

Annual Report for Assessment of Outcomes 2012-13

Subject Area Committee Name: ___Geology/General Science_____

Contact person: __Melinda Hutson_____

For LDC/DE: Core outcome(s) assessed: __Communication and Professional Development__

For CTE: Degree or certificate* assessed: _____

*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.

The Geology/General Science SAC includes a breadth of interdisciplinary science courses, including geology, astronomy, meteorology, and oceanography. Some topics rely heavily on chemistry (mineral structures, phases changes and other processes involved in creating various rock types), while others rely on physics (radiometric dating, seismology, fluid flow) or biology (fossils and evolution as part of relative dating of rock units). Until this year, our SAC had only two full-time continuous Faculty. This past year, we gained a third FT faculty, and had a one-year temporary FT faculty. Despite that, we still rely on a large number of adjunct faculty (fourteen during our assessment this year). Our instructors have diverse backgrounds, with widely different strengths, and varied teaching styles. Part of our SAC's difficulties with the assessment of core outcomes is that our instructors and their assessments work at a course level, whereas the PCC core outcomes work at a program level, and we have not had a good mechanism in place to bridge those two levels of assessment. Another part of our SAC's difficulties is that we have been too busy trying to assess new outcomes each year to spend the time to revisit the results from prior year's assessments.

Three years ago, we assessed critical thinking with a field project and an accompanying report. In many ways, that year's assessment also touched on professional competence (although that outcome wasn't being assessed). Because of the limited overlap of topics covered in our classes, only two courses (G202 and GS106) were assessed. Discussion of the results of that assessment led to changes in course outcomes, math prerequisites, and textbooks and lab manuals. More recently, our SAC has created new field courses (G200B, G200C, G200D) and independent study courses (G298A, G298B, G298C) following conversations that grew out of discussion of the field project assessments.

In 2011, we tried to adapt our field project assessment to the core outcomes of Communication and Community and Environmental Responsibility. We found the project to be overly time consuming, and some

of the part-time instructors dropped out during the process. Everyone recognized the value of peer-review, as well as rough drafts, but it was unclear how instructors could use this information to make course changes, much less program-wide changes. At present, FT faculty Eriks Puris is experimenting with replacing poster presentations with electronic posters. The advantage to electronic posters is the ability to do rough drafts. We also realized that we needed to revisit these core outcomes, particularly communication. We are not writing instructors. Several of our instructors' native language is not English. Communication in science, particularly in our SAC is based on visuals (graphs, charts, block diagrams, etc.) and a specialized vocabulary (e.g., batholith, polymorph, lithosphere, subduction, isostasy), neither of which were adequately assessed in 2011.

Last year we tried to adapt our field project assessment to the core outcomes of Self-Reflection and Cultural Awareness. We also tried to increase the number of students being assessed by expanding the scope of the project to include G201 as well as G202 and GS 106. This assessment was not successful. Only four instructors (2 FT and 2 PT) provided any data or other feedback. The components to assess the core outcomes were add-ons that could have been done without the field project component at all. At the end of last year's report, we stated:

“For the amount of work involved, the past three years of outcomes assessments has not been effective. Our SAC recognizes that we include aspects of all of PCC's core outcomes in all of our classes, but not necessarily in a quantitatively assessable manner. Creating quantifiable assessments of each outcome that is consistently comparable across all of our instructors has led to the creation of a series of “add-ons” to a basic field project, and made the process so unwieldy that most of our instructors do not succeed in completing the process. Thus, feedback to the SAC comes from a limited sample of assessments (primarily from the full-time instructors). There is a general feeling among our part-time instructors that the assessment vehicle does not dovetail with an instructor's particular teaching style/method. While various instructors have expressed interest in continuing aspects of past assessments (peer review of papers, journals, etc.), none of them wants to be constrained to a uniform SAC-wide assessment vehicle. At present, there is no agreement within the SAC as to the direction we should go with assessment, other than we should not continue as we have.”

This year, we were given an assessment coach, and asked to “own” at least some of PCC's core outcomes. After discussion, the G/GS SAC decided to “own” Critical Thinking, Professional Competence, Communication, and Community and Environmental Responsibility. We do not intend to assess Self-Reflection or Cultural Awareness. We also decided to abandon our field project and go to pre- and post-surveys of almost all of our courses using Survey Monkey (as recommended by our assessment coach).

For each outcome assessed this year:

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).

We got off to a late start. For various reasons the four FT faculty working on this assessment had less time available than in a typical academic year. Melinda Hutson (SAC chair) had health problems, including surgery that occupied a great deal of her time. Eriks Puris transferred from the Rock Creek campus to Southeast Center, and was busy setting up a G/GS program (including lab materials) at his new campus. Andrew Hilt is a new hire, and was busy teaching his first term at PCC this past Fall. Finally, Karen Carroll was hired as a one-year full-time instructor at Cascade, and was adjusting to the change from PT to FT. During the Fall SAC meeting in late October 2012, we spent much of the meeting trying to decide on the format that our assessment would take. We decided on a pre-/post-survey format, with vague ideas on what might be included, and left the meeting with the intention of creating the surveys via e-mail.

By early January 2013, it became apparent that we needed to meet to have a clearer idea of what we intended to do. The four FT faculty and part-time instructor Frank Granshaw met and decided on a format, a process and timeline. Following the recommendation of our coach, we chose to create pre- and post-surveys of concepts relevant to the various classes for almost all of the G and GS classes (excluding the field trip classes G160 and 161 and one class that is rarely taught G291). We wanted to include all ten of our regularly taught lecture classes in this assessment. Those are G201, G202, G203, G207, G208, G209, GS106, GS107, GS108, and GS109. Each instructor at the meeting agreed to create two surveys with a minimum of 20 questions for each. We finished the process of creating the surveys shortly before the start of Spring 2013 and administered them at the beginning and end of the term.

The G/GS SAC chose to assess Communication and Professional Competence. The broad descriptions of these outcomes are:

- “Communicate effectively by determining the purpose, audience and context of communication, and respond to feedback to improve clarity, coherence and effectiveness in workplace, community and academic pursuits.”
- “Demonstrate and apply the knowledge, skills and attitudes necessary to enter and succeed in a defined profession or advanced academic program.”[from PCC website].

Both of these outcomes are subject to interpretation. For Geology and General Science, we **Communicate** in a technical manner using a specialized vocabulary and visuals (e.g., graphs, block diagrams). So we made an effort to include questions that required the interpretation of one or more diagrams.

Our students are either planning to go on in science, or trying to fulfill a science requirement, but intending to major in a non-science field. **Professional Competence** in the former requires the ability to use the language and tools of science. For the latter, it is more important that they understand how science works, so that they can make informed decisions throughout their lives (e.g., building in landslide-prone areas, controversy over global warming). **Professional Competence** in Earth Sciences/Geosciences has been the topic of active debate among scholars for the last several years, leading to the idea of Geoscience Concepts (which “articulate an understanding within the geoscience community as to what common knowledge and skills are important for students to master by the end of a program (for majors) or an introductory geoscience course (for non-majors).”

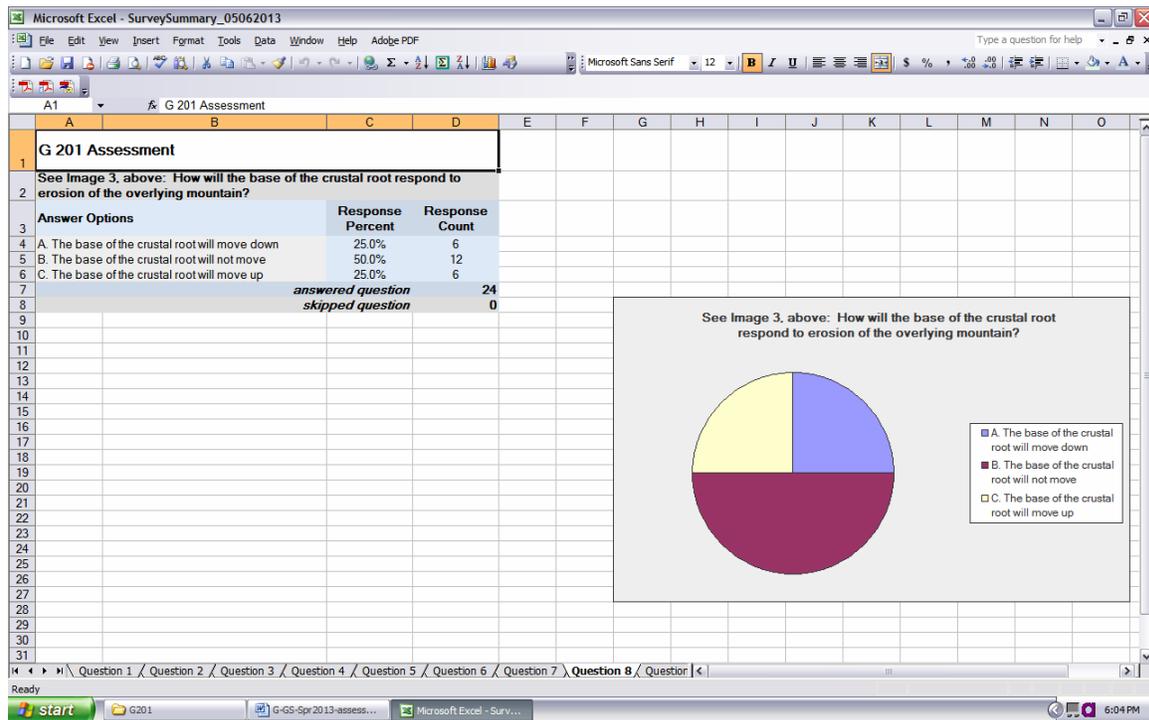
[http://serc.carleton.edu/NAGTWorkshops/assess/geo_concept_assess.html]. Geoscience misconceptions (“difficult concepts”) are being evaluated via a variety of pre- and post-class surveys, most of which are not available without a password. However, the questions database for one of the larger survey groups (Geoscience Concept Inventory or **GCI**, <http://geoscienceconceptinventory.wikispaces.com/>) was freely available, and was chosen by the G/GS SAC as the foundation of our assessment this year.

