vehicle Transmission/Transaxle Maintenance and Repair

6. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch. P-2
7. Inspect for leakage; replace external seals, gaskets, and bushings. P-2
8. Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses. P-1
9. Drain and replace fluid and filter(s). P-1
10. Inspect powertrain mounts. P-2

AUTOMATIC TRANSMISSION AND TRANSAXLE
Off-Vehicle Transmission and Transaxle Repair

1. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces. P-1
2. Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings. P-1
3. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore. P-2
4. Describe the operational characteristics of a continuously variable transmission (CVT). P-3
5. Describe the operational characteristics of a hybrid vehicle drive train. P-3

MANUAL DRIVE TRAIN AND AXLES
General: Drive Train Diagnosis

1. Identify and interpret drive train concerns; determine necessary action. P-1
2. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
3. Check fluid condition; check for leaks; determine necessary action. P-1
4. Drain and refill manual transmission/transaxle and final drive unit. P-1

MANUAL DRIVE TRAIN AND AXLES
Clutch Diagnosis and Repair

1. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action. P-1
2. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action. P-1
3. Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable). P-1
4. Bleed clutch hydraulic system. P-1
5. Check and adjust clutch master cylinder fluid level; check for leaks. P-1
6. Inspect flywheel and ring gear for wear and cracks; determine necessary action. P-1
7. Measure flywheel runout and crankshaft end play; determine necessary action. P-2

MANUAL DRIVE TRAIN AND AXLES
Transmission/Transaxle Diagnosis and Repair

1. Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers. P-2

2. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. P-3

3. Diagnose noise concerns through the application of transmission/transaxle powerflow principles. P-2

4. Diagnose hard shifting and jumping out of gear concerns; determine necessary action. P-2

5. Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action. P-3

MANUAL DRIVE TRAIN AND AXLES
Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair

1. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action. P-1

2. Diagnose universal joint noise and vibration concerns; perform necessary action. P-2

3. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals. P-1

4. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints. P-1

5. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles. P-2

MANUAL DRIVE TRAIN AND AXLES
Drive Axle Diagnosis and Repair

Ring and Pinion Gears and Differential Case Assembly

1. Clean and inspect differential housing; check for leaks; inspect housing vent. P-2

2. Check and adjust differential housing fluid level. P-1

3. Drain and refill differential housing. P-1

4. Diagnose noise and vibration concerns; determine necessary action. P-2

5. Inspect and replace companion flange and pinion seal; measure companion flange runout. P-2

Limited Slip Differential

1. Diagnose noise, slippage, and chatter concerns; determine necessary action. P-3

Drive Axles

5. Inspect and replace drive axle wheel studs. P-1
6. Remove and replace drive axle shafts. P-1
7. Inspect and replace drive axle shaft seals, bearings, and retainers. P-2
8. Measure drive axle flange runout and shaft end play; determine necessary action. P-2
9. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action. P-2

MANUAL DRIVE TRAIN AND AXLES

Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair

1. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. P-3
2. Inspect front-wheel bearings and locking hubs; perform necessary action(s). P-3
3. Check for leaks at drive assembly seals; check vents; check lube level. P-3
4. Identify concerns related to variations in tire circumference and/or final drive ratios. P-3
5. Diagnose noise, vibration, and unusual steering concerns; determine necessary action. P-3
6. Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems. P-3

SUSPENSION AND STEERING
General: Suspension and Steering Systems

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

2. Identify and interpret suspension and steering system concerns; determine necessary action. P-1

SUSPENSION AND STEERING
Steering Systems Diagnosis and Repair

1. Disable and enable supplemental restraint system (SRS). P-1

2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring). P-1

3. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action. P-2

4. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. P-2

5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. P-2

6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action. P-2

7. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets. P-2

8. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed. P-2

9. Determine proper power steering fluid type; inspect fluid level and condition. P-1

10. Flush, fill, and bleed power steering system. P-2

11. Inspect for power steering fluid leakage; determine necessary action. P-1

12. Remove, inspect, replace, and adjust power steering pump drive belt. P-1

13. Remove and reinstall power steering pump. P-2

14. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment. P-2

15. Inspect and replace power steering hoses and fittings. P-2

16. Replace power steering pump filter(s). P-1

17. Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper. P-2

18. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps. P-1

19. Test and diagnose components of electronically-controlled steering systems using a scan tool; determine necessary action. p-3

20. Identify hybrid vehicle power steering system electrical circuits and safety precautions. P-2

SUSPENSION AND STEERING

Suspension Systems Diagnosis and Repair

1. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action. P-1

2. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action. P-1

3. Inspect, remove and install upper and lower control arms, bushings, shafts, and rebound bumpers. P-3

4. Inspect, remove and install strut rods and bushings. P-3

5. Inspect, remove and install upper and/or lower ball joints (with or without wear indicators). P-2

6. Inspect, remove and install steering knuckle assemblies. P-3

7. Inspect, remove and install short and long arm suspension system coil springs and spring insulators. P-3

8. Inspect, remove and install torsion bars and mounts P-3

9. Inspect, remove and install front stabilizer bar (sway bar) bushings, brackets, and links. P-3

10. Inspect, remove and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount. P-3

11. Inspect, remove and install track bar, strut rods/radius arms, and related mounts and bushings. P-3

12. Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts. P-1

13. Inspect electric power-assisted steering. P-3

SUSPENSION AND STEERING
Related Suspension and Steering Service

1. Inspect, remove, and replace shock absorbers; inspect mounts and bushings. P-1

2. Remove, inspect, and service or replace front and rear wheel bearings. P-1

3. Describe the function of the power steering pressure switch. P-3

SUSPENSION AND STEERING
Wheel Alignment Diagnosis, Adjustment, and Repair

1. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action. P-1

2. Perform prealignment inspection and measure vehicle ride height; perform necessary action. P-1

3. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber, and toe as required; center steering wheel. P-1

4. Check toe-out-on-turns (turning radius); determine necessary action. P-2

5. Check SAI (steering axis inclination) and included angle; determine necessary action. P-2

6. Check rear wheel thrust angle; determine necessary action. P-1

7. Check for front wheel setback; determine necessary action. P-2

8. Check front and/or rear cradle (subframe) alignment; determine necessary action. P-3

SUSPENSION AND STEERING
Wheels and Tires Diagnosis and Repair

1. Inspect tire condition; identify tire wear patterns; check for correct tire size and application (load and speed ratings) and adjust air pressure; determine necessary action. P-1

2. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action. P-2

3. Rotate tires according to manufacturer's recommendations. P-1

4. Measure wheel, tire, axle flange, and hub runout; determine necessary action. P-2

5. Diagnose tire pull problems; determine necessary action. P-2

6. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic). P-1

7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. P-2

8. Inspect tire and wheel assembly for air loss; perform necessary action. P-1

9. Repair tire using internal patch. P-1

10. Identify and test tire pressure monitoring system (indirect and direct) for operation; calibrate system; verify operation of instrument panel lamps. P-2

11. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system. P-1

BRAKES
General: Brake Systems Diagnosis

1. Identify and interpret brake system concerns; determine necessary action. P-1

2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

3. Describe procedure for performing a road test to check brake system operation; including an anti-lock brake system (ABS). P-1

BRAKES
Hydraulic System Diagnosis and Repair

1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law). P-1

2. Measure brake pedal height, travel, and free play (as applicable); determine necessary action. P-1

3. Check master cylinder for internal/external leaks and proper operation; determine necessary action. P-1

4. Remove, bench bleed, and reinstall master cylinder. P-1

5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action. P-3

6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, and wear; check for loose fittings and supports; determine necessary action. P-1

7. Replace brake lines, hoses, fittings, and supports. P-2

8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types). P-2

9. Select, handle, store, and fill brake fluids to proper level. P-1

10. Inspect, test, and/or replace components of brake warning light system. P-3

11. Identify components of brake warning light system. P-2

12. Bleed and/or flush brake system. P-1

13. Test brake fluid for contamination. P-1

BRAKES
Drum Brake Diagnosis and Repair

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action. P-1
2. Remove, clean, inspect, and measure brake drum diameter; determine necessary action. P-1
3. Refinish brake drum and measure final drum diameter; compare with specifications. P-1
4. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1
5. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. P-2
6. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments. P-2
7. Install wheel and torque lug nuts. P-1

BRAKES
Disc Brake Diagnosis and Repair

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine necessary action. P-1
2. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action. P-1
3. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action. P-1
4. Remove, inspect, and replace pads and retaining hardware; determine necessary action. P-1

5. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks. P-1

6. Clean and inspect rotor; measure rotor thickness, thickness variation, and lateral runout; determine necessary action. P-1

7. Remove and reinstall rotor. P-1

8. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications. P-1

9. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications. P-1

10. Retract and re-adjust caliper piston on an integrated parking brake system. P-3

11. Check brake pad wear indicator; determine necessary action. P-2

12. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations. P-1

BRAKES

Power-Assist Units Diagnosis and Repair

1. Check brake pedal travel with, and without, engine running to verify proper power booster operation. P-2

2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1

3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine necessary action. P-1

4. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine necessary action. P-3

5. Measure and adjust master cylinder pushrod length. P-3

BRAKES

Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair

1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action. P-3

2. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. P-1

3. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed. P-2

4. Check parking brake operation and parking brake indicator light system operation; determine necessary action. P-1

5. Check operation of brake stop light system. P-1

6. Replace wheel bearing and race. P-2

7. Remove and reinstall sealed wheel bearing assembly. P-2

BRAKES

Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair

1. Identify and inspect electronic brake control system components; determine necessary action. P-1

2. Identify traction control/vehicle stability control system components. P-3

3. Describe the operation of a regenerative braking system. P-3

4. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine necessary action. P-2

5. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action. P-2

6. Depressurize high-pressure components of an electronic brake control system. P-3

7. Bleed the electronic brake control system hydraulic circuits. P-1

8. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data). P-3

9. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). P-3

ELECTRICAL/ELECTRONIC SYSTEMS

General: Electrical System Diagnosis

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1

3. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance. P-1

4. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1

5. Check operation of electrical circuits with a test light. P-1

6. Check operation of electrical circuits with fused jumper wires. P-1

7. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems. P-1

8. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action. P-1

9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1

10. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action. P-1

11. Replace electrical connectors and terminal ends. P-1

12. Repair wiring harness. P-3

13. Perform solder repair of electrical wiring. P-1

14. Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs. P-2

15. Repair wiring harness (including CAN/BUS systems). P-1

ELECTRICAL/ELECTRONIC SYSTEMS
Battery Diagnosis and Service

1. Perform battery state-of-charge test; determine necessary action. P-1

2. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action. P-1

3. Maintain or restore electronic memory functions. P-1

4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. P-1

5. Perform slow/fast battery charge according to manufacturer's recommendations. P-1

6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1

7. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions. P-3

8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1

9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-3

ELECTRICAL/ELECTRONIC SYSTEMS
Starting System Diagnosis and Repair

1. Perform starter current draw tests; determine necessary action. P-1

2. Perform starter circuit voltage drop tests; determine necessary action. P-1

3. Inspect and test starter relays and solenoids; determine necessary action. P-2

4. Remove and install starter in a vehicle. P-1

5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action. P-2

6. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition. P-2

ELECTRICAL/ELECTRONIC SYSTEMS
Charging System Diagnosis and Repair

1. Perform charging system output test; determine necessary action. P-1

2. Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions. P-1

3. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1

4. Remove, inspect, and re-install generator (alternator). P-1

5. Perform charging circuit voltage drop tests; determine necessary action. P-1

ELECTRICAL/ELECTRONIC SYSTEMS
Lighting Systems Diagnosis and Repair

1. Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine necessary action. P-1

2. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1

3. Aim headlights. P-2

4. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-2

ELECTRICAL/ELECTRONIC SYSTEMS
Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair

1. Inspect and test gauges and gauge sending units for causes of abnormal gauge readings; determine necessary action. P-2

2. Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine necessary action. P-2

ELECTRICAL/ELECTRONIC SYSTEMS
Horn and Wiper/Washer Diagnosis and Repair

1. Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action. P-1

2. Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action. P-2

3. Diagnose (troubleshoot) windshield washer problems; perform necessary action. P-2

ELECTRICAL/ELECTRONIC SYSTEMS
Accessories Diagnosis and Repair

1. Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action. P-2

2. Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action. P-2

3. Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action. P-3

4. Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action. P-2

5. Disable and enable an airbag system for vehicle service; verify indicator lamp operation. P-1

6. Remove and reinstall door panel. P-1

7. Check for module communication errors (including CAN/BUS systems) using a scan tool. P-2

8. Describe the operation of keyless entry/remote-start systems. P-3

9. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. P-1

10. Verify windshield wiper and washer operation, replace wiper blades. P-1

11. Diagnose (troubleshoot) radio static and weak, intermittent, or no radio reception; determine necessary action. P-3

12. Diagnose (troubleshoot) body electronic system circuits using a scan tool; determine necessary action. P-3

13. Diagnose the cause(s) of false, intermittent, or no operation of anti-theft systems. P-3

14. Perform software transfers, software updates, or flash reprogramming on electronic modules. P-3

HEATING AND AIR CONDITIONING

General: A/C System Diagnosis and Repair

1. Identify and interpret heating and air conditioning problems; determine necessary action. P-1

2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

3. Performance test A/C system; identify problems. P-1

4. Identify abnormal operating noises in the A/C system; determine necessary action. P-2

5. Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings. P-1

6. Leak test A/C system; determine necessary action. P-1

7. Inspect condition of refrigerant oil removed from A/C system; determine necessary action. P-2

8. Determine recommended oil and oil capacity for system application. P-1

9. Using a scan tool, observe and record related HVAC data and trouble codes. P-3

HEATING AND AIR CONDITIONING
Refrigeration System Component Diagnosis and Repair

1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action. P-1

2. Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed. P-2

3. Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil quantity. P-2

4. Identify hybrid vehicle A/C system electrical circuits and service/safety precautions. P-2

5. Determine need for an additional A/C system filter; perform necessary action. P-3

6. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action. P-2

7. Inspect A/C condenser for airflow restrictions; perform necessary action. P-1

8. Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil quantity. P-2

9. Remove, inspect, and install expansion valve or orifice (expansion) tube. P-1

10. Inspect evaporator housing water drain; perform necessary action. P-1

11. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action. P-2

HEATING AND AIR CONDITIONING
Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

1. Inspect engine cooling and heater systems hoses; perform necessary action. P-1

2. Inspect and test heater control valve(s); perform necessary action. P-2

3. Diagnose temperature control problems in the heater/ventilation system; determine necessary action. P-2

HEATING AND AIR CONDITIONING
Operating Systems and Related Controls Diagnosis and Repair

1. Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and protection devices; perform necessary action. P-1

2. Diagnose A/C compressor clutch control systems; determine necessary action. P-2

3. Diagnose malfunctions in the vacuum, mechanical, and electrical components and the electrical controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action. P-2

4. Inspect and test A/C-heater control panel assembly; determine necessary action. P-3

5. Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action. P-3

6. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action. P-1

7. Identify the source of A/C system odors. P-2

8. Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action. P-2

HEATING AND AIR CONDITIONING
Refrigerant Recovery, Recycling, and Handling

1. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards. P-1

2. Identify and recover A/C system refrigerant. P-1

3. Recycle, label, and store refrigerant. P-1

4. Evacuate and charge A/C system; add refrigerant oil as required. P-1

ENGINE PERFORMANCE
General: Engine Diagnosis

1. Identify and interpret engine performance concerns; determine necessary action. P-1
2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1
3. Diagnose abnormal engine noises or vibration concerns; determine necessary action. P-3
4. Diagnose abnormal exhaust color, odor, and sound; determine necessary action. P-2
5. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. P-1
6. Perform cylinder power balance test; determine necessary action. P-2
7. Perform cylinder cranking and running compression tests; determine necessary action. P-1
8. Perform cylinder leakage test; determine necessary action. P-1
9. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action. P-2
10. Verify engine operating temperature; determine necessary action. P-1
11. Verify correct camshaft timing. P-1

ENGINE PERFORMANCE
Computerized Engine Controls Diagnosis and Repair

1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. P-1
2. Access and use service information to perform step-by-step (troubleshooting) diagnosis. P-1

3. Perform active tests of actuators using a scan tool; determine necessary action. P-2

4. Describe the importance of running all OBDII monitors for repair verification. P-1

5. Diagnose the causes of emissions or driveability concerns using stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data. P-1

6. Diagnose emissions or driveability concerns without use of stored diagnostic trouble codes; determine necessary action. P-1

7. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action. P-2

8. Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM installed accessories, or similar systems); determine necessary action. P-3

ENGINE PERFORMANCE
Ignition System Diagnosis and Repair

1. Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action. P-2

2. Inspect and test crankshaft and camshaft position sensor(s); perform necessary action. P-1

3. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary. P-3

4. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-1

ENGINE PERFORMANCE
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair

1. Diagnose (troubleshoot) hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine necessary action. P-2

2. Check fuel for contaminants; determine necessary action. P-2

3. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action. P-1

4. Replace fuel filter(s). P-1

5. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1

6. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air. P-2

7. Inspect and test fuel injectors. P-2

8. Verify idle control operation. P-1

9. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform necessary action. P-1

10. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed. P-1

11. Perform exhaust system back-pressure test; determine necessary action. P-2

12. Check and refill diesel exhaust fluid (DEF). P-3

ENGINE PERFORMANCE
Emissions Control Systems Diagnosis and Repair

1. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action. P-3

2. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. P-2

3. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action. P-3

4. Diagnose emissions and driveability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action. P-2

5. Diagnose emissions and driveability concerns caused by the evaporative emissions control system; determine necessary action. P-2

6. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action. P-2

7. Inspect, test, service, and replace components of the EGR system including tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary action. P-2

8. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action. P-3

9. Inspect and test catalytic converter efficiency. P-2

10. Inspect and test components and hoses of the evaporative emissions control system; perform necessary action. P-1

11. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action. P-3

REQUIRED SUPPLEMENTAL TASKS

Shop and Personal Safety

1. Identify general shop safety rules and procedures.

2. Utilize safe procedures for handling of tools and equipment.

3. Identify and use proper placement of floor jacks and jack stands.

4. Identify and use proper procedures for safe lift operation.

5. Utilize proper ventilation procedures for working within the lab/shop area.

6. Identify marked safety areas.

7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.

8. Identify the location and use of eye wash stations.

9. Identify the location of the posted evacuation routes.

10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.

11. Identify and wear appropriate clothing for lab/shop activities.

12. Secure hair and jewelry for lab/shop activities.

13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.

14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).

15. Locate and demonstrate knowledge of material safety data sheets (MSDS).

Tools and Equipment

1. Identify tools and their usage in automotive applications.

2. Identify standard and metric designation.

3. Demonstrate safe handling and use of appropriate tools.

4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.

5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

Preparing Vehicle for Service

1. Identify information needed and the service requested on a repair order.

2. Identify purpose and demonstrate proper use of fender covers, mats.

3. Demonstrate use of the three C's (concern, cause, and correction).

4. Review vehicle service history.

5. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

Preparing Vehicle for Customer

1. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

Task List Priority Item Totals (by accreditation level)

Maintenance & Light Repair

P-1 = 116	95% = 110 tasks
P-2 = 35	80% = 28 tasks
P-3 = 15	50% = 7 tasks

Required Supplemental Tasks = 26

Automobile Service Technology

P-1 = 172	95% = 163 tasks
P-2 = 87	80% = 70 tasks
P-3 = 46	50% = 23 tasks

Required Supplemental Tasks = 26

Master Automobile Service Technology

P-1 = 179	95% = 170 tasks
P-2 = 102	80% = 82 tasks
P-3 = 58	50% = 29 tasks

Required Supplemental Tasks = 26

TOOLS AND EQUIPMENT

Local employer needs and the availability of funds are key factors for determining each program's structure and operation. The NATEF Standards recognize that not all programs have the same needs, nor do all programs teach 100 % of the NATEF tasks. Therefore, the basic philosophy for the tools and equipment requirement is as follows: *for all tasks which are taught in the program, the training should be as thorough as possible with the tools and equipment necessary for those tasks*. In other words, if a program does not teach a particular task, the tool from the tool list associated with that task is not required.

The NATEF tool lists are organized into three basic categories*: Hand Tools, General Lab/Shop Equipment,* and *Tools and Equipment by Level.* When referring to the tools and equipment list, please note the following:

A. The organization of the tool list is not intended to dictate how a program organizes its tool crib or student tool sets (i.e., which tools should be in a student set, if utilized, and which should be in the tool crib or shop area).

B. Quantities for each tool or piece of equipment are determined by the program needs; however, sufficient quantities to provide quality instruction should be on hand.

C. For *Tools and Equipment by Level*, the program need only have those tools for the level being accredited.

D. Programs may meet the equipment requirements by borrowing special equipment or providing for off-site instruction (e.g., in a dealership or independent repair shop). Use of borrowed or off-site equipment *must* be appropriately documented. Are we still going to allow programs to teach off-site or borrow?

E. No specific brand names for tools and equipment are specified or required.

F. Although the NATEF Standards recommend that programs encourage students to begin to build their own tool sets, this is not a requirement. However, many employers require an entry-level automobile technician provide his/her own basic hand tool set.

HAND TOOLS

(Contained in individual sets or the tool crib in sufficient quantities to permit efficient instruction)

Air Blow Gun (meeting OSHA requirements)
Allen (Wrench or Socket) Set - Standard (.050" - 3/8")
Allen (Wrench or Socket) Set - Metric (2mm - 8mm, 10mm, 12mm)
Battery Post Cleaner
Battery Terminal Pliers
Battery Terminal Puller
Chisels:
- Cape 5/16"
- Cold 3/8", 3/4"

Chisel Holder
Claw Type Pickup Tool
Combination Wrenches:
- Standard (1/4" – 1 1/4")
- Metric (7mm - 24mm)

Crowfoot Wrench Set - Metric
Crowfoot Wrench Set – Standard
Ear Protection
Feeler Gauge (Blade Type):
- .002" - .040"
- .006mm - .070mm

Files:
- Coarse 6" and 12"
- Fine 6" and 12"
- Half Round 12"
- Round 6" and 12"

Flare Nut (tubing) Wrenches:
- 3/8" - 3/4"
- 10mm - 17mm

Flashlight
Fuse Puller
Fused Jumper Wire Set (with various adapters)
Hack Saw
Hammers:
- 16 oz. Ball Peen
- Brass
- Dead Blow Plastic Mallet
- Plastic Tip
- Rubber Mallet

Inspection Mirror
Magnetic Pickup Tool
Pliers:

- Combination 6"
- Hose Clamp
- Locking Jaw
- Needle Nose 6"
- Side Cutting
- Slip Joint (Water Pump)

Pry Bars:
- Rolling Head
- Straight

Punches:
- Center
- Brass Drift
- Pin 1/8", 3/16", 1/4", 5/16 "
- Taper 3/8", 1/2", 5/8"

Safety Glasses (meeting OSHA requirements)

Scraper:
- Carbon 1"
- Gasket 1"

Screwdriver - Blade Type:
- Stubby
- 6", 9", 12"
- Offset

Screwdriver - Phillips:
- Stubby #1, #2
- 6" #1, #2
- 12" #3
- Offset #2

Screwdriver - Impact Driver Set

Screw Starter:
- Phillips
- Standard

Socket Set - 1/4" Drive:
- 1/4" - 1/2" Standard Depth
- 1/4" - 1/2" Deep
- 6mm - 12mm Standard Depth
- 6mm - 12mm Deep
- Flex/Universal Type
- 3", 6" Extensions
- Ratchet

Socket Set - 3/8" Drive:
- 5/16" - 3/4" Standard Depth (6 point)
- 3/8" - 3/4" Deep (6 point)
- 10mm - 19mm Standard Depth
- 10mm - 19mm Deep
- 3", 5", 10" Extensions
- Flexhead Ratchet

- Ratchet
- Spark Plug Sockets 5/8", 13/16"
- Speed Handle
- Universal Joint
- Flexible Socket Set 3/8" - 3/4"
- Flexible Socket Set 10mm - 19mm

Socket Set - 1/2" Drive:

- 7/16" - 1 1/8" Standard Depth
- 7/16" - 1 1/8" Deep
- 10mm - 24mm Standard Depth
- 10mm - 24mm Deep
- 3", 6", 12" Extensions
- Flex Handle (Breaker Bar)
- Ratchet

Spark Plug Feeler Gauge (Gap Tool)
Tape Measure – Standard and Metric
Test Light (12V and self-powered)
Tire Pressure Gauge
Tire Tread Depth Gauge
Torque Wrench:

- 3/8" Drive (10 - 250 lb. in.)
- 3/8" Drive (5 - 75 lb. ft.)
- 1/2" Drive (50 - 250 lb. ft.)

Torx® Set (screwdrivers and/or sockets):

- T-8 to T-60

Wire Brush

GENERAL LAB/SHOP EQUIPMENT

The tools and equipment on this list are used in general lab/shop work but are not generally considered to be individually owned hand tools. A well-equipped, accredited program should have all of these general tools and equipment readily available and in sufficient quantity to provide quality instruction.

Air Chisel Set (various bits)
Air Compressor and Hoses
Air Pressure Regulator
Air Ratchet (3/8" drive)
Automotive Stethoscope (electronic recommended)
Axle Stands (Jack Stands)
Axle Support Stands (Screw Jacks)
Battery Charger
Battery/Starter/Charging System Tester
Bearing Packer (hand operated)
Belt Tension Gauge
Bench or Pedestal Grinder
Coolant/Combustion Gas Detector (recommended)
Coolant Tester
Cooling System Pressure Tester and Adapters
Creeper
Cylinder Leakage Tester
Dial Indicator with Flex Arm and Clamp Base
Digital Multimeter (DMM) with various lead sets (sufficient quantities to meet instruction goals)
Drain Pans
Drill - 3/8" variable speed, reversible
Drill - 1/2" variable speed, reversible
Electric Heat Gun
Engine Coolant Recovery Equipment or Recycler or Coolant Disposal Contract Service
Extension Cords
Face Shields
Fender Covers
Floor Jack (1½ Ton Minimum)
Hand Held Vacuum Pump
Hoist(s)
Hood Prop
Hydraulic Press with adapters
Impact Socket Sets - 3/8" Drive (Standard and Metric)
Impact Sockets - 1/2" Drive (7/16" - 1 1/8")
Impact Sockets - 1/2" Drive (12mm – 24mm)
Impact Sockets – 1/2" Drive Deep (30 mm, 32 mm, 36mm)
Impact Wrench - 1/2" Drive

Impact Wrench - 3/8" Drive
Jumper Cables
Master Puller Set
Micrometer (Depth)
Micrometers - 0-1", 1-2", 2-3", 3-4", 4-5" (Outside Type)
Oil Can - Pump Type
Oil Filter Wrench
Oxy-Acetylene Torch Set
Parts Cleaning Tank and Gloves (non-solvent based cleanser suggested)
Remote Starter Switch
Scan Tool (OBDII w/CAN capability) or Personal Computer (PC) with equivalent interface capability
Screw Extractor Set
Seat Covers
Serpentine Belt Tensioner Tools
Snap Ring Pliers Set - external
Snap Ring Pliers Set - internal
Soldering Gun
Soldering Iron (Pencil Tip)
Spark Plug Boot Puller
Tap and Die Set - Standard
Tap and Die Set – Metric
Temperature Sensing Device
Thread Repair Insert Kit
Tire Inflator Chuck
Trouble/Work Lights (Fluorescent Preferred)
Tube Quick Disconnect Tool Set
Tubing Bender
Tubing Cutter/Flaring Set (Double-lap and ISO)
Twist Drill Set - 1/64" - 1/2"
Ultra Violet Leak Detection Device (Black Light)
Used Oil Receptacle with extension neck and funnel
Valve Core Removing Tool
Vernier Calipers
- 0 - 6"
- 0 - 125mm

Wheel Chocks
Workbenches with vises

SPECIALTY TOOLS AND EQUIPMENT
WITHIN EACH ACCREDITATION CATEGORY

This section covers the tools and equipment a lab/shop should have for training in any given specialty area. This equipment is specialized and it must be available in the lab/shop or to the program. No specific type or brand names are identified because they will vary in each local situation.

MAINTENANCE & LIGHT REPAIR

SUSPENSION & STEERING
- Brake Pedal Depressor
- Hand Grease Gun
- Shock Absorber Tools
- Tire Mounting Machine (rim clamp type)
- Tire Patching Tools and Supplies
- Wheel Balancer - Electronic Type
- Wheel Weight Pliers

BRAKES
- Bearing Seal and Race Driver Set
- Brake Bleeder, Pressure or Vacuum
- Brake Disc Micrometer
- Brake Drum Micrometer and Calibration Equipment
- Brake Lathe (bench with disc and drum service attachments)
- Brake Lathe (on car)
- Brake Shoe Adjusting Gauge
- Brake Spring Remover/Installer
- Brake Spring Pliers
- Brake Spoon
- Piston Retraction Set

ENGINE PERFORMANCE
- Compression Tester
- Cylinder Power Balance Tester
- Infrared Thermometer (or appropriate substitute)
- Vacuum/Pressure Gauge

ELECTRICAL/ELECTRONIC SYSTEMS
- Connector Pick Tool Set
- Door Panel Trim Tool(s)
- Headlight Aimer or Screen
- Heat Gun (or equivalent for heat shrinking operations)
- Wire and Terminal Repair Kit

MANUAL DRIVE TRAIN AND AXLES

Axle Nut Socket Set (or equivalent)
Universal Joint Tools

ENGINE REPAIR

Antifreeze/Coolant Tester

SPECIALTY TOOLS AND EQUIPMENT

AUTOMOBILE SERVICE TECHNOLOGY

SUSPENSION & STEERING

Ball Joint Press and other Special Tools
Brake Pedal Depressor
Bushing Driver Set
Coil Spring Compressor Tool
Chassis Ear (recommended)
Hand Grease Gun
Inner Tie Rod End Tool
Pitman Arm Puller
Power Steering Pump Pulley Special Tool Set (appropriate for units being taught)
Shock Absorber Tools
Strut Spring Compressor Tool
Steering Column Special Tool Set (appropriate for teaching units being utilized)
Tie Rod Puller
Tire Mounting Machine (rim clamp type)
Tire Patching Tools and Supplies
Wheel Alignment Equipment-4 wheel (including alignment tools)
Wheel Balancer - Electronic Type
Wheel Weight Pliers

BRAKES

Bearing Seal and Race Driver Set
Brake Bleeder, Pressure or Vacuum
Brake Disc Micrometer
Brake Drum Micrometer and Calibration Equipment
Brake Lathe (bench with disc and drum service attachments)
Brake Lathe (on car)
Brake Shoe Adjusting Gauge
Brake Spring Remover/Installer
Brake Spring Pliers
Brake Spoon
Piston Retraction Set

HEATING AND AIR CONDITIONING

A/C Compressor Clutch Service Tools
A/C Service Port Adapter Set
Dye Injector
Hygrometer
Leak Detector (SAE Standard)
Manifold Gauge Set or equivalent (HFC-134a)
Refrigerant Charging Station (HFC-134a) or equivalent
Refrigerant Identification Equipment
Refrigerant Recovery/Recycling Machine (HFC-134a)
Thermometer

ENGINE PERFORMANCE

Cylinder Power Balance Tester
Fuel Injection Pressure Gauge Sets with Adapters
Infrared Thermometer (or appropriate substitute)
Injector Pulse Tester
Leak Detector (Smoke or Nitrogen)
Logic Probe (suggested)
Oxygen Sensor Socket
Pinch-off Pliers
Sending Unit Socket(s)
Spark Plug Thread Tap
Spark Tester
Timing Advance Light
Vacuum/Pressure Gauge

AUTOMATIC TRANSMISSION/TRANSAXLE

Transmission Jack(s)
Transmission/Transaxle Flushing Equipment (recommended)
Transmission/Transaxle Holding Fixtures
Transmission/Transaxle Removal and Installation Equipment
Transmission/Transaxle Special Tool Sets (appropriate for units being utilized)

ELECTRICAL/ELECTRONIC SYSTEMS

Connector Pick Tool Set
Door Panel Trim Tool(s)
Headlight Aimer or Screen
Heat Gun (or equivalent for heat shrinking operations)
Wire and Terminal Repair Kit

MANUAL DRIVE TRAIN AND AXLES

- Axle Nut Socket Set (or equivalent)
- Clutch Alignment Set
- Clutch Pilot Bearing/Bushing Puller/Installer
- Constant Velocity Joint (CV) Service Tools:
  - Boot Installation Tool
  - Boot Clamp Pliers or Crimping Ring
- Front Wheel Drive Engine Support Fixture
- Rotating Torque Wrench (beam-type or equivalent)
- Universal Joint Tools

ENGINE REPAIR

- Antifreeze/Coolant Tester
- Oil Pressure Gauge
- Straight Edge
- Torque Angle Gauge

SPECIALTY TOOLS AND EQUIPMENT

MASTER AUTOMOBILE SERVICE TECHNOLOGY

SUSPENSION & STEERING

Ball Joint Press and other Special Tools
Brake Pedal Depressor
Bushing Driver Set
Coil Spring Compressor Tool
Chassis Ear (recommended)
Hand Grease Gun
Inner Tie Rod End Tool
Pitman Arm Puller
Power Steering Pump Pulley Special Tool Set (appropriate for units being taught)
Power Steering Pressure Gauges (recommended)
Shock Absorber Tools
Strut Spring Compressor Tool
Steering Column Special Tool Set (appropriate for teaching units being utilized)
Tie Rod Puller
Tire Mounting Machine (rim clamp type)
Tire Patching Tools and Supplies
Wheel Alignment Equipment-4 wheel (including alignment tools)
Wheel Balancer - Electronic Type
Wheel Weight Pliers

BRAKES

Bearing Seal and Race Driver Set
Brake Bleeder, Pressure or Vacuum
Brake Disc Micrometer
Brake Drum Micrometer and Calibration Equipment
Brake Lathe (bench with disc and drum service attachments)
Brake Lathe (on car)
Brake Shoe Adjusting Gauge
Brake Spring Remover/Installer
Brake Spring Pliers
Brake Spoon
Piston Retraction Set

HEATING AND AIR CONDITIONING

A/C Compressor Clutch Service Tools
A/C Service Port Adapter Set
Dye Injector
Hygrometer
Leak Detector (SAE Standard)
Manifold Gauge Set or equivalent (HFC-134a)
Refrigerant Charging Station (HFC-134a) or equivalent
Refrigerant Identification Equipment
Refrigerant Recovery/Recycling Machine (HFC-134a)
Thermometer

ENGINE PERFORMANCE

Cylinder Power Balance Tester
Four or Five Gas Exhaust Analyzer (Five Gas recommended)
Fuel Injection Pressure Gauge Sets with Adapters
* Graphing Multimeter (GMM) and/or Digital Storage Oscilloscope (DSO)
Infrared Thermometer (or appropriate substitute)
Injector Pulse Tester
Leak Detector (Smoke or Nitrogen)
Logic Probe (suggested)
Oxygen Sensor Socket
Pinch-off Pliers
Sending Unit Socket(s)
Spark Plug Thread Tap
Spark Tester
Timing Advance Light
Vacuum/Pressure Gauge

* Also necessary to accomplish tasks in other MAST categories (Brakes and Electrical/Electronic Systems)

AUTOMATIC TRANSMISSION/TRANSAXLE

Hydraulic Pressure Gauge Set
Transmission Jack(s)
Transmission/Transaxle Flushing Equipment (recommended)
Transmission/Transaxle Removal and Installation Equipment
Transmission/Transaxle Holding Fixtures
Transmission/Transaxle Special Tool Sets (appropriate for units being utilized)

ELECTRICAL/ELECTRONIC SYSTEMS

Connector Pick Tool Set
Door Panel Trim Tool(s)
Headlight Aimer or Screen
Heat Gun (or equivalent for heat shrinking operations)
Wire and Terminal Repair Kit

MANUAL DRIVE TRAIN AND AXLES

Axle Nut Socket Set (or equivalent)
Clutch Alignment Set
Clutch Pilot Bearing/Bushing Puller/Installer
Constant Velocity Joint (CV) Service Tools:
    Boot Installation Tool
    Boot Clamp Pliers or Crimping Ring
Front Wheel Drive Engine Support Fixture
Rotating Torque Wrench (beam-type or equivalent)
Special Tools for Transmissions/Transaxles (appropriate for units being taught)
Universal Joint Tools

ENGINE REPAIR

Antifreeze/Coolant Tester
Oil Pressure Gauge
Straight Edge
Torque Angle Gauge

APPENDIX A
EVALUATION GUIDE

Advisory Committee Tasks within NATEF Standards

The Advisory Committee is possibly the most important tool that any automotive technician training program can have, particularly when it is used properly and to its full extent. Regular meetings and good documentation of the meetings in the form of minutes is a must. The following are standards that must specifically be addressed by/with the program advisory committee and be reflected in the minutes. In order to ensure that these items are addressed, this document might be used as a guideline for developing an agenda for an advisory committee meeting. Programs should not limit the use of the advisory committee to only these items, but these items MUST be addressed:

Standard	Contents	Documentation
2.5 A	Does the Advisory Committee (excluding school personnel), with minimum of five in attendance, convene a minimum of two working meetings per year?	Meeting minutes from at least two meetings per year (one year for initial accreditation; five years for renewal of accreditation).
2.5 B	Rate the input of committee members in terms of participation, providing input on program improvement, and attendance as indicated in the minutes.	Meeting minutes
2.5 C	Rate the mix of committee members in terms of being representative of the following groups: automobile technicians, local employers, consumer groups, former students, others (automotive trainers, parents, etc.)	List of all advisory committee members and their affiliations.
4.2 B	Rate the Advisory Committee input in reviewing budgeted funds allocated to and used by the program.	Highlight pertinent discussion in Advisory Committee meeting minutes.
4.2 C	Rate the funding in terms of being adequate for program operation.	Provide budget information and highlight pertinent discussion regarding budget in Advisory Committee minutes.
5.5 F	Does the Advisory Committee review the information from the annual follow-up procedure and provide input for modifications to the training program?	Highlight pertinent information in Advisory Committee minutes.
6.5 C	Rate the use of the Advisory Committee to provide input on additional tasks, and if added, their approval of those additional tasks.	Highlight pertinent information in the Advisory Committee minutes.
6.14 F	Rate the use of the Advisory Committee review in the evaluation process (evaluation of instruction).	Highlight pertinent information in Advisory Committee minutes.