We tried to have our surveys assess both PCC’s core outcomes, and the outcomes for each individual course. The first draft of each survey used questions from the GCI which were deemed appropriate for the specific G/GS class by the survey creator. There were no questions in the GCI database for some particular topics that we deemed important for a particular class, so the survey creator wrote additional questions. These drafts were reviewed by the other faculty members involved in the process, and edited to create as many commonalities among the surveys as possible (e.g., there were two very similar questions on movement of a crustal root—some surveys had one version, others had the second version; one version was chosen for all surveys during editing). Some questions were too specific to an individual instructor’s teaching style/emphasis. Those questions were either eliminated or simplified/generalized so as to be appropriate for the course regardless of the background of the instructor teaching the class. The final ten surveys (appended to this report) were deemed equivalent by the team creating the surveys.

We asked the instructors of all sections of these ten classes to give the survey during the first week of class and then again during the last week. All of the part-time instructors were offered one hour of pay (from an LAC grant) to participate in the process. Two part-time instructors did not participate in the surveys. Several of the other part-time instructors offered the surveys as an extra credit option and did not get full class participation. Everyone else had students use class/lab time to take the surveys. Students’ missing the last class/lab caused the number of post- surveys to be lower than the number of pre- surveys. In summary, we had 784 students enrolled in these 10 classes during Spring 2013. Of these, 534 students (68% of total enrollment) took the survey during the first week of class and 444 (57% of total enrollment) took the survey at the end of the term. The two part-time instructors who chose not to participate taught multiple sections with 170 (22% of total enrollment) students.

The results of the surveys were returned in two formats: a) a large excel sheet showing ALL of the raw data/responses for each survey, with nothing summarized; and b) a summary file, in which each question is summarized on its own excel page. A screen shot of the results for question 8 from the pre- survey for

G201 is shown below. For the ten classes surveyed, we received 40 excel files, with multiple pages of data. We have not had time to evaluate all of the data, as we received it at the beginning of Final Exam week at the end of Spring term.



Preliminary evaluation of the surveys falls into two categories: a) looking at the questions that were common across several surveys; and b) looking at individual courses (all sections of a course combined) as a whole. We haven't yet decided which will give us the best information on outcomes. Examples of both methodologies are below.

Table 1. Common questions: isostasy and distribution of volcanoes

Question: Isostasy				
Course	% correct pre	% correct post	Change*	%no prior geol
G201 Q8	25	75	+50%	25
G202 Q11	31	60	+29%	9
G203 Q7	56	50	-6%	8
G207 Q13	43	46	+3%	50
GS106 Q8	46	43	-3%	53
Question: Distribution of Volcanoes				
Course	% correct pre	% correct post	Change*	%no prior geol
G201 Q6	46	20	-26%	25
G203 Q9	50	52	+2%	8
G208 Q7	23	37	+15%	18
GS106 Q9	27	41	+13%	53

* changes of <5% are probably not significant.

The data in Table 1 indicate that responses are highly variable from class to class. Part of the variability may be due to whether or not students had prior geology (e.g., G208 and GS106 for distribution of volcanoes), but that can't be the main factor. It seems that some of this change is due to instructor teaching style. There were six sections of GS106 taught by five instructors, none of whom have said that they stress isostasy. G201 was taught by only one instructor, who was also one of only two instructors to teach G202. That instructor stresses the concept of isostasy at the beginning of the term and reinforces it throughout. The drop in correct answers for G201 on the Distribution of Volcanoes question may also reflect the instructor's emphasis on local geology, with repeated diagrams of the volcanoes of the Pacific Northwest.

Another way to look at the data to try to eliminate instructor bias is to compare courses where there were a large number of sections and students (e.g., GS107 with four sections; 99 pre-surveys, 77 post-surveys) with a course taught by only one instructor (e.g., G201 with one section, 24 pre-surveys, 20 post-surveys).

Table 2. Average results for G201 and GS107

<i>Course (and % of students with no prior geology/astronomy)</i>	<i>% correct pre-survey(average of all questions)</i>	<i>% increase in correct response on post-survey(average of all questions)</i>	<i>% of students who chose an incorrect answer in pre-survey and correct answer on post-survey</i>
G201 (25)	67	10	63
GS107 (44)	53	16	46

This appears to give more consistent results. Between $\frac{1}{4}$ and $\frac{1}{2}$ of the students had no prior instruction in the subject area before taking the course. Despite that, students came in with a fair bit of knowledge (they averaged over 50% correct on the pre-survey). Students showed overall improvement between the pre- and post-survey, with about half of the students who could show improvement doing so. In addition, looking at all of the questions in one course allows identification of individual questions in which results are out of line with the other questions in the survey. A few questions showed decreases in the correct response rate that appear to be due to poorly worded/drawn questions (e.g, G201 Q5), while in another case (e.g., G201 Q6), decreases in the correct response rate may reflect overstressing some regionally important aspects of geology at the expense of a globally balanced view.

One instructor (Andy Hilt, FT) tried a variation on the second method, and shared this after everyone else has given the first survey. His variation is described in section 3, and may be incorporated into next year's assessment.

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.

As mentioned in section 2 above, our SAC has not had time to evaluate the wealth of material provided by our surveys. The data above represent about six hours of work by 2 FT faculty, who met during Finals Week to begin the process of evaluation. Based on very limited data, we can say that over 50% of the students in the two courses evaluated were already meeting the outcomes of communication (technical terminology and visuals) and professional competence (as pertains to misconceptions of “difficult concepts” in Geoscience). Of those students who did not meet the outcomes at the beginning of the course, roughly half succeeded in meeting those outcomes by the end of the course. Beyond that, we can say that the current data collection structure (Survey Monkey) provides an almost overwhelming amount of data that is difficult to evaluate in a timely fashion. It is also difficult to look at gains/losses of individual students while simultaneously guaranteeing student anonymity.

The full time Instructor at the Rock Creek Campus taught one section of G-203 and two sections of GS-109 during the spring term. He had them take the Survey Monkey assessment as required by the SAC, but also had them document their choices on a prefabricated paper test sheet. The test sheet contained multiple choice selections for both tests (example in Table 3), so that the students could keep track of each response that they made. This left-hand side of this test sheet was filled in during the second day of class for all three of his spring sections, while the right-hand side was left blank. When the students finished taking the Survey Monkey assessment and completed their test sheet, he collected them and placed them into a file folder.

Table 3> Example of the paper test sheet used by Andy Hilt

Pre-test (Beginning of Term)						Post-test (End of Term)					
1)	A	B	C	D	E	1)	A	B	C	D	E
2)	A	B	C	D		2)	A	B	C	D	
3)	A	B	C	D		3)	A	B	C	D	
4)	A	B	C	D	E	4)	A	B	C	D	E
5)	A	B	C			5)	A	B	C		

- On the final day of class he returned these test sheets to the students. When they went back into the computer lab to complete the Survey Monkey assessment for the second time, he had them fold their test sheet in half so that they would not look at their original responses, and record their answers on the right-

hand side of the sheet.. When every student was done, he went through the correct responses, and they determined their pre-assessment score and their post-assessment score. This allowed them to see if they had improved, not changed, or decreased in their professional competency for the course that they just completed.