7.5 A	Rate the use of an annual review process, including the use of student follow-up information and local Advisory Committee input, to maintain up-to-date tools and equipment at industry and safety standards.	Describe the annual review process and provide an example from the annual survey data and Advisory Committee minutes with pertinent information highlighted.
8.2 E	Rate safety inspections in terms of being regularly held.	Note inspection schedule, show checklist, and highlight pertinent comments in Advisory Committee minutes.
8.11 A	Rate the inclusion of the Advisory Committee in conducting an annual evaluation of the facilities to assure adequacy in meeting program goals.	Highlight pertinent information in Advisory Committee minutes.
*11.3 A	Are Advisory Committee meeting minutes available to confirm that the committee has discussed and approved e-learning?	Highlight pertinent information in the Advisory Committee meeting minutes.

Standard 11 applies only to programs using e-learning outside of scheduled classroom/lab/shop time to meet instructional hour requirements for the purpose of achieving accreditation.

Automotive Program Evaluation

Everyone associated with an automotive program, whether it is automobile, collision repair & refinish, or medium/heavy truck, should be aware that an extensive self-evaluation must be conducted by school personnel and certain criteria must be met to be approved for an on-site team evaluation. Documentation must be available for the on-site team to verify that the program meets all requirements for NATEF accreditation. The good news is that the on-site team will evaluate exactly the same items the school evaluated.

The following document was prepared by a group of experienced ETLs, NATEF staff and Trustees. The result is a collection of suggestions for schools and ETLs alike to be used as a guide for preparing, reviewing, and evaluating the documentation needed for program accreditation. These suggestions are meant as examples and we are confident that there are many other documents that can be used to show how programs meet the standards for accreditation.

When evaluating the statements on the Self-Evaluation Forms, read the statement on the form then refer to the Program Standards section of the manual for additional information on each standard sub-section. It is helpful if you make notes of reference materials you used to rate the standard. As you continue to prepare for the on-site evaluation, it is helpful if you make copies of the information, clearly mark the reference, and highlight specific information for each sub-section. For example, Standard 1.2 A. asks you to rate program materials available (brochure or catalog) on the inclusion of admission requirements, employment potential, etc. Have a copy of the school catalog available for the team with the section identified with a sticky note and specific information highlighted.

The evaluation team will look at the same statement and will use the information you provide them to rate the items. The evaluation team should make comments on any sub-section that is rated above or less than 4.

STANDARD 1 – PURPOSE

THE AUTOMOBILE TECHNICIAN TRAINING PROGRAM SHOULD HAVE CLEARLY STATED PROGRAM GOALS, RELATED TO THE NEEDS OF THE STUDENTS AND EMPLOYERS SERVED.

1.1 EMPLOYMENT POTENTIAL

A. - B. Provide a copy of the annual survey and a summary of the results.

1.2 PROGRAM DESCRIPTION/GOALS

A. Provide a copy of the brochure and/or catalog with appropriate pages identified (use sticky notes, highlighter, etc. to make the information easy to find).

B. Identify the location of the program materials and the distribution methods used to provide the information to students.

STANDARD 2 – ADMINISTRATION

PROGRAM ADMINISTRATION SHOULD ENSURE THAT INSTRUCTIONAL ACTIVITIES SUPPORT AND PROMOTE THE GOALS OF THE PROGRAM.

2.1 STUDENT COMPETENCY CERTIFICATION

A. Show an example of the certificate, diploma, transcript, or degree plan.

2.2 CHAIN OF COMMAND

A. Show a copy of the school organizational chart.

2.3 ADMINISTRATIVE SUPPORT

A. - D. Provide a copy of the school policy or letter of support from the administration that addresses the various issues of planned in-service and update training; tools, equipment, and service publications; curriculum; and budget preparation.

2.4 WRITTEN POLICIES

A. - C. Provide a copy of the school policy and teacher/student handbook with pages marked with sticky note and references highlighted.

2.5 ADVISORY COMMITTEE

A. - C. Provide a copy of the Advisory Committee minutes which should include the date of the meeting, who was in attendance, start and end time, agenda, topics and summary of discussion, motions for vote, actions taken, follow-up to be completed, and date of next meeting. Provide a complete list of Advisory Committee Members. For initial accreditation, show records for the past year. For renewal of accreditation, show all records since the last accreditation.

2.6 PUBLIC/COMMUNITY RELATIONS

A. This is similar to 1.2 – show press releases, newspaper articles, fliers, trophies, etc.

2.7 CUSTOMER VEHICLES

A. - B. This applies only to programs that use customer vehicles. Show the policy statement on collecting, disbursing, and accounting for funds.

STANDARD 3 – LEARNING RESOURCES

SUPPORT MATERIAL, CONSISTENT WITH BOTH PROGRAM GOALS AND PERFORMANCE OBJECTIVES, SHOULD BE AVAILABLE TO STAFF AND STUDENTS.

3.1 SERVICE INFORMATION

A. – B. State the location of all service information such as manuals, CDs, on-line access, etc.

3.2 MULTIMEDIA

A. – B. Provide a list and give the location of all technology available for student and instructor use.

3.3 INSTRUCTIONAL DEVELOPMENT SERVICES

A. Indicate who provides media development services.

B. State the location of equipment and supplies.

3.4 PERIODICALS

A. Provide a list, give the location, and show examples of periodicals.

3.5 STUDENT MATERIALS

A. - B. Provide a copy of each textbook and other materials used for instruction.

STANDARD 4 – FINANCES

FUNDING SHOULD BE PROVIDED TO MEET PROGRAM GOALS AND PERFORMANCE OBJECTIVES.

4.1 PROGRAM TRAINING COST

A. For program budget, please only consider those expenses unique to the automotive program (e.g. consumable supplies, instructor development, curriculum development, environmental and other program contract services, amortized capital equipment, etc.) divided by full-time enrollment (FTE).

4.2 BUDGET

A. State the process used to determine the program budget.

B. Highlight pertinent discussion in Advisory Committee meeting minutes.

C. Provide budget information and highlight pertinent discussion regarding budget in Advisory Committee minutes.

4.3 BUDGET PREPARATION

A. Refer to 4.2 A. Provide copies of budget requests. ETLs may interview program staff.

4.4 STATUS REPORTS

A. Provide a copy of the last quarter's report.

STANDARD 5 – STUDENT SERVICES

SYSTEMATIC SKILLS ASSESSMENT, INTERVIEWS, COUNSELING SERVICES, PLACEMENT, AND FOLLOW-UP PROCEDURES SHOULD BE USED.

5.1 SKILLS ASSESSMENT

A. Provide the policy statement and a description of the process used for skills assessment. Skills assessment may take place prior to or early in the program. Provide a copy of the assessment instrument, if available.

B. Provide program explanatory material with pertinent information highlighted. Note availability for students.

C. Highlight pertinent information in program materials, catalog, brochure, etc.

5.2 PRE-ADMISSION COUNSELING

A. Highlight access to the career counseling process and student services available, as cited in catalog or other materials.

5.3 STUDENT RECORDS

A. Explain how records are maintained give their location, and length of time kept.

5.4 PLACEMENT

A. Provide the policy or explanation of the placement process.

5.5 ANNUAL FOLLOW-UP

A. - D. Provide an explanation and a sample document.

E. Describe the procedure to use the information obtained in follow-up and give an example of changes made to program based on feedback, if available.

F. Highlight pertinent information in Advisory Committee minutes.

5.6 LEGAL REQUIREMENTS

A. Provide copies of Policies and Procedures. Post Haz-Mat signs. Show MSDS sheets.

STANDARD 6 – INSTRUCTION

INSTRUCTION MUST BE SYSTEMATIC AND REFLECT AUTOMOBILE PROGRAM GOALS. A TASK LIST AND SPECIFIC PERFORMANCE OBJECTIVES WITH CRITERION REFERENCED MEASURES MUST BE USED.

6.1 PROGRAM PLAN

A. Provide a copy of the course outline and brochure.

6.2 STUDENT TRAINING PLAN

A.- B. Show an example of a student training plan or advisement sheet.

6.3 PREPARATION TIME

A. Show a copy of the Master Schedule and instructor office hours.

6.4 TEACHING LOAD

A. - B. Show student enrollment sheets, indicate the number of training stations, and identify teaching assistants (if any).

6.5 CURRICULUM

A. Cross reference to curriculum or student progress instrument.

B. The evaluation team will conduct a visual inspection. Provide a copy of the tool inventory / location.

C. Highlight pertinent information in the Advisory Committee minutes.

D. Provide syllabus (with information highlighted), course descriptions, job sheets, student materials, etc.

E. Provide samples of work order forms, parts order form, and show how time spent on task is recorded.

6.6 STUDENT PROGRESS

A. Provide the school policy on student evaluation, sample of student progress chart, and use an actual record with student identifying information blocked out.

6.7 PERFORMANCE STANDARDS

A. Provide a task sheet or progress chart.

B. Provide the evaluation criteria from the syllabus, progress chart, or task sheet.

C. Provide a task sheet or student progress chart.

6.8 SAFETY STANDARDS

A. - B. Show an example of the safety test, course of study, course outline, posters, etc.

C. Provide the course of study and sample of the safety test.

D. The evaluation team will conduct a visual inspection of markings on guards and lanes, posting of safety rules and signage, and present an example of a student contract.

6.9 PERSONAL STANDARDS

A. The evaluation team will conduct a visual inspection. Provide instructional materials, class / lab / shop rules.

6.10 WORK HABITS/ETHICS

A. - B. The evaluation team will conduct a visual inspection. Describe attendance policy, etc.

6.11 PROVISIONS FOR INDIVIDUAL DIFFERENCES

A. Provide ADA information, equipment modifications, differential instruction, and provide an example of an Individual Education Plan (IEP).

6.12 RELATED INSTRUCTION

A. Show syllabus with objectives and examples of tasks where related instruction is provided (OHM's Law, Pascal's Law, gear ratio, etc.); SkillsUSA Personal Development Plan, if appropriate.

B. Show copy of instructor teaching credential.

6.13 TESTING

A. Show samples of written tests.

B. Show sample job sheets.

C. Show sample of the rating scale used.

D. Show posters, ASE test registration books, describe provisions made for taking ASE tests.

6.14 EVALUATION OF INSTRUCTION

A. - E. Provide an explanation of the overall program evaluation policy and plan. Show samples of the instructor evaluation instrument, etc.

F. Highlight pertinent information in Advisory Committee minutes.

6.15 ON-VEHICLE SERVICE AND REPAIR WORK

A. Show task sheets and repair orders. The evaluation team will conduct a visual inspection.

B. Show course of study and a copy of the student progress chart.

C. Provide a copy of the program policy.

D. Show a sample work order. The evaluation team will conduct a visual inspection.

6.16 ARTICULATION

A. Show copy of the articulation agreement. Note: this may be N/A.

STANDARD 7 – EQUIPMENT

EQUIPMENT AND TOOLS USED IN THE AUTOMOBILE TECHNICIAN TRAINING PROGRAM MUST BE OF THE TYPE AND QUALITY FOUND IN THE REPAIR INDUSTRY AND MUST ALSO BE THE TYPE NEEDED TO PROVIDE TRAINING TO MEET THE PROGRAM GOALS AND OBJECTIVES.

7.1 SAFETY

A. - B. The evaluation team will conduct a visual inspection.

7.2 QUANTITY AND QUALITY

A. The evaluation team will conduct a visual inspection of the tools and equipment needed for instruction.

B. The evaluation team will conduct a visual inspection of class size and inventory.

C. The evaluation team will conduct a visual inspection tools and equipment used to meet industry quality standards.

7.3 CONSUMABLE SUPPLIES

A. The evaluation team will conduct a visual inspection. Provide inventory sheets and describe replenishment procedure.

7.4 MAINTENANCE

A. Provide a copy of the preventive maintenance schedule or spreadsheet.

7.5 REPLACEMENT

A. Describe the annual review process and provide an example from the annual survey data and Advisory Committee minutes with pertinent information highlighted.

7.6 INVENTORY

A. Provide the inventory list and describe the control system.

7.7 PARTS PURCHASING

A. If purchase parts, provide a written procedure or parts request form.

B. ETL may discuss this issue with instructor.

7.8 HAND TOOLS

A. Provide an inventory. The evaluation team will conduct a visual inspection.

B. Explain policy and provide information available for students detailing recommended tool list and vendor visits.

STANDARD 8 – FACILITIES

THE PHYSICAL FACILITIES MUST BE ADEQUATE TO PERMIT ACHIEVEMENT OF THE PROGRAM GOALS AND PERFORMANCE OBJECTIVES.

8.1 TRAINING STATIONS

A. The evaluation team will conduct a visual inspection. Provide information on class size for each course.

8.2 SAFETY

A. The evaluation team will conduct a visual inspection of the location of signs.

B. The evaluation team will conduct a visual inspection of fire extinguishers.

C. The evaluation team will conduct a visual inspection and location of posted policy/procedures.

D. The evaluation team will conduct a visual inspection of lighting.

E. Note inspection schedule, show check list, and highlight pertinent comments in Advisory Committee minutes.

F. The evaluation team will conduct a visual inspection to verify that all other applicable safety standards are met.

G. The evaluation team will look for the identified vehicle traffic lanes.

8.3 MAINTENANCE

A. Provide copy of written policy and procedures.

8.4 HOUSEKEEPING

A. - B. The evaluation team will conduct a visual inspection.

8.5 OFFICE SPACE

A. The evaluation team will conduct a visual inspection.

8.6 INSTRUCTIONAL AREA

A. The evaluation team will conduct a visual inspection.

8.7 STORAGE

A. - E. The evaluation team will conduct a visual inspection.

8.8 SUPPORT FACILITIES

A. - B. The evaluation team will conduct a visual inspection.

8.9 VENTILATION

A. The evaluation team will conduct a visual inspection and verify the function of exhaust fume removal system.

B. The ETL and team members will interview instructors and students.

8.10 FIRST AID

A. - C. Provide copy of the written policy. The evaluation team will conduct a visual inspection.

8.11 FACILITY EVALUATION

A. Highlight pertinent information in Advisory Committee minutes.

STANDARD 9 – INSTRUCTIONAL STAFF

THE INSTRUCTIONAL STAFF MUST HAVE TECHNICAL COMPETENCY AND MEET ALL STATE AND LOCAL REQUIREMENTS FOR CERTIFICATION/ CREDENTIALS.

9.1 TECHNICAL COMPETENCY

A. - D. Provide information on each instructor, diplomas earned, and copy of ASE Certification.

9.2 INSTRUCTIONAL COMPETENCY / CERTIFICATION

A. Provide a copy of the teaching certificate for each instructor.

9.3 TECHNICAL UPDATING

A. Provide a copy of the inventory of trade publications, service bulletins, etc. The evaluation team will conduct a visual inspection.

B. Provide certificate, transcript, or completion forms for each instructor.

9.4 FIRST AID

A. Provide a copy of the written policy on First Aid.

9.5 SUBSTITUTE

A. - C. Provide written policy on substitute teachers and schedule for orientation of new substitutes.

STANDARD 10 – COOPERATIVE AGREEMENTS

WRITTEN POLICIES AND PROCEDURES SHOULD BE USED FOR COOPERATIVE AND APPRENTICESHIP TRAINING PROGRAMS.

10.1 STANDARDS

A. Show overall co-op or apprenticeship plan, sample training plan, and the ETL will talk with instructor. This may be N/A.

10.2 AGREEMENTS

A. Show a sample agreement. This may be N/A.

10.3 SUPERVISION

A. Show written policy on supervision, identify the person responsible for supervision; the ETL should interview the person who supervises co-op or apprenticeship. This may be N/A.

STANDARD 11 – E-LEARNING

WRITTEN POLICIES AND PROCEDURES MUST BE FOLLOWED WHEN E-LEARNING CURRICULAR MATERIALS ARE USED OUTSIDE OF SCHEDULED CLASSROON/LAB/SHOP TIME FOR THE PURPOSE OF MEETING NATEF INSTRUCTIONAL HOUR REQUIREMENTS (This applies only to programs that are using e-learning to meet program hour requirements. This is a go/no go Standard that requires validation of a 'yes' response to each of the criteria.)

11.1 ACCESS

A. Provide a copy of the policy regarding the availability of appropriate technology for students to access e-learning instructional materials.

11.2 CURRICULUM AND STUDENT PROGRESS

A. Highlight e-learning activities in the course of study materials.

B. Cross-reference e-learning activities to content/tasks in the program plan.

C. Correlate instructional hours to be credited toward meeting up to 25 percent of the program specialty hour requirements with the vendor's average completion time for each instructional module.

D. Show an example of the Learning Management System (LMS) used to track student progress.

11.3 ADVISORY COMMITTEE INPUT

A. Highlight pertinent information in the Advisory Committee meeting minutes.

2012 NATEF Automobile Accreditation

Maintenance and Light Repair
Task List

ENGINE REPAIR

General

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.	P-1
2. Verify operation of the instrument panel engine warning indicators.	P-1
3. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	P-1
4. Install engine covers using gaskets, seals, and sealers as required.	P-1
5. Remove and replace timing belt; verify correct camshaft timing.	P-1
6. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.	P-1
7. Identify hybrid vehicle internal combustion engine service precautions.	P-3

ENGINE REPAIR

Cylinder Head and Valve Train

1. Adjust valves (mechanical or hydraulic lifters).	P-1

ENGINE REPAIR

Lubrication and Cooling Systems

1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level	P-1
2. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
3. Remove, inspect, and replace thermostat and gasket/seal.	P-1
4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.	P-1
5. Perform engine oil and filter change.	P-1

AUTOMATIC TRANSMISSION AND TRANSAXLE

General

1. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
2. Check fluid level in a transmission or a transaxle equipped with a dip-stick.	P-1
3. Check fluid level in a transmission or a transaxle not equipped with a dip-stick.	P-1
4. Check transmission fluid condition; check for leaks.	P-2

AUTOMATIC TRANSMISSION AND TRANSAXLE

In-Vehicle Transmission/Transaxle

1. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch. P-2

2. Inspect for leakage at external seals, gaskets, and bushings. P-2

3. Inspect power train mounts. P-2

4. Drain and replace fluid and filter(s). P-1

AUTOMATIC TRANSMISSION AND TRANSAXLE

Off-Vehicle Transmission and Transaxle

1. Describe the operational characteristics of a continuously variable transmission (CVT). P-3

2. Describe the operational characteristics of a hybrid vehicle drive train. P-3

MANUAL DRIVE TRAIN AND AXLES

General

1. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

2. Drain and refill manual transmission/transaxle and final drive unit. P-1

3. Check fluid condition; check for leaks. P-2

MANUAL DRIVE TRAIN AND AXLES

Clutch

1. Check and adjust clutch master cylinder fluid level. P-1

2. Check for system leaks. P-1

MANUAL DRIVE TRAIN AND AXLES

Transmission/Transaxle

1. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. P-3

MANUAL DRIVE TRAIN AND AXLES

Drive Shaft, Half Shafts, Universal and Constant-Velocity (CV) Joints

1. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals. P-2

2. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints. P-2

MANUAL DRIVE TRAIN AND AXLES

Differential Case Assembly

1. Clean and inspect differential housing; check for leaks; inspect housing vent P-2
2. Check and adjust differential housing fluid level. P-1

3. Drain and refill differential housing. P-1

Drive Axles

1. Inspect and replace drive axle wheel studs. P-2

MANUAL DRIVE TRAIN AND AXLES

Four-wheel Drive/All-wheel Drive

1. Inspect front-wheel bearings and locking hubs. P-3

2. Check for leaks at drive assembly seals; check vents; check lube level. P-2

SUSPENSION AND STEERING SYSTEMS

General

1. Research applicable vehicle and service information, vehicle service history, service precautions, a P-1

2. Disable and enable supplemental restraint system (SRS). P-1

SUSPENSION AND STEERING

Related Suspension and Steering Service

1. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots P-1

2. Determine proper power steering fluid type; inspect fluid level and condition P-1

3. Flush, fill, and bleed power steering system. P-2

4. Inspect for power steering fluid leakage; determine necessary action. P-1

5. Remove, inspect, replace, and adjust power steering pump drive belt. P-1

6. Inspect and replace power steering hoses and fittings. P-2

7. Replace power steering pump filter(s). P-2

8. Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, anc P-1
steering linkage damper.

9. Inspect tie rod ends (sockets), tie rod sleeves, and clamps. P-1

10. Inspect upper and lower control arms, bushings, and shafts. P-1

11. Inspect and replace rebound and jounce bumpers. P-1

12. Inspect track bar, strut rods/radius arms, and related mounts and bushings P-1

13. Inspect upper and lower ball joints (with or without wear indicators). P-1

14. Inspect suspension system coil springs and spring insulators (silencers). P-1

15. Inspect suspension system torsion bars and mounts. P-1

16. Inspect and replace front stabilizer bar (sway bar) bushings, brackets, and links P-1

17. Inspect strut cartridge or assembly. P-1

18. Inspect front strut bearing and mount. P-1

19. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms. P-1

20. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bush P-1

21. Inspect, remove, and replace shock absorbers; inspect mounts and bushings. P-1

22. Inspect electric power-assisted steering. P-3

23. Identify hybrid vehicle power steering system electrical circuits and safety precautions P-2

24. Describe the function of the power steering pressure switch. P-3

SUSPENSION AND STEERING

Wheel Alignment

1. Perform prealignment inspection and measure vehicle ride height; determine necessary action P-1

SUSPENSION AND STEERING

Wheels and Tires

1. Inspect tire condition; identify tire wear patterns; check for correct size and application (load and P-1

2. Rotate tires according to manufacturer’s recommendations. P-1

3. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic). P-1

4. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. P-2

5. Inspect tire and wheel assembly for air loss; perform necessary action. P-1

6. Repair tire using internal patch. P-1

7. Identify and test tire pressure monitoring systems (indirect and direct) for operation; verify operat P-2

8. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monit P-2

BRAKES

General

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

2. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS). P-1

BRAKES

Hydraulic System

1. Measure brake pedal height, travel, and free play (as applicable); determine necessary action P-1

2. Check master cylinder for external leaks and proper operation. P-1

3. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, l P-1

4. Select, handle, store, and fill brake fluids to proper level. P-1

5. Identify components of brake warning light system. P-3

6. Bleed and/or flush brake system. P-1

7. Test brake fluid for contamination. P-1

BRAKES

Drum Brakes

1. Remove, clean, inspect, and measure brake drum diameter; determine necessary action P-1

2. Refinish brake drum and measure final drum diameter; compare with specifications. P-1

3. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble P-1

4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. P-2

5. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments. P-2

6. Install wheel and torque lug nuts. P-1

BRAKES

Disc Brakes

1. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determ P-1

2. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action. P-1

3. Remove, inspect, and replace pads and retaining hardware; determine necessary action P-1

4. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks. P-1

5. Clean and inspect rotor, measure rotor thickness, thickness variation, and lateral runout; determir P-1

6. Remove and reinstall rotor. P-1

7. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications. P-1

8. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications. P-1

9. Retract and re-adjust caliper piston on an integral parking brake system. P-3

10. Check brake pad wear indicator; determine necessary action. P-2

11. Describe importance of operating vehicle to burnish/break-in replacement brake pads according t P-1

BRAKES

Power-Assist Units

1. Check brake pedal travel with, and without, engine running to verify proper power booster operat P-2

2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1

BRAKES

Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.)

1. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub anc P-1
adjust bearings.

2. Check parking brake cables and components for wear, binding, and corrosion; clean, P-2
lubricate, adjust or replace as needed.

3. Check parking brake operation and parking brake indicator light system operation; determine P-1
necessary action.

4. Check operation of brake stop light system. P-1

5. Replace wheel bearing and race. P-2

BRAKES

Electronic Brakes, and Traction and Stability Control Systems

1. Identify traction control/vehicle stability control system components. P-3

2. Describe the operation of a regenerative braking system. P-3

ELECTRICAL/ELECTRONIC SYSTEMS

General

1. Research applicable vehicle and service information, vehicle service history, service P-1
precautions, and technical service bulletins.

2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits P-1
using principles of electricity (Ohm's Law).

3. Use wiring diagrams to trace electrical/electronic circuits. P-1

4. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. P-1

5. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-2

6. Check operation of electrical circuits with a test light. P-2

7. Check operation of electrical circuits with fused jumper wires. P-2

8. Measure key-off battery drain (parasitic draw). P-1

9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action P-1

10. Perform solder repair of electrical wiring. P-1

11. Replace electrical connectors and terminal ends. P-1

ELECTRICAL/ELECTRONIC SYSTEMS

Battery Service

1. Perform battery state-of-charge test; determine necessary action. P-1

2. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action. P-1

3. Maintain or restore electronic memory functions. P-1

4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-do P-1

5. Perform slow/fast battery charge according to manufacturer's recommendations. P-1

6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1

7. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions. P-3

8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1

9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-3

ELECTRICAL/ELECTRONIC SYSTEMS

Starting System

1. Perform starter current draw test; determine necessary action. P-1

2. Perform starter circuit voltage drop tests; determine necessary action. P-1

3. Inspect and test starter relays and solenoids; determine necessary action P-2

4. Remove and install starter in a vehicle. P-1

5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary a P-2

ELECTRICAL/ELECTRONIC SYSTEMS

Charging System

1. Perform charging system output test; determine necessary action. P-1

2. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wea P-1

3. Remove, inspect, and re-install generator (alternator). P-2

4. Perform charging circuit voltage drop tests; determine necessary action. P-1

ELECTRICAL/ELECTRONIC SYSTEMS

Lighting Systems

1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1

2. Aim headlights. P-2

3. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-2

ELECTRICAL/ELECTRONIC SYSTEMS

Accessories

1. Disable and enable airbag system for vehicle service; verify indicator lamp operation. P-1

2. Remove and reinstall door panel. P-1

3. Describe the operation of keyless entry/remote-start systems. P-3

4. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indi P-1

5. Verify windshield wiper and washer operation; replace wiper blades. P-1

HEATING AND AIR CONDITIONING

General

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

HEATING AND AIR CONDITIONING

Refrigeration System Components

1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action. P-1

2. Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions P-2

3. Inspect A/C condenser for airflow restrictions; determine necessary action. P-1

HEATING AND AIR CONDITIONING

Heating, Ventilation, and Engine Cooling Systems

1. Inspect engine cooling and heater systems hoses; perform necessary action. P-1

HEATING AND AIR CONDITIONING

Operating Systems and Related Controls

1. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action. P-1

2. Identify the source of A/C system odors. P-2

ENGINE PERFORMANCE

General

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

2. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary actior P-1

3. Perform cylinder power balance test; determine necessary action. P-2

4. Perform cylinder cranking and running compression tests; determine necessary action P-1

5. Perform cylinder leakage test; determine necessary action. P-1

6. Verify engine operating temperature. P-1

7. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-1

ENGINE PERFORMANCE

Computerized Engine Controls

1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. P-1

2. Describe the importance of operating all OBDII monitors for repair verification. P-1

ENGINE PERFORMANCE

Fuel, Air Induction, and Exhaust Systems

1. Replace fuel filter(s). P-1

2. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1

3. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action. P-1

4. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace P-1

5. Check and refill diesel exhaust fluid (DEF). P-3

ENGINE PERFORMANCE

Emissions Control Systems

1. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.	P-2	116	P-1
		35	P-2
		15	P-3
REQUIRED SUPPLEMENTAL TASKS		166	

Shop and Personal Safety

1. Identify general shop safety rules and procedures.

2. Utilize safe procedures for handling of tools and equipment.

3. Identify and use proper placement of floor jacks and jack stands.

4. Identify and use proper procedures for safe lift operation.

5. Utilize proper ventilation procedures for working within the lab/shop area.

6. Identify marked safety areas.

7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.

8. Identify the location and use of eye wash stations.

9. Identify the location of the posted evacuation routes.

10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.

11. Identify and wear appropriate clothing for lab/shop activities.

12. Secure hair and jewelry for lab/shop activities.

13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.

14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).

15. Locate and demonstrate knowledge of material safety data sheets (MSDS).

Tools and Equipment

1. Identify tools and their usage in automotive applications.

2. Identify standard and metric designation.

3. Demonstrate safe handling and use of appropriate tools.

4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.

5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

Preparing Vehicle for Service

1. Identify information needed and the service requested on a repair order.

2. Identify purpose and demonstrate proper use of fender covers, mats.

3. Demonstrate use of the three C's (concern, cause, and correction).

4. Review vehicle service history.

5. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

Preparing Vehicle for Customer

1. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

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ENGINE REPAIR

General: Engine Diagnosis; Removal and Reinstallation (R & R)

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
2. Research applicable vehicle and service information, such as internal engine operation**,** vehicle service history, service precautions, and technical service bulletins. P-1
3. Verify operation of the instrument panel engine warning indicators. P-1
4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-1
5. Install engine covers using gaskets, seals, and sealers as required. P-1
6. Remove and replace timing belt; verify correct camshaft timing. P-1
7. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-1
8. Inspect, remove and replace engine mounts. P-2
9. Identify hybrid vehicle internal combustion engine service precautions. P-3

ENGINE REPAIR

Cylinder Head and Valve Train Diagnosis and Repair

1. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specifications and procedures. P-1

2. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition. P-1

3. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action. P-2

4. Adjust valves (mechanical or hydraulic lifters). P-1

5. Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing. P-1

6. Establish camshaft position sensor indexing. P-1

ENGINE REPAIR

Engine Block Assembly Diagnosis and Repair

1. Remove, inspect, or replace crankshaft vibration damper (harmonic balancer). P-2

ENGINE REPAIR

Lubrication and Cooling Systems Diagnosis and Repair

1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core; determine necessary action. P-1

2. Identify causes of engine overheating. P-1

3. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1

4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. P-1

5. Inspect, remove, and replace water pump. P-2

6. Remove and replace radiator. P-2

7. Remove, inspect, and replace thermostat and gasket/seal. P-1

8. Inspect and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams. P-1

9. Perform oil pressure tests; determine necessary action. P-1

10. Perform engine oil and filter change. P-1

11. Inspect auxiliary coolers; determine necessary action. P-3

12. Inspect, test, and replace oil temperature and pressure switches and sensors. P-2

AUTOMATIC TRANSMISSION AND TRANSAXLE

General: Transmission and Transaxle Diagnosis

1. Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action. P-1

2. Research applicable vehicle and service information fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

3. Diagnose fluid loss and condition concerns; determine necessary action. P-1

4. Check fluid level in a transmission or a transaxle equipped with a dip-stick. P-1

5. Check fluid level in a transmission or a transaxle not equipped with a dip-stick. P-1

6. Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine necessary action. P-1

7. Diagnose noise and vibration concerns; determine necessary action. P-2

8. Perform stall test; determine necessary action. P-3

9. Perform lock-up converter system tests; determine necessary action. P-3

10. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles. P-1

11. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information. P-1

12. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law). P-2

AUTOMATIC TRANSMISSION AND TRANSAXLE
In-Vehicle Transmission/Transaxle Maintenance and Repair

1. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch. P-2

2. Inspect for leakage; replace external seals, gaskets, and bushings. P-2

3. Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses. P-1

4. Drain and replace fluid and filter(s). P-1

5. Inspect powertrain mounts. P-2

AUTOMATIC TRANSMISSION AND TRANSAXLE
Off-Vehicle Transmission and Transaxle Repair

1. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces. P-1

2. Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings. P-1

3. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore. P-2

4. Describe the operational characteristics of a continuously variable transmission (CVT). P-3

5. Describe the operational characteristics of a hybrid vehicle drive train. P-3

MANUAL DRIVE TRAIN AND AXLES

General: Drive Train Diagnosis

1. Identify and interpret drive train concerns; determine necessary action. P-1
2. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. P-1
3. Check fluid condition; check for leaks; determine necessary action. P-1
4. Drain and refill manual transmission/transaxle and final drive unit. P-1

MANUAL DRIVE TRAIN AND AXLES

Clutch Diagnosis and Repair

1. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action. P-1
2. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action. P-1
3. Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable). P-1
4. Bleed clutch hydraulic system. P-1
5. Check and adjust clutch master cylinder fluid level; check for leaks. P-1
6. Inspect flywheel and ring gear for wear and cracks; determine necessary action. P-1
7. Measure flywheel runout and crankshaft end play; determine necessary action. P-2

MANUAL DRIVE TRAIN AND AXLES

Transmission/Transaxle Diagnosis and Repair

1. Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers. P-2
2. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. P-3

3. Diagnose noise concerns through the application of transmission/transaxle powerflow principles. P-2

4. Diagnose hard shifting and jumping out of gear concerns; determine necessary action. P-2

5. Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action. P-3

MANUAL DRIVE TRAIN AND AXLES

Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair

1. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action. P-1

2. Diagnose universal joint noise and vibration concerns; perform necessary action. P-2

3. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals. P-1

4. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints. P-1

5. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles. P-2

MANUAL DRIVE TRAIN AND AXLES

Drive Axle Diagnosis and Repair

Ring and Pinion Gears and Differential Case Assembly

1. Clean and inspect differential housing; check for leaks; inspect housing vent. P-2

2. Check and adjust differential housing fluid level. P-1

3. Drain and refill differential housing. P-1

4. Diagnose noise and vibration concerns; determine necessary action. P-2

5. Inspect and replace companion flange and pinion seal; measure companion flange runout. P-2

Limited Slip Differential

1. Diagnose noise, slippage, and chatter concerns; determine necessary action. P-3

Drive Axles

1. Inspect and replace drive axle wheel studs. P-1
2. Remove and replace drive axle shafts. P-1
3. Inspect and replace drive axle shaft seals, bearings, and retainers. P-2
4. Measure drive axle flange runout and shaft end play; determine necessary action. P-2
5. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action. P-2

MANUAL DRIVE TRAIN AND AXLES

Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair

1. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. P-3
2. Inspect front-wheel bearings and locking hubs; perform necessary action(s). P-3
3. Check for leaks at drive assembly seals; check vents; check lube level. P-3
4. Identify concerns related to variations in tire circumference and/or final drive ratios. P-3
5. Diagnose noise, vibration, and unusual steering concerns; determine necessary action. P-3
6. Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems. P-3

SUSPENSION AND STEERING

General: Suspension and Steering Systems

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

2. Identify and interpret suspension and steering system concerns; determine necessary action. P-1

SUSPENSION AND STEERING

Steering Systems Diagnosis and Repair

1. Disable and enable supplemental restraint system (SRS). P-1

2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring). P-1

3. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action. P-2

4. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. P-2

5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action. P-2

6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action. P-2

7. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets. P-2

8. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed. P-2

9. Determine proper power steering fluid type; inspect fluid level and condition. P-1

10. Flush, fill, and bleed power steering system. P-2

11. Inspect for power steering fluid leakage; determine necessary action. P-1

12. Remove, inspect, replace, and adjust power steering pump drive belt. P-1

13. Remove and reinstall power steering pump. P-2

14. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment. P-2

15. Inspect and replace power steering hoses and fittings. P-2

16. Replace power steering pump filter(s). P-1

17. Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper. P-2

18. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps. P-1

19. Test and diagnose components of electronically-controlled steering systems using a scan tool; determine necessary action. p-3