- In the G-203 section, 9 of 13 students improved by between 1 and 13 points. 1 student went down by 1 point, 1 student had no change, and 2 students did not resubmit the post test. In GS-109, 30 students improved by between 1 and 14 points, 1 student went down by 1 point, 4 students did not change, and 10 students either did not retake or did not rescore the test.
- In both cases, he had them evaluate their own pre and post-tests so that they could see the changes personally and immediately. Many students demonstrated a strong interest in the feedback provided by this assessment, and felt it was worth their time to take this pre and post-assessment on Survey Monkey. The instructor found that this assessment method actually proved to be a useful review method at the end of the term as well.

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).

Students' attainment of outcomes happens at the individual course level during interaction with instructors. So, unless we can get results back to the individual instructors (and get all of the part-time instructors on-board), the possibility of improvement based on assessment is limited. We need to create a feedback loop between the assessment process, the evaluation process, and instructor involvement. We also need to find a way to get our part-time faculty invested in the process. This year we got funding for part-time participation. Only one part-time instructor was willing to be involved in the creation of the surveys (and he spent a huge amount of time in creating and editing surveys). Once created, four additional part-time instructors provided specific and insightful comments on individual questions (including comments that the "correct answer" contradicted what they thought was true and in one case, what was stated in the textbook). However, it is also clear from those comments that all four of these part-time instructors viewed this as an assessment of content mastery, rather than PCC's core outcomes. One instructor stated that had she seen the survey before having her students take it, she would have used it as a final exam. Only one of these instructors attended any of the SAC meetings during the 2012-2013 academic year, and the one that did only attended the Fall meeting, before we had a clear idea of what we were doing.

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.

The G/GS SAC feels that this is a work in progress. We shifted gears from a field project/referenced term paper to multiple choice questions on Survey Monkey. The surveys were put together too quickly for everyone involved to have input to the process. We have already identified some areas that need strengthening or changing:

- Because we relied on the GCI, the surveys were heavily weighted towards a few concepts, such as plate tectonics, which are minor components of some of the classes that used these surveys.
- We need to be more careful at mapping questions to both PCC's core outcomes (primarily) and our course outcomes (secondarily), rather than overall course material.
- We need to increase the number of common questions across the discipline. There were two different questions dealing with interpretation of topographic maps. These could have been reduced to one common question on multiple surveys.
- We would like to find a way to have students interpret a short article (at the level of Scientific American) in such a way as to service multiple purposes, including comprehension of vocabulary and concepts, and the ability to combine information from various sources to "read between the lines" where important information is not explicitly stated.
- We need to evaluate the ideal length of our survey. Should it be shorter? Would this help with analyzing the results?
- We need to create a feedback loop between the surveys and our instructors. The instructor for G201 is now aware that discussion of local geology needs to be balanced with more emphasis on passive plate margins (such as the Eastern US).
- With further development, the current assessment methodology has the potential to yield meaningful results leading to improved instruction. Additional development needs to include restructuring the work load associated with assessment, so that it becomes more sustainable, while the SAC holds its breath hoping that the unfunded mandate for assessment becomes funded in some institutionally meaningful way.

Appendix: 10 G/GS Surveys

**G 201 Assessment****G 201 - Physical Geology**

Instructions: For each question, select the best possible response unless prompted to "Choose all that apply". If you see "Choose all that apply", then you should choose all of the responses that correctly answer the question.

*** 1. Please enter the 5 digit Course Number (CRN) and name of the class you are taking this survey for. For example: "27999 GS 106"**

2. *ONLY IF YOUR INSTRUCTOR HAS REQUESTED THIS INFORMATION*, Please enter your name and email address below. Leave these fields blank if your instructor has not made this request.

Your Name (First and Last)

Your pcc.edu email address

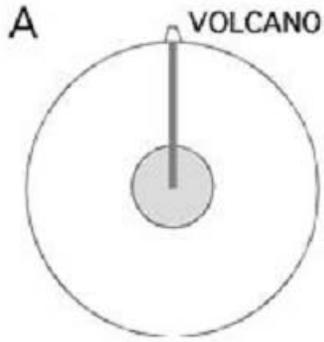
3. A student has a black rock that does not reflect light. The student cuts it open and the inside is the same as the outside. Can the student determine that this rock contains iron-rich minerals simply by looking at it? [

- A. Yes. The student would know that black rocks do not contain iron.
- B. Yes. The student would be able to see silver specks if the rock contains iron.
- C. Yes. The student can use a magnifying glass to see if the rock contains iron.
- D. No. The student would not be able to see if the rock contains iron even with a magnifying glass.
- E. No. The student cannot look at the rock since it does not reflect light and is therefore invisible.

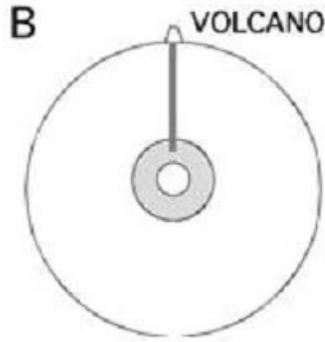
4. Where are sediments found?

- A. Mostly on islands or at the bottom of the ocean
- B. Mostly near the equator
- C. Mostly near the edges of continents
- D. Almost anywhere on the Earth's surface

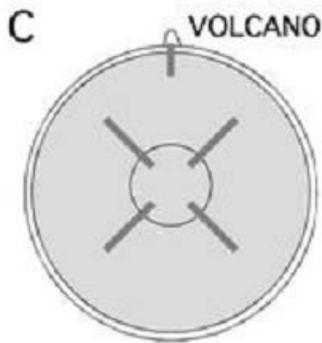
Image 1



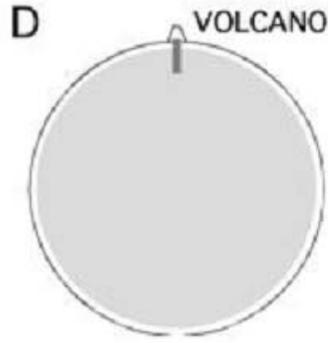
A. Material comes from the Earth's melted center



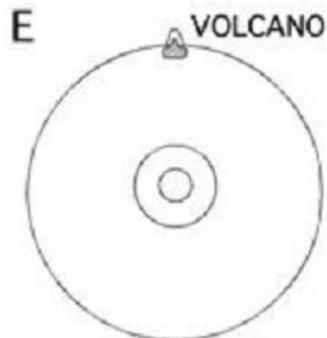
B. Material comes from a melted layer near the Earth's center



C. Material travels from the Earth's melted center and mixes with a melted layer beneath the Earth's surface



D. Material comes from a melted layer beneath the Earth's surface

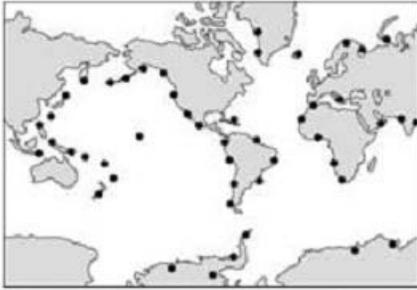


E. Material comes from pockets of melted material beneath the Earth's surface

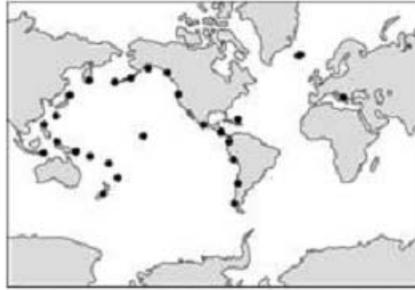
5. See Image 1, above. When volcanoes erupt, which diagram most closely represents where most volcanic material come from?

- A.
- B.
- C.
- D.
- E.

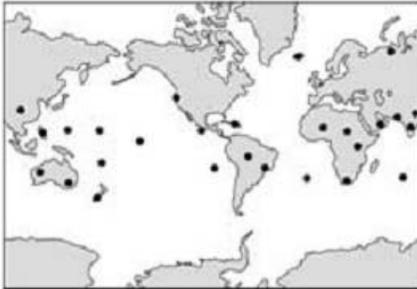
Image 2



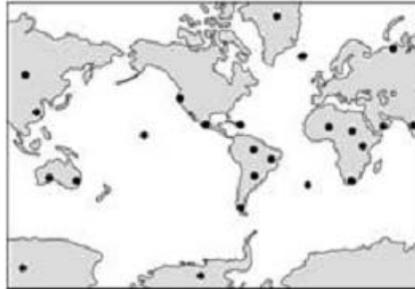
A. Mostly along the margins of the Pacific and Atlantic Oceans



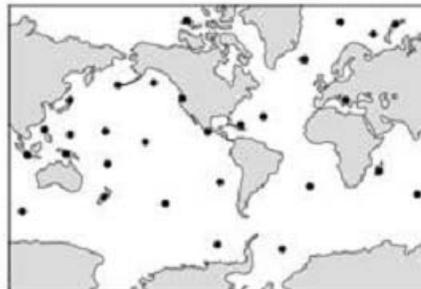
B. Mostly along the margins of the Pacific Ocean



C. Mostly in warm climates



D. Mostly on continents



E. Mostly on islands

6. The maps in Image 2 (above) show the position of the Earth's continents and oceans.

The dots on each map mark the locations where volcanic eruptions occur.