20. Identify hybrid vehicle power steering system electrical circuits and safety precautions. P-2

SUSPENSION AND STEERING

Suspension Systems Diagnosis and Repair

1. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action. P-1

2. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action. P-1

3. Inspect, remove and install upper and lower control arms, bushings, shafts, and rebound bumpers. P-3

4. Inspect, remove and install strut rods and bushings. P-3

5. Inspect, remove and install upper and/or lower ball joints (with or without wear indicators). P-2

6. Inspect, remove and install steering knuckle assemblies. P-3

7. Inspect, remove and install short and long arm suspension system coil springs and spring insulators. P-3

8. Inspect, remove and install torsion bars and mounts P-3

9. Inspect, remove and install front stabilizer bar (sway bar) bushings, brackets, and links. P-3

10. Inspect, remove and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount. P-3

11. Inspect, remove and install track bar, strut rods/radius arms, and related mounts and bushings. P-3

12. Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts. P-1

13. Inspect electric power-assisted steering. P-3

SUSPENSION AND STEERING

Related Suspension and Steering Service

1. Inspect, remove, and replace shock absorbers; inspect mounts and bushings. P-1

2. Remove, inspect, and service or replace front and rear wheel bearings. P-1

3. Describe the function of the power steering pressure switch. P-3

SUSPENSION AND STEERING

Wheel Alignment Diagnosis, Adjustment, and Repair

1. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action. P-1

2. Perform prealignment inspection and measure vehicle ride height; perform necessary action. P-1

3. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber and toe as required; center steering wheel. P-1

4. Check toe-out-on-turns (turning radius); determine necessary action. P-2

5. Check SAI (steering axis inclination) and included angle; determine necessary action. P-2

6. Check rear wheel thrust angle; determine necessary action. P-1

7. Check for front wheel setback; determine necessary action. P-2

8. Check front and/or rear cradle (subframe) alignment; determine necessary action. P-3

SUSPENSION AND STEERING

Wheels and Tires Diagnosis and Repair

1. Inspect tire condition; identify tire wear patterns; check for correct tire size and application (load and speed ratings) and adjust air pressure; determine necessary action. P-1

2. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action. P-2

3. Rotate tires according to manufacturer's recommendations. P-1

4. Measure wheel, tire, axle flange, and hub runout; determine necessary action. P-2

5. Diagnose tire pull problems; determine necessary action. P-2

6. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic). P-1

7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor. P-2

8. Inspect tire and wheel assembly for air loss; perform necessary action. P-1

9. Repair tire using internal patch. P-1

10. Identify and test tire pressure monitoring system (indirect and direct) for operation; calibrate system; verify operation of instrument panel lamps. P-2

11. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system. P-1

BRAKES

General: Brake Systems Diagnosis

1. Identify and interpret brake system concerns; determine necessary action. P-1

2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

3. Describe procedure for performing a road test to check brake system operation; including an anti-lock brake system (ABS). P-1

BRAKES

Hydraulic System Diagnosis and Repair

1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law). P-1

2. Measure brake pedal height, travel, and free play (as applicable); determine necessary action. P-1

3. Check master cylinder for internal/external leaks and proper operation; determine necessary action. P-1

4. Remove, bench bleed, and reinstall master cylinder. P-1

5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action. P-3

6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, and wear; check for loose fittings and supports; determine necessary action. P-1

7. Replace brake lines, hoses, fittings, and supports. P-2

8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types). P-2

9. Select, handle, store, and fill brake fluids to proper level. P-1

10. Inspect, test, and/or replace components of brake warning light system. P-3

11. Identify components of brake warning light system. P-2

12. Bleed and/or flush brake system. P-1

13. Test brake fluid for contamination. P-1

BRAKES

Drum Brake Diagnosis and Repair

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action. P-1
2. Remove, clean, inspect, and measure brake drum diameter; determine necessary action. P-1
3. Refinish brake drum and measure final drum diameter; compare with specifications. P-1
4. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1
5. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. P-2
6. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments. P-2
7. Install wheel and torque lug nuts. P-1

BRAKES

Disc Brake Diagnosis and Repair

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine necessary action. P-1
2. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action. P-1
3. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action. P-1
4. Remove, inspect, and replace pads and retaining hardware; determine necessary action. P-1

5. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks. P-1

6. Clean and inspect rotor; measure rotor thickness, thickness variation, and lateral runout; determine necessary action. P-1

7. Remove and reinstall rotor. P-1

8. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications. P-1

9. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications. P-1

10. Retract and re-adjust caliper piston on an integrated parking brake system. P-3

11. Check brake pad wear indicator; determine necessary action. P-2

12. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations. P-1

BRAKES

Power-Assist Units Diagnosis and Repair

1. Check brake pedal travel with, and without, engine running to verify proper power booster operation. P-2

2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-1

3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine necessary action. P-1

4. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine necessary action. P-3

5. Measure and adjust master cylinder pushrod length. P-3

BRAKES

Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair

1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action. P-3

2. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. P-1

3. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed. P-2

4. Check parking brake operation and parking brake indicator light system operation; determine necessary action. P-1

5. Check operation of brake stop light system. P-1

6. Replace wheel bearing and race. P-2

7. Remove and reinstall sealed wheel bearing assembly. P-2

BRAKES

Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair

1. Identify and inspect electronic brake control system components; determine necessary action. P-1

2. Identify traction control/vehicle stability control system components. P-3

3. Describe the operation of a regenerative braking system. P-3

4. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine necessary action. P-2

5. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action. P-2

6. Depressurize high-pressure components of an electronic brake control system. P-3

7. Bleed the electronic brake control system hydraulic circuits. P-1

8. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data). P-3

9. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). P-3

ELECTRICAL/ELECTRONIC SYSTEMS

General: Electrical System Diagnosis

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law). P-1

3. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance. P-1

4. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. P-1

5. Check operation of electrical circuits with a test light. P-1

6. Check operation of electrical circuits with fused jumper wires. P-1

7. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems. P-1

8. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action. P-1

9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. P-1

10. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action. P-1

11. Replace electrical connectors and terminal ends. P-1

12. Repair wiring harness. P-3

13. Perform solder repair of electrical wiring. P-1

14. Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs. P-2

15. Repair wiring harness (including CAN/BUS systems). P-1

ELECTRICAL/ELECTRONIC SYSTEMS

Battery Diagnosis and Service

1. Perform battery state-of-charge test; determine necessary action. P-1

2. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action. P-1

3. Maintain or restore electronic memory functions. P-1

4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. P-1

5. Perform slow/fast battery charge according to manufacturer's recommendations. P-1

6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1

7. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions. P-3

8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. P-1

9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. P-3

ELECTRICAL/ELECTRONIC SYSTEMS

Starting System Diagnosis and Repair

1. Perform starter current draw tests; determine necessary action. P-1

2. Perform starter circuit voltage drop tests; determine necessary action. P-1

3. Inspect and test starter relays and solenoids; determine necessary action. P-2

4. Remove and install starter in a vehicle. P-1

5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action. P-2

6. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition. P-2

ELECTRICAL/ELECTRONIC SYSTEMS

Charging System Diagnosis and Repair

1. Perform charging system output test; determine necessary action. P-1

2. Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions. P-1

3. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1

4. Remove, inspect, and re-install generator (alternator). P-1

5. Perform charging circuit voltage drop tests; determine necessary action. P-1

ELECTRICAL/ELECTRONIC SYSTEMS

Lighting Systems Diagnosis and Repair

1. Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine necessary action. P-1

2. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1

3. Aim headlights. P-2

4. Identify system voltage and safety precautions associated with high-intensity discharge headlights. P-2

ELECTRICAL/ELECTRONIC SYSTEMS

Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair

1. Inspect and test gauges and gauge sending units for causes of abnormal gauge readings; determine necessary action. P-2

2. Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine necessary action. P-2

ELECTRICAL/ELECTRONIC SYSTEMS

Horn and Wiper/Washer Diagnosis and Repair

1. Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action. P-1

2. Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action. P-2

3. Diagnose (troubleshoot) windshield washer problems; perform necessary action. P-2

ELECTRICAL/ELECTRONIC SYSTEMS

Accessories Diagnosis and Repair

1. Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action. P-2

2. Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action. P-2

3. Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action. P-3

4. Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action. P-2

5. Disable and enable an airbag system for vehicle service; verify indicator lamp operation. P-1

6. Remove and reinstall door panel. P-1

7. Check for module communication errors (including CAN/BUS systems) using a scan tool. P-2

8. Describe the operation of keyless entry/remote-start systems. P-3

9. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. P-1

10. Verify windshield wiper and washer operation, replace wiper blades. P-1

11. Diagnose (troubleshoot) radio static and weak, intermittent, or no radio reception; determine necessary action. P-3

12. Diagnose (troubleshoot) body electronic system circuits using a scan tool; determine necessary action. P-3

13. Diagnose the cause(s) of false, intermittent, or no operation of anti-theft systems. P-3

14. Perform software transfers, software updates, or flash reprogramming on electronic modules. P-3

HEATING AND AIR CONDITIONING

General: A/C System Diagnosis and Repair

1. Identify and interpret heating and air conditioning problems; determine necessary action. P-1

2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

3. Performance test A/C system; identify problems. P-1

4. Identify abnormal operating noises in the A/C system; determine necessary action. P-2

5. Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings. P-1

6. Leak test A/C system; determine necessary action. P-1

7. Inspect condition of refrigerant oil removed from A/C system; determine necessary action. P-2

8. Determine recommended oil and oil capacity for system application. P-1

9. Using a scan tool, observe and record related HVAC data and trouble codes. P-3

HEATING AND AIR CONDITIONING

Refrigeration System Component Diagnosis and Repair

1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action. P-1

2. Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed. P-2

3. Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil quantity. P-2

4. Identify hybrid vehicle A/C system electrical circuits and service/safety precautions. P-2

5. Determine need for an additional A/C system filter; perform necessary action. P-3

6. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action. P-2

7. Inspect A/C condenser for airflow restrictions; perform necessary action. P-1

8. Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil quantity. P-2

9. Remove, inspect, and install expansion valve or orifice (expansion) tube. P-1

10. Inspect evaporator housing water drain; perform necessary action. P-1

11. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action. P-2

HEATING AND AIR CONDITIONING

Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

1. Inspect engine cooling and heater systems hoses; perform necessary action. P-1

2. Inspect and test heater control valve(s); perform necessary action. P-2

3. Diagnose temperature control problems in the heater/ventilation system; determine necessary action. P-2

HEATING AND AIR CONDITIONING

Operating Systems and Related Controls Diagnosis and Repair

1. Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and protection devices; perform necessary action. P-1

2. Diagnose A/C compressor clutch control systems; determine necessary action. P-2

3. Diagnose malfunctions in the vacuum, mechanical, and electrical components and the electrical controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action. P-2

4. Inspect and test A/C-heater control panel assembly; determine necessary action. P-3

5. Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action. P-3

6. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action. P-1

7. Identify the source of A/C system odors. P-2

8. Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action. P-2

HEATING AND AIR CONDITIONING

Refrigerant Recovery, Recycling, and Handling

1. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards. P-1

2. Identify and recover A/C system refrigerant. P-1

3. Recycle, label, and store refrigerant. P-1

4. Evacuate and charge A/C system; add refrigerant oil as required. P-1

ENGINE PERFORMANCE

General: Engine Diagnosis

1. Identify and interpret engine performance concerns; determine necessary action. P-1

2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. P-1

3. Diagnose abnormal engine noises or vibration concerns; determine necessary action. P-3

4. Diagnose abnormal exhaust color, odor, and sound; determine necessary action. P-2

5. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. P-1

6. Perform cylinder power balance test; determine necessary action. P-2

7. Perform cylinder cranking and running compression tests; determine necessary action. P-1

8. Perform cylinder leakage test; determine necessary action. P-1

9. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action. P-2

10. Verify engine operating temperature; determine necessary action. P-1

11. Verify correct camshaft timing. P-1

ENGINE PERFORMANCE

Computerized Engine Controls Diagnosis and Repair

1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. P-1
2. Access and use service information to perform step-by-step (troubleshooting) diagnosis. P-1
3. Perform active tests of actuators using a scan tool; determine necessary action. P-2
4. Describe the importance of running all OBDII monitors for repair verification. P-1
5. Diagnose the causes of emissions or driveability concerns using stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data. P-1
6. Diagnose emissions or driveability concerns without use of stored diagnostic trouble codes; determine necessary action. P-1
7. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action. P-2
8. Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM installed accessories, or similar systems); determine necessary action. P-3

ENGINE PERFORMANCE

Ignition System Diagnosis and Repair

1. Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action. P-2
2. Inspect and test crankshaft and camshaft position sensor(s); perform necessary action. P-1
3. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary. P-3
4. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-1

ENGINE PERFORMANCE

Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair

1. Diagnose (troubleshoot) hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine necessary action. P-2
2. Check fuel for contaminants; determine necessary action. P-2
3. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action. P-1
4. Replace fuel filter(s). P-1
5. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1
6. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air. P-2
7. Inspect and test fuel injectors. P-2
8. Verify idle control operation. P-1
9. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform necessary action. P-1
10. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed. P-1
11. Perform exhaust system back-pressure test; determine necessary action. P-2
12. Check and refill diesel exhaust fluid (DEF). P-3

ENGINE PERFORMANCE

Emissions Control Systems Diagnosis and Repair

1. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action. P-3
2. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. P-2

3. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action.	P-3
4. Diagnose emissions and driveability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action.	P-2
5. Diagnose emissions and driveability concerns caused by the evaporative emissions control system; determine necessary action.	P-2
6. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.	P-2
7. Inspect, test, service, and replace components of the EGR system including tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary action.	P-2
8. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.	P-3
9. Inspect and test catalytic converter efficiency.	P-2
10. Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.	P-1
11. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.	P-3

REQUIRED SUPPLEMENTAL TASKS

Shop and Personal Safety

1. Identify general shop safety rules and procedures.

2. Utilize safe procedures for handling of tools and equipment.

3. Identify and use proper placement of floor jacks and jack stands.

4. Identify and use proper procedures for safe lift operation.

5. Utilize proper ventilation procedures for working within the lab/shop area.

6. Identify marked safety areas.

7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.

8. Identify the location and use of eye wash stations.

9. Identify the location of the posted evacuation routes.

10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.

11. Identify and wear appropriate clothing for lab/shop activities.

12. Secure hair and jewelry for lab/shop activities.

13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems , and hybrid vehicle high voltage circuits.

14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).

15. Locate and demonstrate knowledge of material safety data sheets (MSDS).

Tools and Equipment

1. Identify tools and their usage in automotive applications.

2. Identify standard and metric designation.

3. Demonstrate safe handling and use of appropriate tools.

4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.

5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

Preparing Vehicle for Service

1. Identify information needed and the service requested on a repair order.

2. Identify purpose and demonstrate proper use of fender covers, mats.

3. Demonstrate use of the three C's (concern, cause, and correction).

4. Review vehicle service history.

5. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

Preparing Vehicle for Customer

1. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

ASE STUDENT CERTIFICATION
TEST SPECIFICATIONS AND TASK LISTS

AUTOMOBILE – 2008 NATEF STANDARDS

The ASE Student Certification test series for the 2008 NATEF Automobile Program Standards is comprised of eight examinations covering light vehicle diagnosis and repair. Listed below are the test specifications and task lists for each of these eight exams.

The task lists are simply lists of the tasks involved in the process of diagnosing and repairing problems in the various vehicle systems. The tasks may also be thought of as competencies. Each question found in the tests is keyed to one of these tasks. The tasks are organized into content categories, and these content categories, along with the number of questions included in each category, comprise the test specifications. Every form of the exams will be built to meet these specifications.

Students preparing for the ASE Student Certification tests should review the tasks (competencies) listed, and note areas where further preparation may be needed. It also helps students to note how many questions will be included on the exams in each content area.

Technical Areas

Click an area to navigate directly.

ENGINE REPAIR

Content Area	Questions In Test
A. General Engine Diagnosis; Removal and Reinstallation (R&R)	9
B. Cylinder Head and Valve Train Diagnosis and Repair	12
C. Engine Block Assembly Diagnosis and Repair	6
D. Lubrication and Cooling Systems Diagnosis and Repair	9
E. General Knowledge	4
Required To Pass: 22 of 40 TOTAL	40

A. General Engine Diagnosis; Removal and Reinstallation (R & R)

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

2. Identify and interpret engine concern; determine necessary action.

3. Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins.

4. Locate and interpret vehicle and major component identification numbers.

5. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.

6. Diagnose engine noises and vibrations; determine necessary action.

7. Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.

8. Perform engine vacuum tests; determine necessary action.

9. Perform cylinder power balance tests; determine necessary action.

10. Perform cylinder cranking and running compression tests; determine necessary action.

11. Perform cylinder leakage tests; determine necessary action.

12. Remove and reinstall engine in an OBDII or newer vehicle; reconnect all attaching components and restore the vehicle to running condition.

13. Install engine covers using gaskets, seals and sealers as required.

14. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.

15. Inspect, remove and replace engine mounts.

B. Cylinder Head and Valve Train Diagnosis and Repair

1. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specifications and procedures.

2. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.

3. Inspect valve springs for squareness and free height comparison; determine necessary action.

4. Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine necessary action.

5. Inspect valve guides for wear; check valve stem-to-guide clearance; determine necessary action.

6. Inspect valves and valve seats; determine necessary action.

7. Check valve spring assembled height and valve stem height; determine necessary action.

8. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action.

9. Inspect valve lifters; determine necessary action.

10. Adjust valves (mechanical or hydraulic lifters).

11. Inspect and replace camshaft and drive belt/chain (includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and variable valve timing components).

12. Inspect and/or measure camshaft for runout, journal wear and lobe wear.

13. Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine necessary action.

14. Establish camshaft position sensor indexing.

C. Engine Block Assembly Diagnosis and Repair

1. Disassemble engine block; clean and prepare components for inspection and reassembly.

2. Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine necessary action.

3. Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine necessary action.

4. Deglaze and clean cylinder walls.

5. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action.

6. Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine necessary action.

7. Inspect main and connecting rod bearings for damage and wear; determine necessary action.

8. Identify piston and bearing wear patterns that indicate connecting rod alignment and main

bearing bore problems; determine necessary action.

9. Inspect and measure piston skirts and ring lands; determine necessary action.

10. Remove and replace piston pin.

11. Determine piston-to-bore clearance.

12. Inspect, measure, and install piston rings.

13. Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance or silencer); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time.

14. Remove, inspect or replace crankshaft vibration damper (harmonic balancer).

15. Assemble engine block.

D. Lubrication and Cooling Systems Diagnosis and Repair

1. Perform oil pressure tests; determine necessary action.

2. Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform necessary action.

3. Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; determine necessary action.

4. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.