Which map do you think most closely represents the places where these volcanoes are typically observed?

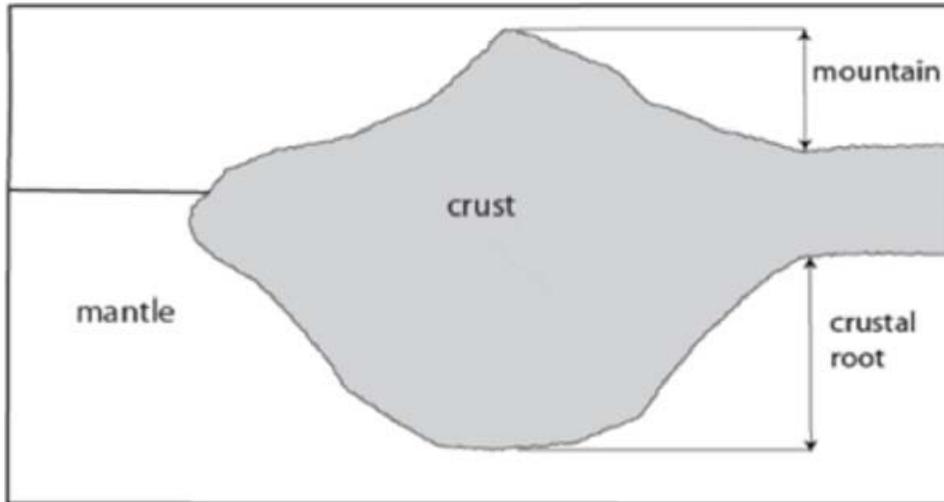
- A.
- B.
- C.
- D.
- E.

7. Which of the following describes what scientists mean when they use the word "earthquake"?

- A. When an earthquake occurs, visible cracks appear on the Earth's surface
- B. When an earthquake occurs, people can feel the earth shake
- C. When an earthquake occurs, man-made structures are damaged
-

- D. When an earthquake occurs, energy is released inside the Earth
- E. When an earthquake occurs, the gravitational pull of the Earth increases

Image 3



8. See Image 3, above: How will the base of the crustal root respond to erosion of the overlying mountain?

- A. The base of the crustal root will move down
- B. The base of the crustal root will not move
- C. The base of the crustal root will move up

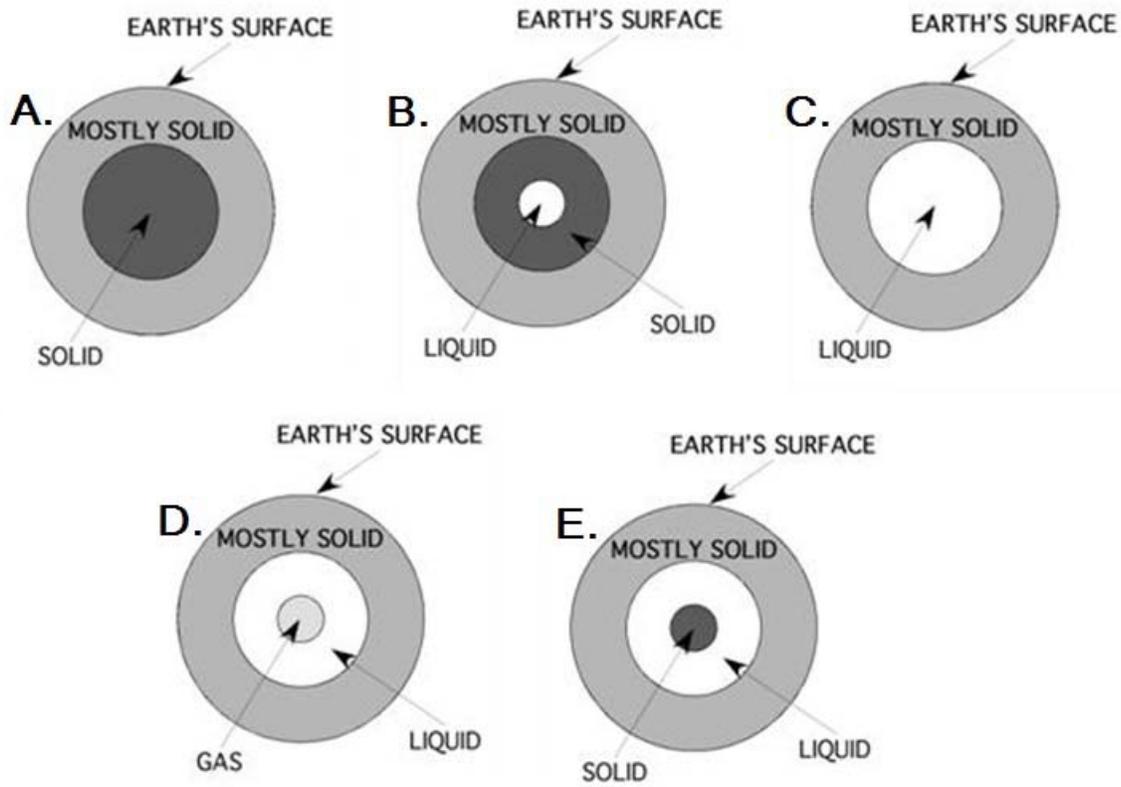
9. How are rocks and minerals related?

- A. Minerals are just small rocks
- B. Minerals are the building blocks of rocks
- C. Minerals are broken down rock fragments
- D. Minerals are made up of various rocks

10. What does density refer to?

- A. How big something is
- B. How quickly particles move
- C. How much material exists in a space
- D. How much air is contained in an object
- E. How slowly liquids move

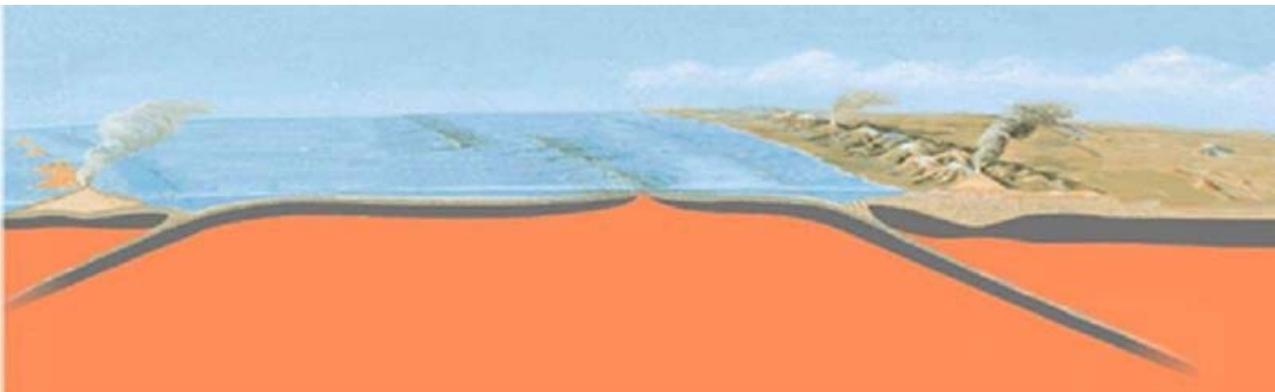
Image 4



11. See Image 4 (above). Which of the diagrams is most closely related to what you might see if you cut the Earth in half?

- A.
- B.
- C.
- D.
- E.

Image 5



12. In Image 5 (above), how many tectonic plates are illustrated?

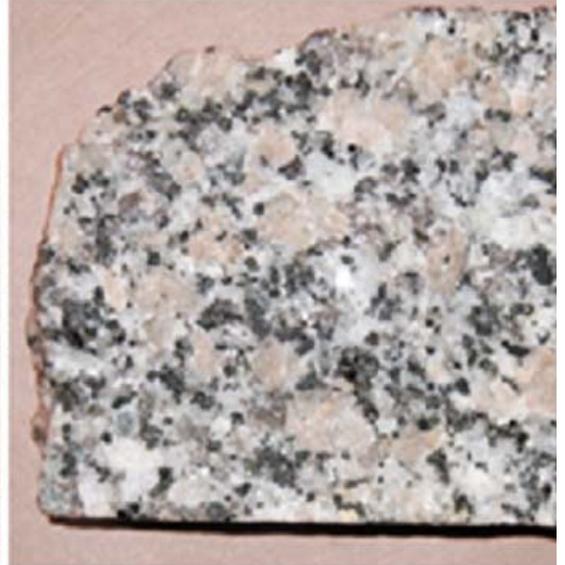
- 1.
-

- 2.
- 3.
- 4.
- 5.

Image 6 (A - E)



(A)



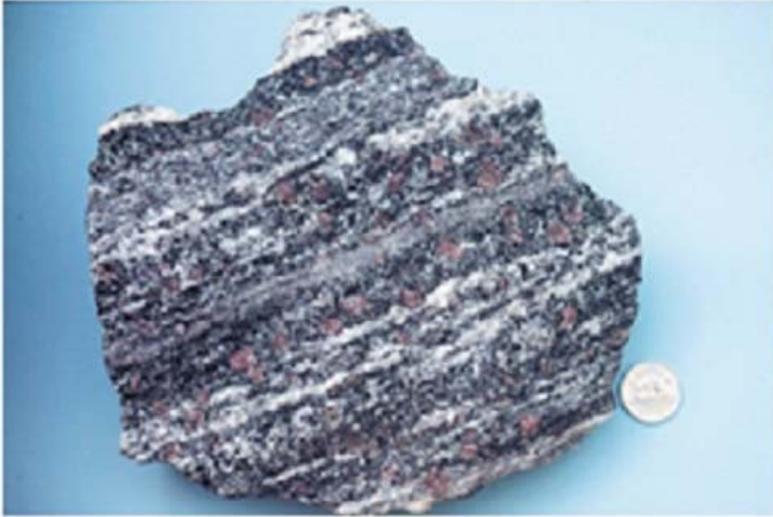
(B)



(C)



(D)



(E)

Examine the pictures of the rocks above before answering question 11-13.

13. Which rock was formed from material deposited by running water?

- A.
- B.
- C.
- D.
- E.

14. Which rock formed when a lava flow at the Earth's surface cooled and solidified?

- A.
- B.
- C.
- D.
- E.

15. Which rock formed by solid state alteration of a pre-existing rock during a continent-continent collision?

- A.
- B.
- C.
- D.
- E.

16. Table salt:

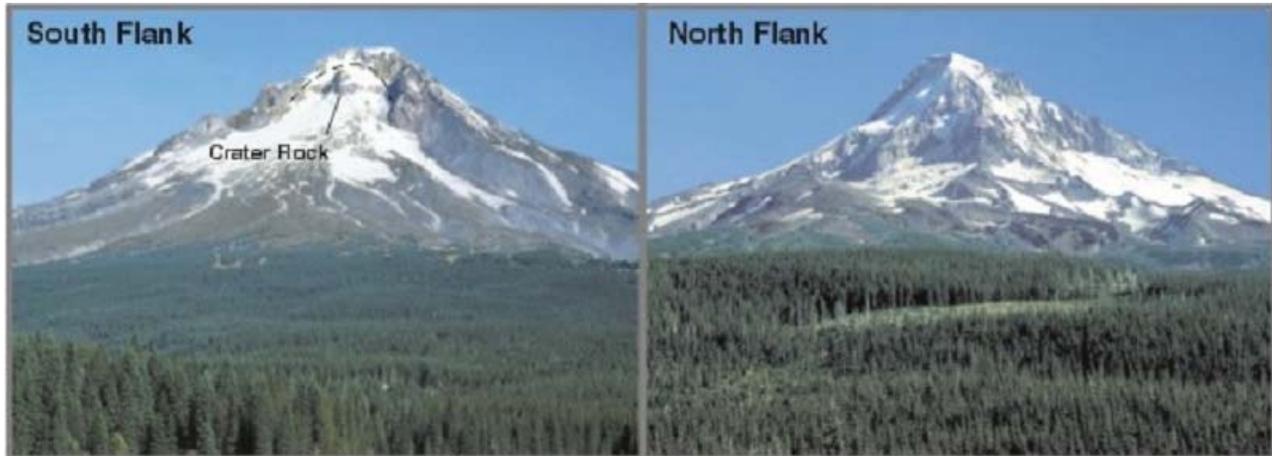
- A. is processed to get the clear/white color
- B. is processed to get the salty taste
- C. forms in nature, we just break it into smaller pieces and use it

- D. is manufactured and not at all a natural product

17. New rocks can form by: *CHOOSE ALL THAT APPLY*

- A. cooling from lava
- B. cementing together fragments of other rocks
- C. solids forming from a water solution
- D. adding pressure to existing rocks
- E. adding heat to existing rocks

Image 7



18. Crater Rock shown in the picture of Mount Hood (Image 7, above) is likely formed from what type of rock?

- A. Andesite
- B. Basalt
- C. Granite
- D. Gabbro

19. The Mid-Atlantic Ridge that occurs on the ocean floor in the middle of the Atlantic Ocean was formed by:

- A. A rise in sea level
- B. A lowering of sea level
- C. Plates that are moving apart
- D. Plates that are moving together

20. Minerals can be identified based on: *CHOOSE ALL THAT APPLY*

- A. Its hardness
- B. Its color
- C. The way it breaks
- D. The way it forms
- E. The way light reflects off of the mineral

21. Which of the following is/are hazard(s) related to volcanoes? *CHOOSE ALL THAT APPLY*

-

- A. Mudflows
- B. Lava flows
- C. Hurricanes
- D. Thunderstorms
- E. Earthquakes

22. Rocks can form: *CHOOSE ALL THAT APPLY*

- A. Inside the Earth
- B. Underwater
- C. On the surface of the Earth
- D. Below a volcano

23. Have you taken any Geology or General Science classes before? *CHOOSE ALL THAT APPLY*

- A. Yes, at Portland Community College
- B. Yes, at another college or university
- C. Yes, but not at a college or university (an example would be at high school)
- D. No

Done

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G 202 Assessment

G 202 - Physical Geology

Instructions: For each question, select the best possible response unless prompted to "Choose all that apply". If you see "Choose all that apply", then you should choose all of the responses that correctly answer the question.

*** 1. Please enter the 5 digit Course Number (CRN) and name of the class you are taking this survey for. For example: "27999 GS 106"**

2. *ONLY IF YOUR INSTRUCTOR HAS REQUESTED THIS INFORMATION*, Please enter your name and email address below. Leave these fields blank if your instructor has not made this request.

Your Name (First and Last)

Your pcc.edu email address

3. Where can glaciers can be found today? *CHOOSE ALL THAT APPLY*

- A. In the mountains
- B. At sea level
- C. At the South pole
- D. Along the equator only
- E. Anywhere except along the equator

4. Rivers with meandering (curvy or bendy) channels are typically found in what type of settings?

- A. in valleys draining volcanoes
- B. in steeply sloping valleys
- C. in gently sloping valleys
- E. in valleys carved by glaciers

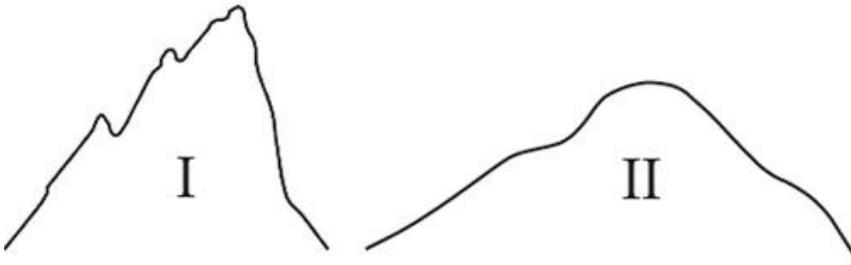
5. Which of the following best describes what would happen if you dropped a small copper ball while standing somewhere in North America?

The small copper ball would fall to the ground and then:

- A. Roll towards the equator
- B. Roll towards the north
- C. Roll towards the nearest ocean
- D. Roll towards the lowest elevation

- E. Roll towards the nearest magnet

Image 1



6. See Image 1, above. The sketches represent the outlines of two mountains made up of the same type of rock. The mountains have finished growing.

Which of the following reasons best explains the differences in the two sketches?

- A. Mountain I is older than Mountain II
- B. Mountain II is older than Mountain I
- C. Mountain I has more vegetation on it when compared to Mountain II
- D. Mountain II is in a more arid region than Mountain I

7. A strong wind blows sand out across the deepest part of the ocean.

What will be visible above the surface of the water after many years?

- A. If enough time passes, a flat island built of sand will form stick up from the ocean's surface
- B. If enough time passes, a small mountain built of sand will stick up from the ocean's surface
- C. The sand and ocean water will combine to form rock. If enough time passes, a flat island built of this rock will stick up from the ocean's surface
- D. The sand and ocean water will combine to form rock. If enough time passes, a small mountain built of this rock will stick up from the ocean's surface
- E. Probably nothing will appear above the ocean's surface even if a very long time passes.