5. Inspect and replace engine cooling and heater system hoses.

6. Inspect, test, and replace thermostat and gasket/seal.

7. Test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.

8. Inspect, remove and replace water pump.

9. Remove and replace radiator.

10. Inspect, and test fans(s) (electrical or mechanical), fan clutch, fan shroud, and air dams.

11. Inspect auxiliary coolers; determine necessary action.

12. Inspect, test, and replace oil temperature and pressure switches and sensors.

13. Perform oil and filter change.

14. Identify causes of engine overheating.

AUTOMATIC TRANSMISSION AND TRANSAXLE

Content Area	Questions In Test
A. General Transmission and Transaxle Diagnosis	18
B. In-Vehicle Transmission and Transaxle Repair	10
C. Off-Vehicle Transmission and Transaxle Repair	8
D. General Knowledge	4
Required To Pass: 22 of 40 TOTAL	40

A. General Transmission and Transaxle Diagnosis

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

2. Identify and interpret transmission/transaxle concern; differentiate between engine performance and transmission/transaxle concerns; determine necessary action.

3. Research applicable vehicle and service information, such as transmission/transaxle system operation, fluid type, vehicle service history, service precautions, and technical service bulletins.

4. Locate and interpret vehicle and major component identification numbers.

5. Diagnose fluid loss and condition concerns; check fluid level in transmissions with and without dip-stick; determine necessary action.

6. Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine necessary action.

7. Perform stall test; determine necessary action.

8. Perform lock-up converter system tests; determine necessary action.

9. Diagnose noise and vibration concerns; determine necessary action.

10. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.

12. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).

13. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.

B. In-Vehicle Transmission/Transaxle Maintenance and Repair

1. Inspect, adjust, and replace manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.

2. Inspect and replace external seals gaskets, and bushings.

3. Inspect, test, adjust, repair, or replace electrical/electronic components and circuits, including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses.

4. Diagnose electronic transmission control systems using a scan tool; determine necessary action.

5. Inspect, replace, and align powertrain mounts.

6. Service transmission; perform visual inspection; replace fluid and filters.

C. Off-Vehicle Transmission and Transaxle Repair

1. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces.

2. Disassemble, clean, and inspect transmission/transaxle.

3. Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, sleeves, retainers, brackets, checkvalves/balls, screens, spacers, and gaskets).

4. Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine necessary action.

5. Assemble transmission/transaxle.

6. Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings.

7. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.

8. Install and seat torque converter to engage drive/splines.

9. Inspect, measure, and reseal oil pump assembly and components.

10. Measure transmission/transaxle end play or preload; determine necessary action.

11. Inspect, measure, and replace thrust washers and bearings.

12. Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.

13. Inspect bushings; determine necessary action.

14. Inspect and measure planetary gear assembly components; determine necessary action.

15. Inspect case bores, passages, bushings, vents, and mating surfaces; determine necessary action.

16. Inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform necessary action.

17. Inspect, measure, repair, adjust or replace transaxle final drive components.

18. Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plates; determine necessary action.

19. Measure clutch pack clearance; determine necessary action.

20. Air test operation of clutch and servo assemblies.

21. Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, and retainers;

determine necessary action.

22. Inspect bands and drums; determine necessary action.

23. Describe the operational characteristics of a continuously variable transmission (CVT)

24. Describe the operational characteristics of a hybrid vehicle drive train.

MANUAL DRIVE TRAIN AND AXLES

Content Area	Questions In Test
A. General Drive Train Diagnosis	5
B. Clutch Diagnosis and Repair	5
C. Transmission/Transaxle Diagnosis and Repair	7
D. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair	5
E. Drive Axle Diagnosis and Repair	6
F. Four-Wheel Drive/All-Wheel Drive Component Diagnosis And Repair	7
G. General	5
Required To Pass: 21 of 40 TOTAL	40

A. General Drive Train Diagnosis

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

2. Identify and interpret drive train concern; determine necessary action.

3. Research applicable vehicle and service information, such as drive train system operation, fluid type, vehicle service history, service precautions, and technical service bulletins.

4. Locate and interpret vehicle and major component identification numbers.

5. Diagnose fluid loss, level, and condition concerns; determine necessary action.
6. Drain and fill manual transmission/transaxle and final drive unit.

B. Clutch Diagnosis and Repair

1. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action.

2. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action.

3. Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.

4. Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable).

5. Bleed clutch hydraulic system.

6. Inspect flywheel and ring gear for wear and cracks; determine necessary action.

7. Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action.

8. Measure flywheel runout and crankshaft end play; determine necessary action.

C. Transmission/Transaxle Diagnosis and Repair

1. Remove and reinstall transmission/transaxle.

2. Disassemble, clean, and reassemble transmission/transaxle components.

3. Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.

4. Diagnose noise concerns using transmission/transaxle powerflow principles.

5. Diagnose hard shifting and jumping out of gear concerns; determine necessary action.

6. Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers.

7. Inspect, replace, and align powertrain mounts.

8. Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.

9. Remove and replace transaxle final drive.

10. Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.

11. Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.

12. Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.

13. Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action.

14. Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly.

15. Inspect lubrication devices (oil pump or slingers); perform necessary action.

16. Inspect, test, and replace transmission/transaxle sensors and switches.

17. Describe the operational characteristics of an electronically controlled manual transmission/transaxle.

D. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair

1. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action.

2. Diagnose universal joint noise and vibration concerns; perform necessary action.

3. Remove and replace front wheel drive (FWD) front wheel bearing.
4. Inspect, service, and replace shafts, yokes, boots, and CV joints.

5. Inspect, service, and replace shaft center support bearings.

6. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.

E. Drive Axle Diagnosis and Repair

1. Ring and Pinion Gears and Differential Case Assembly

1. Diagnose noise and vibration concerns; determine necessary action.
2. Diagnose fluid leakage concerns; determine necessary action.
3. Inspect and replace companion flange and pinion seal; measure companion flange runout.
4. Inspect ring gear and measure runout; determine necessary action.
5. Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings.
6. Measure and adjust drive pinion depth.
7. Measure and adjust drive pinion bearing preload.
8. Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).
9. Check ring and pinion tooth contact patterns; perform necessary action.
10. Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.
11. Reassemble and reinstall differential case assembly; measure runout; determine necessary action.

2. Limited Slip Differential

1. Diagnose noise, slippage, and chatter concerns; determine necessary action.
2. Clean and inspect differential housing; refill with correct lubricant and/or additive.
3. Inspect and reinstall limited slip differential components.
4. Measure rotating torque; determine necessary action.

3. Drive Axle Shaft

1. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action.
2. Inspect and replace drive axle shaft wheel studs.
3. Remove and replace drive axle shafts.
4. Inspect and replace drive axle shaft seals, bearings, and retainers.
5. Measure drive axle flange runout and shaft end play; determine necessary action.

F. Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair

1. Diagnose noise, vibration, and unusual steering concerns; determine necessary action.

2. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.

3. Remove and reinstall transfer case.

4. Disassemble, service, and reassemble transfer case and components.

5. Inspect front-wheel bearings and locking hubs; perform necessary action.

6. Check drive assembly seals and vents; check lube level.

7. Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems.

8. Identify concerns related to variations in tire circumference and/or final drive ratios.

SUSPENSION AND STEERING

Content Area	Questions In Test
A. General Steering Systems Diagnosis and Repair	11
B. Suspension Systems Diagnosis and Repair	11
C. Wheel Alignment Diagnosis, Adjustment, and Repair	12
D. Wheel and Tire Diagnosis and Repair	6
Required To Pass: 20 of 40 TOTAL	40

A. General Steering Systems Diagnosis and Repair

1. Disable and enable supplemental restraint system (SRS).

2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).

3. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action.

4. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action.

5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action.

6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action.

7. Adjust non-rack and pinion worm bearing preload and sector lash.

8. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.

9. Inspect and replace rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.

10. Determine proper power steering fluid type; inspect fluid level and condition.

11. Flush, fill, and bleed power steering system.

12. Diagnose power steering fluid leakage; determine necessary action.

13. Remove, inspect, replace, and adjust power steering pump belt.

14. Remove and reinstall power steering pump.

15. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.

16. Inspect and replace power steering hoses and fittings.

17. Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.

18. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.

19. Test and diagnose components of electronically controlled steering systems using a scan tool; determine necessary action.

20. Inspect and test electric power assist steering.

21. Identify hybrid vehicle power steering system electrical circuits, service and safety precautions.

B. Suspension Systems Diagnosis and Repair

1. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action.

2. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action.

3. Remove, inspect, and install upper and lower control arms, bushings, shafts, and rebound bumpers.

4. Remove, inspect and install strut rods and bushings.

5. Remove, inspect, and install upper and/or lower ball joints.

6. Remove, inspect, and install steering knuckle assemblies.

7. Remove, inspect, and install short and long arm suspension system coil springs and spring insulators.

8. Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts.

9. Remove, inspect, and install stabilizer bar bushings, brackets, and links.

10. Remove, inspect, and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.

11. Remove, inspect, and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.

12. Inspect, remove, and replace shock absorbers.

13 Remove, inspect, and service or replace front and rear wheel bearings.

14. Test and diagnose components of electronically controlled suspension systems using a scan tool; determine necessary action.

15. Diagnose, inspect, adjust, repair or replace components of electronically controlled steering systems (including sensors, switches, and actuators); initialize system as required.

16. Describe the function of the idle speed compensation switch.

17. Lubricate suspension and steering systems.

C. Wheel Alignment Diagnosis, Adjustment, and Repair

1. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action.

2. Perform prealignment inspection and measure vehicle ride height; perform necessary action.

3. Prepare vehicle for wheel alignment on the alignment machine; perform four wheel alignment by checking and adjusting front and rear wheel caster, camber; and toe as required; center steering wheel.

4. Check toe-out-on-turns (turning radius); determine necessary action.

5. Check SAI (steering axis inclination) and included angle; determine necessary action.

6. Check rear wheel thrust angle; determine necessary action.

7. Check for front wheel setback; determine necessary action.

8. Check front and/or rear cradle (subframe) alignment; determine necessary action.

D. Wheel and Tire Diagnosis and Repair

1. Inspect tire condition; identify tire wear patterns; check and adjust air pressure; determine necessary action.

2. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.

3. Rotate tires according to manufacturer's recommendations.

4. Measure wheel, tire, axle flange, and hub runout; determine necessary action.

5. Diagnose tire pull problems; determine necessary action.

6. Dismount, inspect, and remount tire on wheel; Balance wheel and tire assembly (static and dynamic).

7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.

8. Reinstall wheel; torque lug nuts.

9. Inspect tire and wheel assembly for air loss; perform necessary action.

10. Repair tire using internal patch.

11. Inspect, diagnose, and calibrate tire pressure monitoring system.

BRAKES

Content Area	Questions In Test
A. Hydraulic System Diagnosis and Repair	9
B. Drum Brake Diagnosis and Repair	6
C. Disc Brake Diagnosis and Repair	9
D. Power Assist Units Diagnosis and Repair	3
E. Miscellaneous (Wheel Bearing, Parking Brakes, Electrical, Etc.)	4
F. Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair	9
Required To Pass: 21 of 40 TOTAL	40

A. Hydraulic System Diagnosis and Repair

1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).

2. Measure brake pedal height, travel, and free play (as applicable); determine necessary action.

3. Check master cylinder for internal/external leaks and proper operation; determine necessary action.

4. Remove, bench bleed, and reinstall master cylinder.

5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action.

6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action.

7. Replace brake lines, hoses, fittings, and supports.

8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).

9. Select, handle, store, and fill brake fluids to proper level.

10. Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.

11. Inspect, test, and/or replace components of brake warning light system.

12. Bleed and/or flush brake system.

13. Test brake fluid for contamination.

B. Drum Brake Diagnosis and Repair

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.

2. Remove, clean, inspect, and measure brake drums; determine necessary action.

3. Refinish brake drum; measure final drum diameter.

4. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.

5. Inspect and install wheel cylinders.

6. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings.

7. Install wheel, torque lug nuts, and make final checks and adjustments.

C. Disc Brake Diagnosis and Repair

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine necessary action.

2. Remove caliper assembly; inspect for leaks and damage to caliper housing; determine necessary action.

3. Clean and inspect caliper mounting and slides/pins for operation, wear, and damage; determine necessary action.

4. Remove, inspect and replace pads and retaining hardware; determine necessary action.

5. Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.

6. Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks.

7. Clean, inspect, and measure rotor thickness, lateral runout, and thickness variation; determine necessary action

8. Remove and reinstall rotor.

9. Refinish rotor on vehicle; measure final rotor thickness.

10. Refinish rotor off vehicle; measure final rotor thickness.

11. Retract caliper piston on an integrated parking brake system.

12. Install wheel, torque lug nuts, and make final checks and adjustments.

13. Check brake pad wear indicator system operation; determine necessary action.

D. Power Assist Units Diagnosis and Repair

1. Test pedal free travel; check power assist operation.

2. Check vacuum supply to vacuum-type power booster.

3. Inspect the vacuum-type power booster unit for leaks; inspect the check valve for proper operation; determine necessary action.

4. Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action.

5. Measure and adjust master cylinder pushrod length.

E. Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair

1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action.

2. Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings.

3. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed.

4. Check parking brake and indicator light system operation; determine necessary action.

5. Check operation of brake stop light system; determine necessary action.

6. Replace wheel bearing and race.
7. Inspect and replace wheel studs.

8. Remove and reinstall sealed wheel bearing assembly.

F. Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair

1. Identify and inspect electronic brake control system components; determine necessary action.

2. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system ; determine necessary action.

3. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action.

4. Depressurize high-pressure components of the electronic brake control system.

5. Bleed the electronic brake control system hydraulic circuits.

6. Remove and install electronic brake control system electrical/electronic and hydraulic components.

7. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).

8. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).

9. Identify traction control/vehicle stability control system components.

10. Describe the operation of a regenerative braking system.

ELECTRICAL/ELECTRONIC SYSTEMS

Content Area	Questions In Test
A. General Electrical System Diagnosis	10
B. Battery Diagnosis and Repair	5
C. Starting System Diagnosis and Repair	5
D. Charging System Diagnosis and Repair	5
E. Lighting System Diagnosis and Repair	5
F. Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair	3
G. Horn and Wiper/Washer Diagnosis and Repair	3
H. Accessories Diagnosis and Repair	4
Required To Pass: 20 of 40 TOTAL	40

A. General Electrical System Diagnosis

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

2. Identify and interpret electrical/electronic system concern; determine necessary action.

3. Research applicable vehicle and service information, such as electrical/electronic system operation, vehicle service history, service precautions, and technical service bulletins.

4. Locate and interpret vehicle and major component identification numbers.

5. Diagnose electrical/electronic integrity of series, parallel and series-parallel circuits using principles of electricity (Ohm's Law).

6. Use wiring diagrams during diagnosis of electrical circuit problems.

7. Demonstrate the proper use of a digital multimeter (DMM) during diagnosis of electrical circuit problems, including: source voltage, voltage drop, current flow, and resistance.

8. Check electrical circuits with a test light; determine necessary action.

9. Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.

10. Check electrical circuits using fused jumper wires; determine necessary action.

11. Locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.

12. Measure and diagnose the cause(s) of excessive parasitic draw; determine necessary action.

13. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.

14. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; perform necessary action.

15. Remove and replace terminal end from connector; replace connectors and terminal ends.

16. Repair wiring harness (including CAN/BUS systems).

17. Perform solder repair of electrical wiring.

18. Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures

B. Battery Diagnosis and Service

1. Perform battery state-of-charge test; determine necessary action.
2. Perform battery capacity test; confirm proper battery capacity for vehicle application; determine necessary action.
3. Maintain or restore electronic memory functions.
4. Inspect, clean, fill, and/or replace battery, battery cables, connectors, clamps, and hold-downs.
5. Perform battery charge.
6. Start a vehicle using jumper cables or an auxiliary power supply.
7. Identify high voltage circuits of electric or hybrid electric vehicle and related safety precautions.
8. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry following battery disconnect.
9. Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures.

C. Starting System Diagnosis and Repair

1. Perform starter current draw tests; determine necessary action.
2. Perform starter circuit voltage drop tests; determine necessary action.
3. Inspect and test starter relays and solenoids; determine necessary action.
4. Remove and install starter in a vehicle.
5. Inspect and test switches, connectors, and wires of starter control circuits; perform necessary action.
6. Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition.

D. Charging System Diagnosis and Repair

1. Perform charging system output test; determine necessary action.
2. Diagnose charging system for the cause of undercharge, no-charge, and overcharge conditions.
3. Inspect, adjust, or replace generator (alternator) drive belts, pulleys, and tensioners; check pulley and belt alignment.
4. Remove, inspect, and install generator (alternator).
5. Perform charging circuit voltage drop tests; determine necessary action.

E. Lighting Systems Diagnosis and Repair

1. Diagnose the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action.

2. Inspect, replace, and aim headlights and bulbs.

3. Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.

4. Identify system voltage and safety precautions associated with high intensity discharge headlights.

F. Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair

1. Inspect and test gauges and gauge sending units for cause of abnormal gauge readings; determine necessary action.

2. Inspect and test connectors, wires, and printed circuit boards of gauge circuits; determine necessary action.

3. Diagnose the cause of incorrect operation of warning devices and other driver information systems; determine necessary action.

4. Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.

G. Horn and Wiper/Washer Diagnosis and Repair

1. Diagnose incorrect horn operation; perform necessary action.

2. Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.

3. Diagnose incorrect washer operation; perform necessary action.

H. Accessories Diagnosis and Repair

1. Diagnose incorrect operation of motor-driven accessory circuits; determine necessary action.

2. Diagnose incorrect heated glass, mirror, or seat operation; determine necessary action.

3. Diagnose incorrect electric lock operation (including remote keyless entry); determine necessary action.

4. Diagnose incorrect operation of cruise control systems; determine necessary action.

5. Diagnose supplemental restraint system (SRS) concerns; determine necessary action.

6. Disarm and enable the airbag system for vehicle service.

7. Diagnose radio static and weak, intermittent, or no radio reception; determine necessary action.

8. Remove and reinstall door panel.

9. Diagnose body electronic system circuits using a scan tool; determine necessary action.

10. Check for module communication (including CAN/BUS systems) errors using a scan tool.

11. Diagnose the cause of false, intermittent, or no operation of anti-theft systems.

12. Describe the operation of keyless entry/remote-start systems.

13. Perform software transfers, software updates, or flash reprogramming on electronic modules.

HEATING AND AIR CONDITIONING

Content Area	Questions In Test
A. A/C System Diagnosis and Repair	8
B. Refrigeration System Component Diagnosis and Repair	8
C. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair	4
D. Operating Systems and Related Controls Diagnosis and Repair	12
E. Refrigerant Recovery, Recycling, and Handling	4
F. General Knowledge	4
Required To Pass: 20 of 40 TOTAL	40

A. A/C System Diagnosis and Repair

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

2. Identify and interpret heating and air conditioning concern; determine necessary action.

3. Research applicable vehicle and service information, such as heating and air conditioning system operation, vehicle service history, service precautions, and technical service bulletins.