8. Which of the following can be caused by wind? *CHOOSE ALL THAT APPLY*

- A. Tectonic plate motion
- B. Waves
- C. Earthquakes
- D. Mountain-building
- E. Erosion

9. Which of the following can directly affect erosion rates? *CHOOSE ALL THAT APPLY*

- A. Rock type
- B. Earthquakes
-

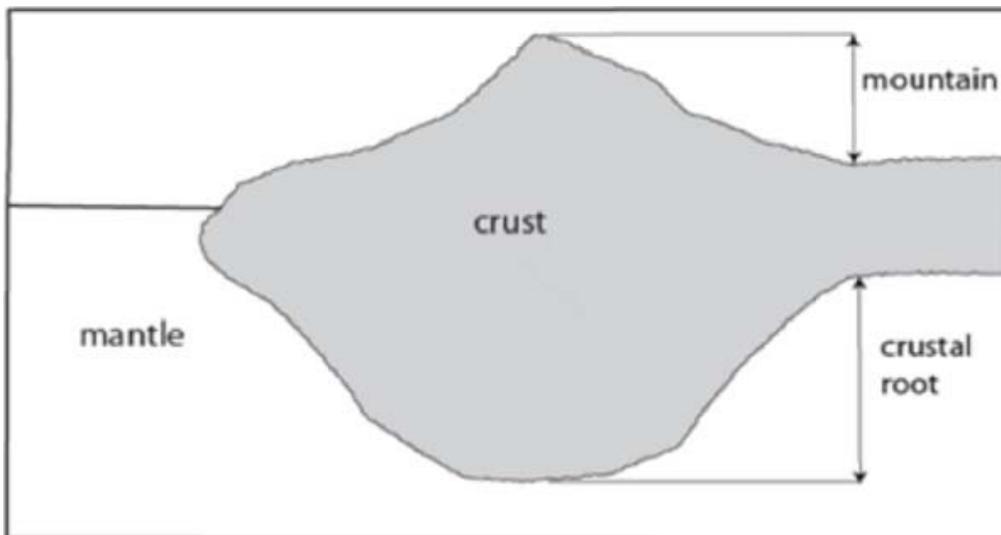
- C. Time
- D. Climate

10. Which of the following are considered common mechanisms for weathering and erosion?

CHOOSE ALL THAT APPLY

- A. Wind
- B. Rain
- C. Earthquakes
- D. Volcanoes
- E. Rivers

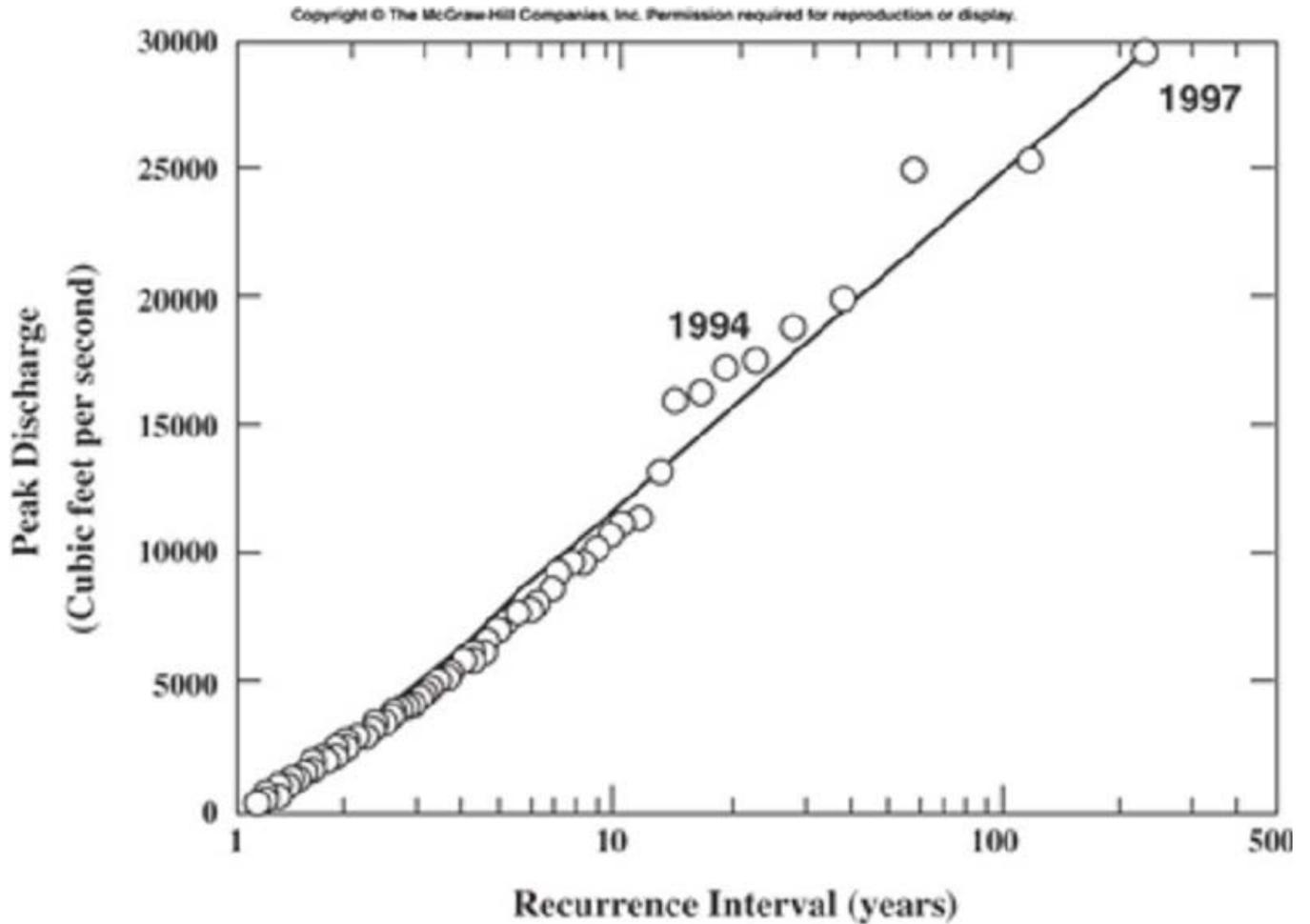
Image 2



11. See Image 2, above. How will the base of the crustal root respond to erosion of the overlying mountain?

- A. The base of the crustal root will move down
- B. The base of the crustal root will not move
- C. The base of the crustal root will move up

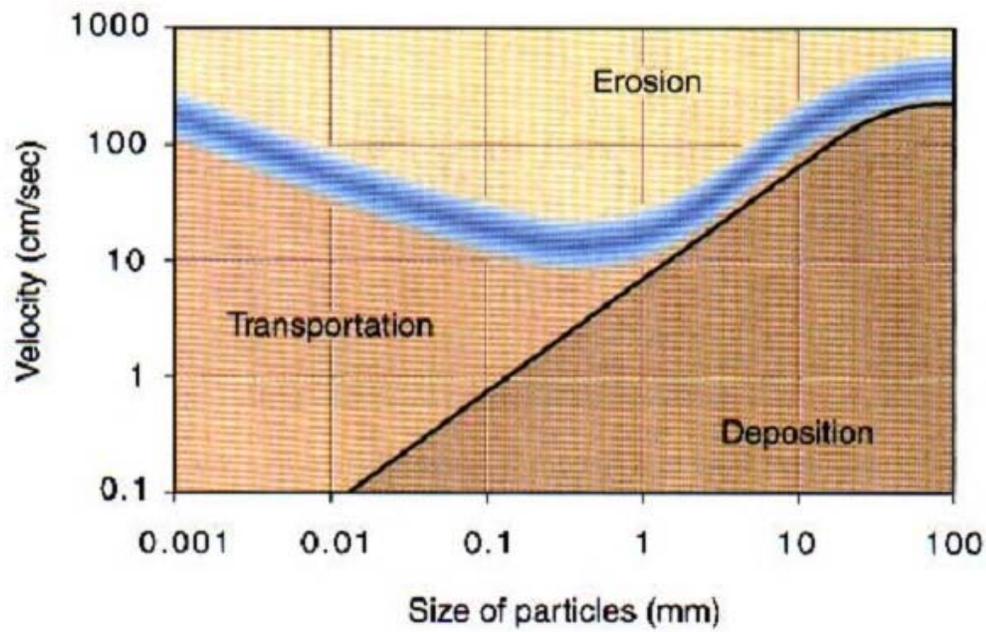
Image 3



12. Above (Image 3) is a plot for a river near Fargo, North Dakota. Which stage is defined by a peak discharge of 25,000 cubic feet per second?

- A. Annual flood stage
- B. 5 year flood stage
- C. 10 year flood stage
- D. 100 year flood stage
- E. 500 year flood stage

Image 4: Hjulstrom's diagram

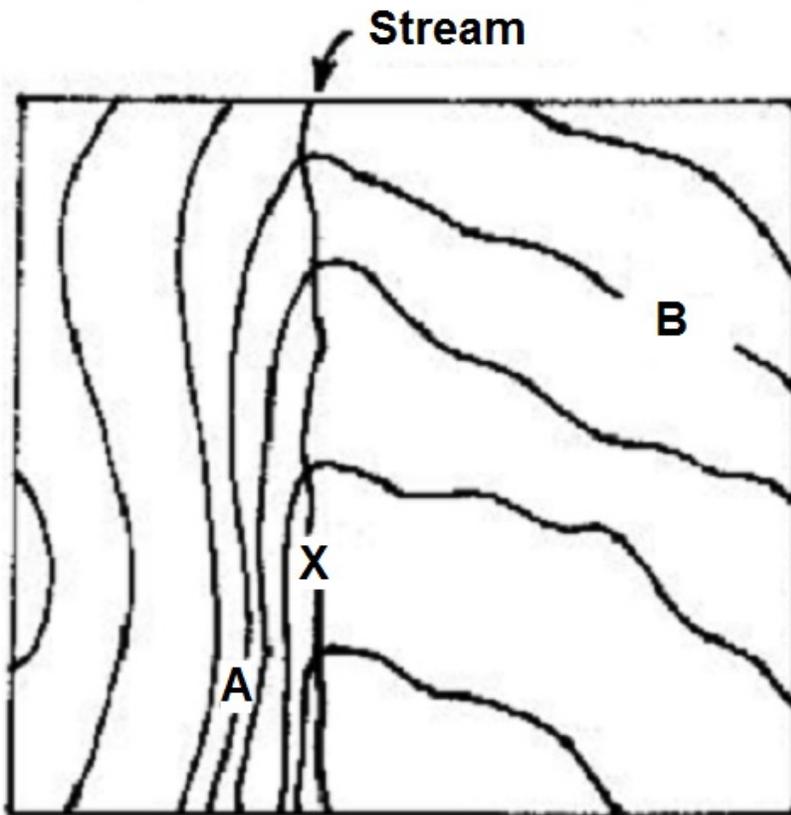


13. Use Hjulstrom's diagram (Image 4, above) to answer the question below.

At what stream velocity will a suspended particle 0.1 mm in size be deposited as the flow rate of a stream decreases?

- A. 0.1 cm/sec
- B. 1 cm/sec
- C. 10 cm/sec
- D. 100 cm/sec
- E. 1,000 cm/sec

Image 5



14. The diagram above (Image 5) is a topographic map that shows contour lines as they cross stream X, which is drawn from North to South across the map area. If point B is at an elevation of 400 feet, and the map has a contour interval of 20 feet, what is the possible elevation of stream X as it leaves the map area?

- A. 410 feet
- B. 390 feet
- C. 370 feet
- D. 350 feet
- E. 330 feet

Figure A

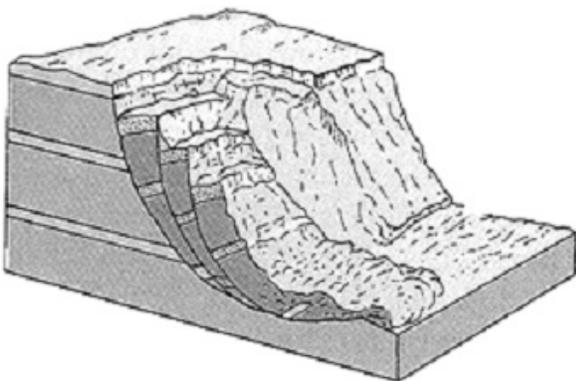
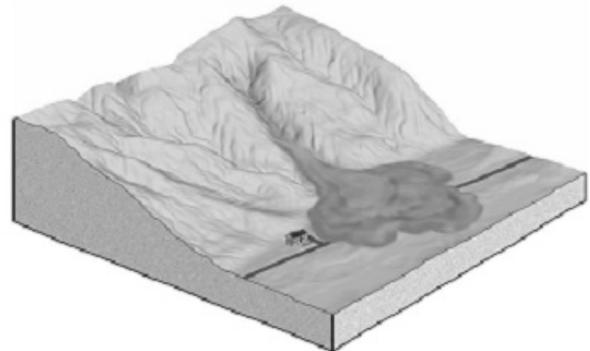


Figure B



15. Based on field observations and aerial reconnaissance, two different 3-D illustrations were

constructed for two different geographic locations as shown in Figure A and Figure B above.

Which conditions most likely caused the mass wasting scenario in figure B?

- A. Continued seasonal variation in temperature causing freezing and thawing of the saturated loose sediment.
- B. Unstable geologic layers due to plate tectonic deformation.
- C. Frequent episodes of recent precipitation causing saturation of the loose sediment.
- D. Increased vegetative cover resulting in more root mass which breaks up the loose sediment below.

16. See Figure A and Figure B, above. Which measures would be beneficial in decreasing the risk of future mass wasting like those depicted in the two figures? *CHOOSE ALL THAT APPLY*

- A. Climatic cooling conditions place these regions into a condition where prolonged permafrost persists.
- B. Addition of riprap structures and retaining walls.
- C. Construction of a dam in a local waterway that backs up water to form a reservoir.
- D. Planting of grass seed and tree seedlings.
- E. Construction of new homes and roadways on top of the mass wasting features.

17. A toxic landfill site recently endured a 9.2 magnitude earthquake which caused the natural clay layer beneath it to fracture. A toxic slurry was introduced to the geologic strata beneath the landfill. Which scenario will result in the greatest contamination risk for local residents?

- A. Underlying silt with high porosity and low permeability
- B. Underlying sand with high porosity and high permeability
- C. Underlying silt and sand with low porosity and low permeability
- D. Underlying gravel with high porosity and high permeability

18. If human civilization had never developed on Earth, would there be a greenhouse effect?

- A. Yes, the greenhouse effect is caused by naturally occurring gases
- B. Yes, the greenhouse effect is caused by plants giving off gases
- C. No, the greenhouse effect is caused by humans burning fossil fuels
- D. No, the greenhouse effect is caused by humans depleting ozone
- E. No, there is no conclusive evidence that a greenhouse effect exists

19. What would happen if a significant portion of the sea ice floating in the Arctic Ocean were to melt?

- A. An increase in the amount of water in the ocean would lead to more coastal flooding.
- B. An increase in the absorption of solar energy would lead to warming of the planet.
- C. An increase in the occurrence of extreme weather events would lead to more hurricanes.
- D. A decrease in the temperature of the ocean would lead to a cooling of the planet.
- E. A decrease in the reflection of solar energy would lead to cooling of the planet.

20. How has the amount of carbon dioxide in the atmosphere changed over the past 500 years?

- A. No change

- B. Linear increase
- C. Linear decrease
- D. Exponential increase
- E. Exponential decrease

21. The greenhouse effect has been linked to warming of Earth including its ocean temperatures. What are greenhouse gases?

- A. Gases in the atmosphere that absorb infrared energy.
- B. Gases in the atmosphere that absorb ultraviolet energy.
- C. Gases in the atmosphere that cause rain to become acidic.
- D. Gases in the atmosphere that are produced as plants grow.

22. Which of the following is a significant factor in erosion in deserts? *CHOOSE ALL THAT APPLY*

- A. lack of vegetation
- B. intense chemical weathering
- C. thin soil cover
- D. episodic rainfall

23. Have you taken any Geology or General Science classes before? *CHOOSE ALL THAT APPLY*

- A. Yes, at Portland Community College
- B. Yes, at another college or university
- C. Yes, but not at a college or university (an example would be at high school)
- D. No

Done

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G 203 Assessment

G203 - Historical Geology

Instructions: For each question, select the best possible response unless prompted to "Choose all that apply". If you see "Choose all that apply", then you should choose all of the responses that correctly answer the question.

*** 1. Please enter the 5 digit Course Number (CRN) and name of the class you are taking this survey for. For example: "27999 GS 106"**

2. *ONLY IF YOUR INSTRUCTOR HAS REQUESTED THIS INFORMATION*, Please enter your name and email address below. Leave these fields blank if your instructor has not made this request.

Your Name (First and Last)

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3. Scientists claim that they can determine when the Earth first formed as a planet.