4. Locate and interpret vehicle and major component identification numbers.

5. Performance test A/C system; identify A/C system malfunctions.

6. Identify abnormal operating noises in the A/C system; determine necessary action.

7. Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.

8. Leak test A/C system; determine necessary action.

9. Inspect the condition of refrigerant oil removed from the system; determine necessary action.

10. Determine recommended oil and oil capacity for system application.

11. Using scan tool, observe and record related HVAC data and trouble codes.

B. Refrigeration System Component Diagnosis and Repair

1. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action.

2. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.

3. Inspect, test, and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap and adjust as needed..

4. Remove, inspect, and reinstall A/C compressor and mountings; determine required oil quantity.

5. Identify hybrid vehicle A/C system electrical circuits, service and safety precautions.

6. Determine the need for an additional A/C system filter; perform necessary action.

7. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action.

8. Inspect A/C condenser for airflow restrictions; perform necessary action.

9. Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine required oil quantity.

10. Remove, inspect, and install expansion valve or orifice (expansion) tube.

11. Inspect evaporator housing water drain; perform necessary action.

12. Remove, inspect, and reinstall evaporator; determine required oil quantity.

13. Remove, inspect, and reinstall condenser; determine required oil quantity.

C. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

1. Diagnose temperature control problems in the heater/ventilation system; determine necessary action.
2. Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action.

3. Inspect engine cooling and heater system hoses and belts; perform necessary action.

4. Inspect, test, and replace thermostat and gasket/seal.

5. Determine coolant condition and coolant type for vehicle application; drain and recover coolant.

6. Flush system; refill system with recommended coolant; bleed system.

7. Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.

8. Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.

9. Inspect and test heater control valve(s); perform necessary action.

10. Remove, inspect, and reinstall heater core.

D. Operating Systems and Related Controls Diagnosis and Repair

1. Diagnose malfunctions in the electrical controls of heating, ventilation, and A/C (HVAC) systems; determine necessary action.

2. Inspect and test A/C-heater blower, motors, resistors, switches, relays, wiring, and protection devices; perform necessary action.

3. Test and diagnose A/C compressor clutch control systems; determine necessary action.

4. Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action.

5. Inspect and test A/C-heater control panel assembly; determine necessary action.

6. Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action.

7. Inspect A/C-heater ducts, doors, hoses, cabin filters and outlets; perform necessary action.

8. Identify the source of A/C system odors.

9. Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.

E. Refrigerant Recovery, Recycling, and Handling

1. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.

2. Identify and recover A/C system refrigerant.

3. Recycle, label, and store refrigerant.

4. Evacuate and charge A/C system; add refrigerant oil as required.

ENGINE PERFORMANCE

Content Area	Questions In Test
A. General Engine Diagnosis	8
B. Computerized Engine Controls Diagnosis and Repair	10
C. Ignition System Diagnosis and Repair	6
D. Fuel, Air Induction, and Exhaust System Diagnosis and Repair	6
E. Emissions Control Systems Diagnosis and Repair	5
F. Engine Related Service	5
Required To Pass: 21 of 40 TOTAL	40

A. General Engine Diagnosis

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

2. Identify and interpret engine performance concern; determine necessary action.

3. Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins.

4. Locate and interpret vehicle and major component identification numbers.

5. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.

6. Diagnose abnormal engine noise or vibration concerns; determine necessary action.

7. Diagnose abnormal exhaust color, odor, and sound; determine necessary action.

8. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.

9. Perform cylinder power balance test; determine necessary action.

10. Perform cylinder cranking and running compression tests; determine necessary action.

11. Perform cylinder leakage test; determine necessary action.

12. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action.

13. Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings, and determine necessary action.

14. Verify engine operating temperature; determine necessary action.

15. Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.

16. Verify correct camshaft timing.

B. Computerized Engine Controls Diagnosis and Repair

1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.

2. Diagnose the causes of emissions or driveability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data.

3. Diagnose emissions or driveability concerns without stored diagnostic trouble codes; determine necessary action.

4. Check for module communication (including CAN/BUS systems) errors using a scan tool.

5. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action.

6. Access and use service information to perform step-by-step diagnosis.

7. Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, or similar systems); determine necessary action.

8. Perform active tests of actuators using a scan tool; determine necessary action.

9. Describe the importance of running all OBDII monitors for repair verification.

C. Ignition System Diagnosis and Repair

1. Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action.

2. Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.

3. Inspect and test crankshaft and camshaft position sensor(s); perform necessary action.

4. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary.

D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair

1. Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine necessary action.

2. Check fuel for contaminants and quality; determine necessary action.

3. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.

4. Replace fuel filters.

5. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.

6. Inspect and test fuel injectors.

7. Verify idle control operation.

8. Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action.

9. Perform exhaust system back-pressure test; determine necessary action.

10. Test the operation of turbocharger/supercharger systems; determine necessary action

E. Emissions Control Systems Diagnosis and Repair

1. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action.

2. Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.

3. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action.

4. Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action.

5. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.

6. Diagnose emissions and driveability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action.

7. Inspect and test mechanical components of secondary air injection systems; perform necessary action.

8. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.

9. Inspect and test catalytic converter efficiency.

10. Diagnose emissions and driveability concerns caused by the evaporative emissions control system; determine necessary action.

11. Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.

12. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.

F. Engine Related Service

1. Adjust valves on engines with mechanical or hydraulic lifters.

2. Remove and replace timing belt; verify correct camshaft timing.

3. Remove and replace thermostat and gasket/seal.

4. Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.

5. Perform common fastener and thread repairs, to include: remove broken bolt, restore internal and external threads, and repair internal threads with a threaded insert.

6. Perform engine oil and filter change.

7. Identify hybrid vehicle internal combustion engine service precautions.

GUIDE

FOR INTERPRETING RESULTS
and
TECHNICAL DATA

for the

NATIONAL AUTOMOTIVE STUDENT SKILLS STANDARDS ASSESSMENT

2012

Prepared by

NATIONAL INSTITUTE FOR
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PREFACE

This guide contains information on interpreting your students' results on the National Automotive Student Skills Standard Assessment (NA3SA). Also, it includes documentation of the technical adequacy of the assessment program for its intended purposes.

The Automotive Youth Educational Systems (AYES), the National Automotive Technicians Education Foundation (NATEF), and SkillsUSA jointly offer the NA3SA assessment. These tests, developed by the National Institute for Automotive Service Excellence (ASE), are appropriate for evaluating students who are near the end of their studies in the areas of Automobile Service and Repair, Collision Repair and Refinish, and Medium/Heavy Duty Truck.

NATEF administers the industry's accreditation program for career-entry Automobile, Collision Repair and Refinish, and Medium/Heavy Duty Truck Training Programs. The standards for becoming a NATEF accredited program include specifications covering the content of instruction, tools and equipment, hours, and instructor qualifications. Concurrently, the National Institute for Automotive Service Excellence (ASE) conducts periodic analyses of the tasks and knowledges required to successfully perform many of the vehicle service jobs in the automotive industry. NATEF policy stipulates that the task lists developed by ASE are to serve as the basis for the NATEF task lists. In this way, the content of the NATEF exams are kept current, consistent with ASE, and linked to the specific tasks and knowledges requisite to the successful performance of the various automotive service occupations.

The examinations are intended for students completing two-year secondary or post-secondary automotive technician training programs.

Questions pertaining to this program should be directed to NA3SA, c/o NATEF at 101 Blue Seal Drive, SE, Suite 101, Leesburg, VA 20175. Phone 800-362-0544. Or, go to www.na3sa.com for more information.

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NATIONAL AUTOMOTIVE STUDENT SKILLS STANDARDS ASSESSMENT

Description of the Battery

The NA3SA assessment consists of three series of secure multiple-choice examinations: Automobile Service and Repair, Collision Repair and Refinish, and Medium/Heavy Truck.

Automobile

- Suspension and Steering
- Brakes
- Electrical/Electronic Systems
- Engine Performance
- Engine Repair
- Automatic Transmission/Transaxle
- Manual Drive Train and Axles
- Heating and Air Conditioning

Collision Repair And Refinish

- Painting and Refinishing
- Structural Analysis and Damage Repair
- Non-structural Analysis and Damage Repair
- Mechanical and Electrical Components

M/H Truck

- Diesel Engines
- Electrical/Electronic Systems
- Brakes
- Suspension and Steerring

Each series is comprised of individual tests that relate to one or more of the technical areas under the NATEF Standards. Students may be assigned a single examination, all examinations, or any combination of them. The examinations emphasize the application of knowledge and theory to tasks actually performed by automotive technicians.

The examinations are currently administered twice annually, in the Fall and in the Spring. Separate student score reports are prepared for each of the examinations. There are 40 scored questions in each examination, but the tests as given will be longer because of the inclusion of nonscored "pretest" questions. Administration time is recommended to be 60 minutes per exam. Each student will be given a pass/fail status on each test attempted. For each test passed, students earn a National Automotive Student Skills Standards Assessment certificate.

Test Development Procedures

Content Specifications

ASE periodically conducts analyses of the work of the automotive technician in the various subject areas. Job Analysis Workshops involving subject matter experts from around the country are convened specifically for this purpose. The task lists contained in the standards for NATEF's accreditation program are tied to ASE's task lists derived from these job analyses. The task lists are then organized into content outlines. These subject areas are then weighted according to judgments of frequency and criticality, and these weights are translated into numbers of questions in each content area. This provides the content specifications for the examinations. As described earlier, the task lists are designed to correspond to the tasks required to successfully perform the various automotive service procedures.

Question Writing

Items (test questions) are written by groups of subject matter experts (SME's) who are selected and trained by the ASE staff. The item writing teams include faculty members of educational institutions as well as experienced, working automotive technicians.

After the SME's draft the items and assign content codes, the items are reviewed by other SME's for accuracy. They are then edited, formatted, and entered into a permanent item bank. SME's then review and approve all the text changes. Newly written items are tried out as nonscored "pretest" items embedded into the test forms. Data collected in this manner are then used to identify any items that may

not function properly so that they can be rewritten or discarded if necessary. All data are banked with the item text in the item banks.

Test Assembly
Subject matter experts begin test assembly by selecting pretested items from the bank for each of the examinations. Items are selected to meet both content and statistical (performance) specifications. Items selected for the examinations are appropriately distributed among the NATEF tasks. Each form of the examination will sample the NATEF tasks, however not all tasks will be tested by each form of the examination. Relevant item statistics include discrimination (item-test correlation) indices that exceed 0.20 and a difficulty level (P-value) within the range of 0.20 to 0.90. Items with unsatisfactory statistics are discarded or rewritten.

Each annual form may contain a combination of pre-tested and new items. Before final scoring, statistical and content analysis is conducted on all items as a final check to detect flaws.

Passing Standards
Passing standards are individually set for each of the examinations. The determination of passing scores for high-stakes examinations like the NA3SA tests must be done systematically and with care. Several methods are possible, but the one chosen as most appropriate is called a contrasting-groups approach. This method is based on actual performance of real students, not judgments of how students are likely to perform. Criterion groups of "should-pass," "borderline," and "should-not pass" students are selected in advance of testing. These selections are made by instructors with detailed knowledge of the level of preparedness of the students. After testing, a passing score is selected that minimizes the false-positive and false-negative classifications in the obtained score distributions of these groups. Passing standards set this way are generally regarded by instructors and administrators as more appropriate and more realistic than test-based judgmental approaches. These same passing standards are then carried forward to future forms of the NA3SA Exams.

INTERPRETING RESULTS

The NA3SA score reports allow comparisons of a school's or student's performance with that of others participating in the program during the same year. Mean scores and pass/fail proportions are calculated for each of the examinations. These are reported at the instructor and school level. State reports comparing all the schools in a state are provided to the designated state level supervisor.

Performance Comparisons

Percentile Rank Tables
Following this narrative are tables of percentile ranks of the national population of examinees who took the current year's test forms in the spring administration. This is useful for comparing your students' performance to the national sample. Instructions for using the table are presented below each table.

Comparing Your Students to Another Group
The statistics reported for each administration are based upon the group taking the examinations in that testing period, and do not include prior year's administrations. Total group statistics are given for comparison purposes.

A critical issue is the extent to which the composition of your examinee group resembles that of any other group to which they are being compared. If population characteristics (e.g. age, amount of prior experience, etc.) account for differences between your students and another group, then the comparison may be of less use to you. You must make a judgment about any other characteristics that may contribute to differences in achievement, then decide how to interpret the comparison.

Comparing Means
Mean scores of groups can be compared if they were tested in the same year. However, the means of small groups can be expected to contain increased sampling error, and so should not be interpreted to accurately represent the performance of any larger population. For example, if only a few students from a school take a particular test, their performance should not be assumed to represent all the students in that school. Also, year-to-year differences between the means of groups, especially small groups, should be interpreted with caution. These statistics will include sampling error, as described above, plus error resulting from any differences in test form difficulty across administrations.

SCORE REPORTS

Who Gets Reports

Reports are prepared for students, instructors, and state supervisors. Student reports include number correct in each of the content areas, the total score, and pass/fail. The instructor report shows a summary of the information contained on that instructor's student score reports. Copies of the student reports are also provided to instructors. State reports summarize the results in terms of mean scores and pass/fail rates from each school in that state and are available to the designated state level supervisor.

Score Reports Retention and Replacement

All recipients, including students, are allowed to keep their score reports. The NA3SA partner organizations do not provide a records-maintenance service, so duplicate or replacement copies of these reports are not normally available. Records are normally maintained in the test delivery system for the current and previous year and can be accessed according to the user's role in the system. Older data are not available.

Automobile Percentile Rank Table – 2012

Number Correct	Engine Repair	Auto Trans & Transxl	Manual Drive Train & Axles	Susp & Steering	Brakes	Elec/Elec Systems	Heat & A/C	Engine Perform	Number Correct
	ER	AT	MD	SS	BR	EE	AC	EP	
0-5	1	1	1	1	1	1	1	1	0-5
6	1	1	1	1	1	1	1	1	**6**
7	1	2	2	1	1	1	2	1	**7**
8	1	3	3	2	1	2	3	2	**8**
9	2	5	6	3	3	3	5	3	**9**
10	3	7	10	5	5	5	7	5	**10**
11	4	9	13	7	8	8	10	7	**11**
12	6	11	17	10	11	10	13	10	**12**
13	8	14	21	14	14	14	17	13	**13**
14	11	17	25	18	19	18	20	17	**14**
15	14	20	29	23	23	22	24	21	**15**
16	17	23	33	28	28	26	27	25	**16**
17	20	26	38	33	33	32	31	30	**17**
18	24	30	42	38	38	37	34	36	**18**
19	28	34	46	44	43	43	37	40	**19**
20	33	38	50	50	49	48	41	46	**20**
21	38	43	54	56	54	54	45	52	**21**
22	42	48	58	62	59	59	49	57	**22**
23	47	53	63	68	64	64	53	63	**23**
24	52	57	66	73	69	68	57	68	**24**
25	57	62	70	78	73	72	62	73	**25**
26	61	66	74	82	77	76	65	77	**26**
27	66	71	77	86	81	80	69	81	**27**
28	70	75	80	89	84	84	73	85	**28**
29	74	81	84	92	88	86	78	88	**29**
30	78	85	87	94	90	89	82	91	**30**
31	82	89	90	96	93	91	86	93	**31**
32	86	92	92	97	95	93	90	95	**32**
33	90	94	94	98	96	95	94	96	**33**
34	92	97	96	99	98	96	96	98	**34**
35	95	98	98	99	99	98	98	99	**35**
36	97	99	99	99	99	99	99	99	**36**
37	99	99	99	99	99	99	99	99	**37**
38-40	99	99	99	99	99	99	99	99	**38-40**

How To Use This Table

A percentile is the percentage of students who scored at or below a given score point. To use the table, find the student's Number Correct score for a given test in the left (or far right) column, and then look over to that test's column to find the percentile equivalent. For example, if a student scored 25 correct on Engine Repair, first find 25 in the left column. Then look to the right under the Engine Repair heading, and you will find 57. Therefore, a score of 25 on the Engine Repair test is at the 57th percentile of the national population of students who took this exam in the Spring of 2012.

Collision Repair and Refinishing Percentile Rank Table – 2012

Number Correct	Struct Anlys & Dmg Rep	Nonstr Anlys & Dmg Rep	Mech & Elect Comp	Paint & Refinish	Number Correct
	SR	NS	ME	PR	
0-5	1	1	1	1	0-5
6	1	1	1	1	**6**
7	1	1	1	1	**7**
8	2	1	1	1	**8**
9	2	2	2	2	**9**
10	3	3	3	3	**10**
11	4	5	4	4	**11**
12	6	6	6	6	**12**
13	8	9	10	8	**13**
14	10	12	14	11	**14**
15	13	15	18	14	**15**
16	16	20	22	18	**16**
17	21	24	27	22	**17**
18	26	29	33	27	**18**
19	31	34	40	33	**19**
20	36	39	47	38	**20**
21	41	45	53	43	**21**
22	48	52	59	50	**22**
23	55	58	64	57	**23**
24	61	63	70	63	**24**
25	68	68	74	69	**25**
26	73	73	78	74	**26**
27	78	78	84	78	**27**
28	81	81	88	83	**28**
29	84	85	92	86	**29**
30	88	89	94	90	**30**
31	91	92	96	92	**31**
32	95	95	97	94	**32**
33	97	97	97	96	**33**
34	99	98	98	98	**34**
35	99	99	99	99	**35**
36	99	99	99	99	**36**
37	99	99	99	99	**37**
38-40	99	99	99	99	**38-40**

How To Use This Table

A percentile is the percentage of students who scored at or below a given score point. To use the table, find the student's Number Correct score for a given test in the left (or far right) column, and then look over to that test's column to find the percentile equivalent. For example, if a student scored 25 correct on Structural Analysis and Damage Repair, first find 25 in the left column. Then look to the right under the Structural Analysis and Damage Repair heading, and you will find 68. Therefore, a score of 25 on the Structural Analysis and Damage Repair test is at the 68th percentile of the national population of students who took this exam in the Spring of 2012.