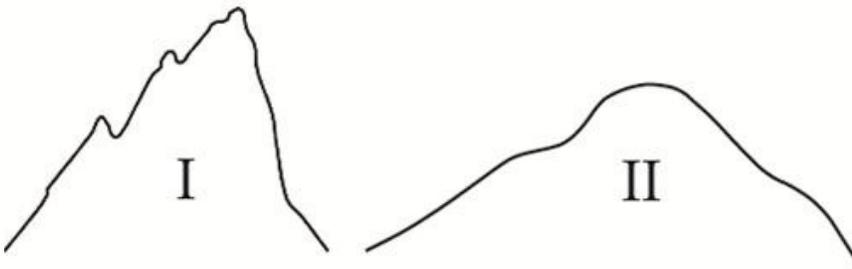
Which technique(s) do scientists use today to determine when the Earth first formed? *CHOOSE ALL THAT APPLY*

- A. Comparison of fossils found in rocks
- B. Comparison of layers found in rocks
- C. Analysis of uranium found in rocks
- D. Analysis of carbon found in rocks
- E. Scientists cannot calculate the age of the Earth

4. Which of the following statements about the age of rocks is most likely true?

- A. Rocks found in the ocean are about the same age as rocks found on continents
- B. Rocks found on continents are generally older than rocks found in the ocean
- C. Rocks found in the ocean are generally older than rocks found on continents
- D. Ages of rocks are not precise enough to determine which rock type is older

Image 1



5. The sketches above (Image 1) represent the outlines of two mountains made up of the same type of rock. The mountains have finished growing.

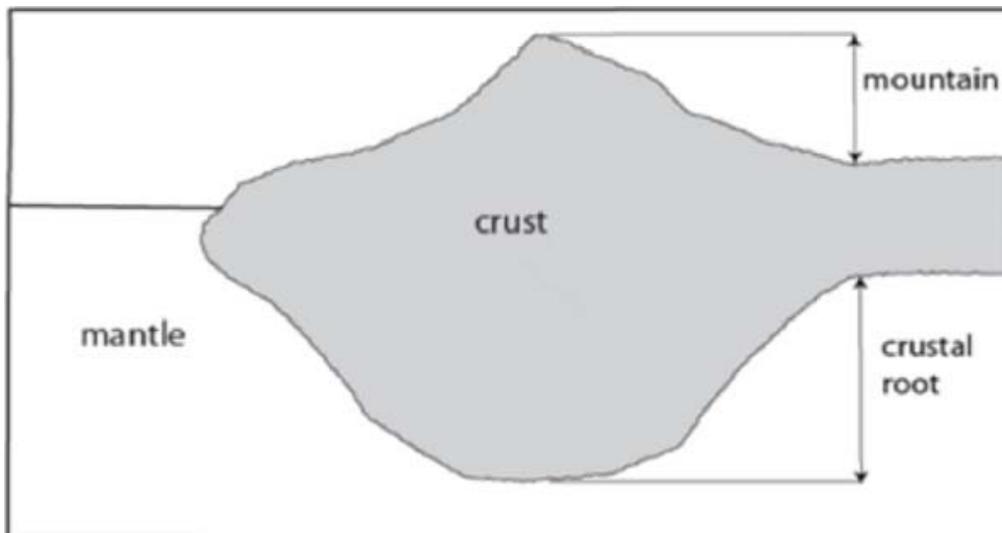
Which of the following reasons best explains the differences in the two sketches?

- A. Mountain I is older than Mountain II
- B. Mountain II is older than Mountain I
- C. Mountain I has more vegetation on it when compared to Mountain II
- D. Mountain II is in a more arid region than Mountain I

6. Which of the following statements about radioactivity and half-life are true?

- A. Radioactivity only occurs if carbon is present in an object
- B. Radioactivity can occur in the atmosphere, but not at the Earth's surface
- C. Radioactivity only occurs when created by people
- D. Half-life is a measure of how quickly radioactivity decreases
- E. Half-life and radioactivity decrease and eventually disappear

Image 2

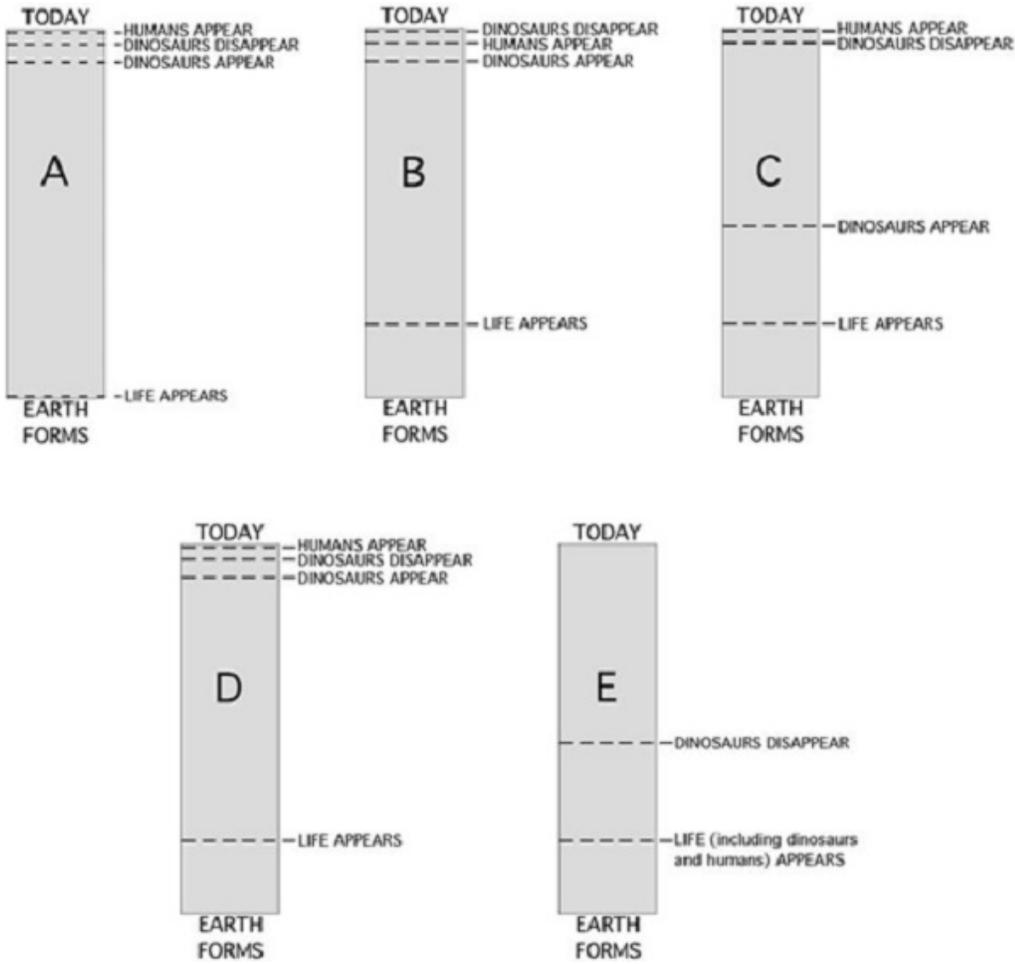


7. See Image 2. How will the base of the crustal root respond to erosion of the overlying mountain?

- A. The base of the crustal root will move down
- B. The base of the crustal root will not move

- C. The base of the crustal root will move up

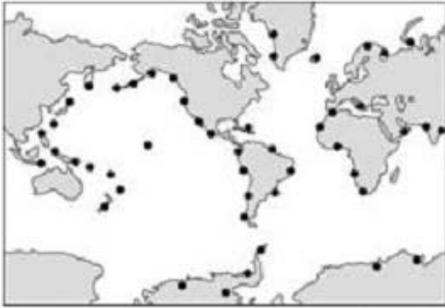
Image 3



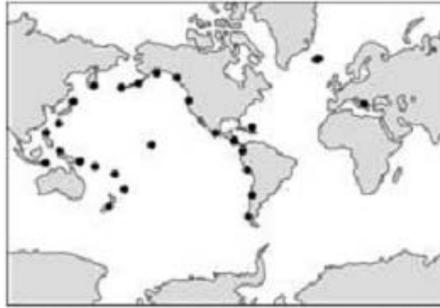
8. Which of the figures in Image 3 (above) most closely represents changes in life on Earth over time?

- A.
- B.
- C.
- D.
- E.

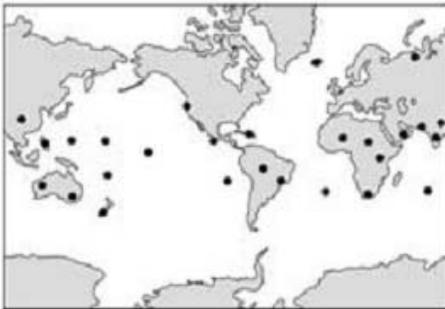
Image 4



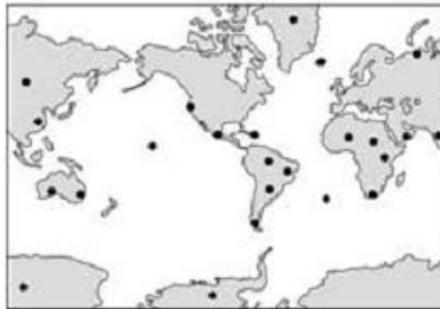
A. Mostly along the margins of the Pacific and Atlantic Oceans