Meduim / Heavy Truck Percentile Rank Table – 2012

Number Correct	Truck Diesel Engines	Truck Brakes	Truck Susp & Steering	Truck Elect/Elect Systems	Number Correct
	DE	TB	TS	TE	
0-5	1	1	1	1	0-5
6	1	1	1	1	**6**
7	1	1	1	1	**7**
8	1	1	2	1	**8**
9	1	2	2	2	**9**
10	2	4	3	5	**10**
11	3	6	5	7	**11**
12	4	9	6	9	**12**
13	6	13	10	12	**13**
14	10	16	13	15	**14**
15	13	21	17	19	**15**
16	16	27	20	23	**16**
17	19	32	24	28	**17**
18	25	38	29	34	**18**
19	30	42	34	38	**19**
20	37	46	42	44	**20**
21	43	52	48	49	**21**
22	47	57	54	52	**22**
23	53	63	59	58	**23**
24	60	67	62	63	**24**
25	66	71	67	68	**25**
26	71	74	72	72	**26**
27	74	78	77	75	**27**
28	79	81	82	80	**28**
29	83	83	86	82	**29**
30	87	87	89	86	**30**
31	89	90	92	91	**31**
32	93	92	93	92	**32**
33	95	94	95	94	**33**
34	97	96	98	97	**34**
35	98	97	98	98	**35**
36	98	98	99	99	**36**
37	99	99	99	99	**37**
38-40	99	99	99	99	**38-40**

How To Use This Table

A percentile is the percentage of students who scored at or below a given score point. To use the table, find the student's Number Correct score for a given test in the left (or far right) column, and then look over to that test's column to find the percentile equivalent. For example, if a student scored 25 correct on Diesel Engines, first find 25 in the left column. Then look to the right under the Diesel Engines heading, and you will find 66. Therefore, a score of 25 on the Diesel Engines test is at the 66th percentile of the national population of students who took this exam in the Spring of 2012.

TECHNICAL DATA – GLOSSARY OF TERMS

ASE computes both item- and test-level statistics as well as candidate performance statistics separately for each form of each of the examinations. Following this narrative are the data tables for the current forms of the exams. The information below is intended to help interpret the technical data in these tables.

N of Items
This refers to the number of *scored* items (questions) in the test form. However, students may have been administered more questions than this. ASE "pretests" newly written or revised questions by embedding them into test forms as non-scored items. Most often, test forms will contain about 10 non-scored pretest items.

Mean
The mean of a set of scores is commonly referred to as the average. This is the sum of all scores divided by the number of scores.

Variance and Std. Dev. (Standard Deviation)
These statistics convey the spread of a set of scores. The variance is the average of the squared deviations of the scores about the mean. The standard deviation (Std. Dev.) is a more easily interpretable statistic. It can be thought of as the average amount that scores differ from the mean score (although this definition is not precisely correct). When the standard deviation is larger the scores are more spread out. As a rule of thumb, about two-thirds of the scores of a sample are likely to fall within one standard deviation of the mean.

Skew
Distributions of scores are rarely bilaterally symmetrical. If the scores are clustered more to the left with a longer tail to the right, skew is positive. If the tail is longer to the left, skew is negative.

Kurtosis
Compared to the standard normal shape, score distributions may be more peaked (positive kurtosis) or more flat (negative kurtosis). Skew and kurtosis are included in these reports in the interest of completeness, but this information has limited practical value for the instructor in interpreting student scores.

Median
This is the test score above (and below) which 50% of the students scored. In other words, it is the middle score in the group of scores. Because score distributions are rarely perfectly symmetrical, the median will seldom be exactly equal to the Mean.

Alpha (Coefficient Alpha, or Test Reliability)
The measurement of any cognitive characteristic contains some degree of inconsistency or error. For example, an examinee taking parallel forms of the same examination would likely earn somewhat different scores on the two forms. These differences might be due to sources of error originating with the examinee, the testing environment, or the examination itself. Reliability as considered here refers to freedom from random error originating in the test itself.

The reliability coefficients reported for the NA3SA examinations are measures of internal consistency computed by the Coefficient Alpha formula (also known as KR-20 in the dichotomous case such as this). Reliability coefficients range from zero to one, with a value of one indicating perfect reliability. The size of a reliability coefficient is affected by several factors including the degree to which the test items are measuring the same cognitive construct and the number of items in the test. All other things being equal, longer tests generally have higher reliability.

SEM (Standard Error of Measurement)
Error of measurement results from unreliability and refers to random error associated with a test score. Such error may inflate or depress an examinee's score. As measurement error goes up, reliability goes down and the standard error of measurement goes up. The SEM represents the standard deviation of a theoretical distribution of obtained scores scattered about the theoretical true score of the candidate. As such, it is a function of both reliability and the standard deviation of test scores. Standard error of measurement may be thought of as a "margin of error" that can be used to express the degree of confidence in the accuracy of a test score.

Mean Pcnt Corr (Mean Percent Correct, or Item Difficulty)
The item difficulty, defined as the percentage of examinees answering the item correctly, is computed for each item. Items that are either too difficult (20% or lower) or too easy (90% or higher) are flagged and examined by subject matter experts for flaws. The mean item difficulty expressed as mean percent correct (Mean Pcnt Corr) is provided for each test form.

Mean Biserial (Item Discrimination)
This is the mean Biserial correlation between the selection of the correct option and total test scores. Biserial correlation coefficients are used as indices of the discriminating power of the options within the items. The correct option should correlate positively with total score. Any items that fail to discriminate between examinees having high and low ability are subject to content review and may be either (1) eliminated or (2) rewritten and subsequently pilot tested as new items. The mean biserial of the correct options of the items in each test are provided in the statistical tables, indicated by "Mean Biserial."

Validity

Validity refers to the degree to which interpretations of test scores are appropriate. For exams such as these, evidence of the appropriateness of the test content is the central validity argument, and proper test construction methods are the primary assurance that the exams can support the intended interpretations.

The NA3SA End-of Program Examinations are designed and constructed to assess examinees' mastery of the NATEF task lists. The participation of subject matter experts on the item-writing teams and the item and test review processes are designed to ensure conformity of the tests with the approved NATEF task list. Following this, ASE staff select test items that are (1) appropriate to the purpose of the test, (2) suitably balanced over topics and skills, (3) free from irrelevant sources of difficulty, and (4) as a group, comparable with previous test forms in difficulty and other performance characteristics. These, plus other rigorous psychometric procedures for item development and test construction, provide excellent assurance of content appropriateness of the exams. NA3SA examinations are not intended to predict future success on any other test or endeavor.

NA3SA Test Form Statistics - Spring 2012

Test: Suspension and Steering (SS)

N of Items	40
Mean	20.523
Variance	38.497
Std. Dev.	6.205
Skew	0.064
Kurtosis	-0.476
Median	20.000
Alpha	0.780
SEM	2.908
Mean Pcnt Corr	51
Mean Biserial	0.415

Test: Engine Repair (ER)

N of Items	40
Mean	24.042
Variance	52.499
Std. Dev.	7.246
Skew	-0.113
Kurtosis	-0.709
Median	24.000
Alpha	0.852
SEM	2.789
Mean Pcnt Corr	60
Mean Biserial	0.503

Test: Brakes (BR)

N of Items	40
Mean	21.054
Variance	45.633
Std. Dev.	6.755
Skew	0.161
Kurtosis	-0.641
Median	21.000
Alpha	0.820
SEM	2.864
Mean Pcnt Corr	53
Mean Biserial	0.454

Test: Automatic Transmission & Transaxle (AT)

N of Items	40
Mean	22.516
Variance	54.899
Std. Dev.	7.409
Skew	-0.230
Kurtosis	-0.714
Median	23.000
Alpha	0.855
SEM	2.819
Mean Pcnt Corr	56
Mean Biserial	0.505

Test: Electrical/Electronic Systems (EE)

N of Items	40
Mean	21.269
Variance	48.401
Std. Dev.	6.957
Skew	0.181
Kurtosis	-0.511
Median	21.000
Alpha	0.832
SEM	2.852
Mean Pcnt Corr	53
Mean Biserial	0.471

Test: Manual Drive Train & Axles (MD)

N of Items	40
Mean	20.815
Variance	60.605
Std. Dev.	7.785
Skew	0.153
Kurtosis	-0.861
Median	20.000
Alpha	0.870
SEM	2.811
Mean Pcnt Corr	52
Mean Biserial	0.522

Test: Engine Performance (EP)

N of Items	40
Mean	21.305
Variance	44.621
Std. Dev.	6.680
Skew	0.063
Kurtosis	-0.516
Median	21.000
Alpha	0.824
SEM	2.805
Mean Pcnt Corr	53
Mean Biserial	0.471

Test: Heating and Air Conditioning (AC)

N of Items	40
Mean	22.277
Variance	61.050
Std. Dev.	7.813
Skew	-0.143
Kurtosis	-0.973
Median	23.000
Alpha	0.869
SEM	2.827
Mean Pcnt Corr	56
Mean Biserial	0.520

Test: Painting and Refinishing (PR)

N of Items	40
Mean	22.415
Variance	38.362
Std. Dev.	6.194
Skew	-0.027
Kurtosis	-0.425
Median	23.000
Alpha	0.785
SEM	2.872
Mean Pcnt Corr	56
Mean Biserial	0.427

Test: Structural Analysis & Damage Repair (SR)

N of Items	40
Mean	22.624
Variance	39.046
Std. Dev.	6.249
Skew	-0.182
Kurtosis	-0.310
Median	23.000
Alpha	0.791
SEM	2.858
Mean Pcnt Corr	57
Mean Biserial	0.436

Test: Nonstruct. Analysis & Damage Repair (NS)

N of Items	40
Mean	22.269
Variance	40.203
Std. Dev.	6.341
Skew	-0.044
Kurtosis	-0.601
Median	22.000
Alpha	0.799
SEM	2.841
Mean Pcnt Corr	56
Mean Biserial	0.442

Test: Mechanical & Electrical Components (ME)

N of Items	40
Mean	21.302
Variance	35.700
Std. Dev.	5.975
Skew	0.086
Kurtosis	-0.367
Median	21.000
Alpha	0.775
SEM	2.833
Mean Pcnt Corr	53
Mean Biserial	0.422

Test: Diesel Engines (DE)

N of Items	40
Mean	23.035
Variance	40.232
Std. Dev.	6.343
Skew	0.086
Kurtosis	-0.406
Median	23.000
Alpha	0.807
SEM	2.785
Mean Pcnt Corr	58
Mean Biserial	0.456

Test: Truck Electrical/Electronic Systems (TE)

N of Items	40
Mean	22.059
Variance	49.019
Std. Dev.	7.001
Skew	0.052
Kurtosis	-0.644
Median	22.000
Alpha	0.837
SEM	2.824
Mean Pcnt Corr	55
Mean Biserial	0.478

Test: Truck Brakes (TB)

N of Items	40
Mean	21.594
Variance	49.365
Std. Dev.	7.026
Skew	0.258
Kurtosis	-0.654
Median	21.000
Alpha	0.838
SEM	2.830
Mean Pcnt Corr	54
Mean Biserial	0.476

Test: Truck Susp. & Steering (TS)

N of Items	40
Mean	22.237
Variance	42.230
Std. Dev.	6.498
Skew	0.053
Kurtosis	-0.553
Median	22.000
Alpha	0.804
SEM	2.876
Mean Pcnt Corr	56
Mean Biserial	0.442

ASE Student Certification
Instructor Score Report
Academic Year: 2012-2013
Test Window: Fall 2012

Instructor: [redacted]

School Name: Portland Community College

School Address: 12000 SW 49th Ave. Portland, OR 97218

Series Name **AUTOMOBILE**

Student	Suspension and Steering (40 Questions)	Brakes (40 Questions)	Electrical/Electronic Systems (40 Questions)	Engine Performance (40 Questions)	Engine Repair (40 Questions)	Automatic Transmission and Transaxle (40 Questions)	Manual Drive Train and Axles (40 Questions)	Heating and Air Conditioning (40 Questions)
1	72% Pass	65% Pass	75% Pass	75% Pass	80% Pass	75% Pass	80% Pass	58% Pass
2					85% Pass			80% Pass
3		82% Pass		60% Pass		78% Pass		65% Pass
4							75% Pass	
5				88% Pass	90% Pass	85% Pass	85% Pass	70% Pass
6	65% Pass	65% Pass	72% Pass	82% Pass	82% Pass	78% Pass	75% Pass	70% Pass
7	70% Pass	78% Pass	72% Pass					58% Pass
8	55% Pass	62% Pass						
9	78% Pass	78% Pass				72% Pass	65% Pass	
10	70% Pass	90% Pass		85% Pass			78% Pass	
11	82% Pass	80% Pass	90% Pass	92% Pass	95% Pass	85% Pass	90% Pass	82% Pass
12	70% Pass	65% Pass	62% Pass	72% Pass	80% Pass	78% Pass	80% Pass	78% Pass
13	72% Pass	85% Pass				88% Pass		78% Pass
14		75% Pass	88% Pass					65% Pass
15		58% Pass	72% Pass					
16	82% Pass	88% Pass	90% Pass		88% Pass			88% Pass
17						85% Pass		
Avg % Correct	72%	75%	78%	79%	86%	80%	78%	72%
% Examinees Passing	100%	100%	100%	100%	100%	100%	100%	100%

ASE Student Certification
Instructor Score Report
Academic Year: 2012-2013
Test Window: Spring 2013

Instructor: [redacted]
School Name: Portland Community College
School Address: 12000 SW 49th Ave. Portland, OR 97218

Series Name **AUTOMOBILE**

Student	Suspension and Steering (40 Questions)	Brakes (40 Questions)	Electrical/Electronic Systems (40 Questions)	Engine Performance (40 Questions)	Engine Repair (40 Questions)	Automatic Transmission and Transaxle (40 Questions)	Manual Drive Train and Axles (40 Questions)	Heating and Air Conditioning (40 Questions)
1	88% Pass	90% Pass	90% Pass	82% Pass	98% Pass	78% Pass	90% Pass	88% Pass
2	88% Pass	88% Pass	82% Pass	95% Pass	98% Pass	88% Pass	75% Pass	100% Pass
3	65% Pass	68% Pass	58% Pass	55% Pass	72% Pass	62% Pass	58% Pass	80% Pass
4					95% Pass	78% Pass		
5	82% Pass	78% Pass	78% Pass	78% Pass	98% Pass	78% Pass	78% Pass	80% Pass
6	65% Pass	68% Pass	55% Pass	60% Pass	65% Pass	72% Pass	55% Pass	72% Pass
7	75% Pass	75% Pass	90% Pass	82% Pass	98% Pass	85% Pass	82% Pass	78% Pass
8	62% Pass	60% Pass	58% Pass	80% Pass	80% Pass	72% Pass	82% Pass	70% Pass
9	88% Pass	82% Pass	78% Pass	88% Pass	80% Pass	82% Pass	82% Pass	75% Pass
10	75% Pass	90% Pass	80% Pass	95% Pass	88% Pass	78% Pass	82% Pass	80% Pass
11	88% Pass	80% Pass	78% Pass	88% Pass	78% Pass	82% Pass	75% Pass	78% Pass
12	40% Fail				62% Pass	72% Pass	68% Pass	
13	82% Pass	88% Pass	90% Pass	82% Pass	98% Pass		80% Pass	80% Pass
14	88% Pass	88% Pass	78% Pass	95% Pass	90% Pass	88% Pass	75% Pass	92% Pass
Avg % Correct	76%	80%	76%	82%	86%	78%	76%	81%
% Examinees Passing	92%	100%	100%	100%	100%	100%	100%	100%

Print Report

CIP Code	Test Name	Test Type	Test Date	Test Result
470604	A1********	TESTIRCL**	20121206	M
470604	A2********	TESTIRCL**	20121206	M
470604	A3********	TESTIRCL**	20121206	M
470604	A4********	TESTIRCL**	20121206	M
470604	A5********	TESTIRCL**	20121206	M
470604	A6********	TESTIRCL**	20121206	M
470604	A7********	TESTIRCL**	20121206	M
470604	A8********	TESTIRCL**	20121206	M
470604	A1********	TESTIRCL**	20121206	M
470604	A7********	TESTIRCL**	20121206	M
470604	A2********	TESTIRCL**	20121206	M
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470604	A5********	TESTIRCL**	20121206	M
470604	A1********	TESTIRCL**	20130520	M
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470604	A8********	TESTIRCL**	20130520	M

PORTLAND COMMUNITY COLLEGE
Auto Service Technology

Student Name:	Class:	Date:

Year:	Make:	Model:	Mileage:
VIN#:	License:	Mfg. Date:	Invoice#:

Coupe ☐ Hatch ☐ Sedan ☐ Wagon ☐ X-Cab ☐ KingCab ☐ ½ ☐ ¾ ☐ 1Ton ☐
PS ☐ AC ☐ ABS ☐ SRS ☐ 2WD ☐ 4WD ☐ AWD ☐

Customer Concern:

Parts:	QNTY	COST

Additional Recommendations:

Reason for choosing service information source:

Cause & Correction:	*TIME*

LABOR HRS TOTAL 0.00 LABOR TOTAL @ $90 PER HR 0.00

Service Information Resources Used: PARTS TOTAL 0.00

☐ Mitchell ☐ Alldata ☐ Other TOTAL 0.00

Save Copy of Repair Order

Portland Community College
Automotive Service Technology
Vehicle Inspection Report
Student Name_____

Year _____ Make _____ Model _____ License _____

VIN _____ Mileage _____ Production Date _____

1	2	3	COURTESY INSPECTION	1	2	3	COMPLETE INSPECTION	
			Test Drive Checks				***Under Car Checks***	
			Bulb Check/Warning Lamps				Steering Linkage/Gear	
			Headlamps				Outer Tie Rod Ends	
			Turn Lamps				Inner Tie Rod Ends	
			Brake Lamps				Left Ball Joint/s	
			Other Lamps				Right Ball Joint/s	
			Wiper Blades				Front Sway Bar Bushings	
			Under Hood Checks				Rear Sway Bar bushings	
			Engine Oil				Front Control Arm Bushings	
			Transmission Oil				Rear Control Arm Bushings	
			Power Steering Fluid				Left Axle Boots/Shaft	
			Brake Fluid				Right Axle Boots/Shaft	
			Engine Coolant °F				***Brake Checks***	**Specs/Actual**
			Washer Fluid				**RF Brake Pads**	/
			Fluid Leaks (Type?)				**RF Brake Rotor**	/
			Air Filter				RF Caliper	
			Cabin Filter				**LF Brake Pads**	/
			PCV Valve / Filter				**LF Rotor**	/
			Timing Belt (sticker?)				LF Caliper	
			Drive Belt/s				Front Brake Hoses	
			Coolant Hoses				**RR Brake Pads/Shoes**	/
			Power Steering Hoses				**RR Rotor / Drum**	/
			Battery / Terminals				RR Caliper/Wheel Cylinder	
			Tire Inspections				**LR Brake Pads/Shoes**	/
			Tires/Inflation/Tread Depth				**LR Rotor / Drum**	/
			Left Front				LR-Caliper/Wheel Cylinder	
			Right Front				Rear Brake Hose/s	
			Left Rear				Front Wheel Bearings	
			Right Rear				Rear Wheel/Axle Bearings	
			Wheel Torque Spec/Verified					

1 = OK

2 = Suggested

3 = Required

Notes: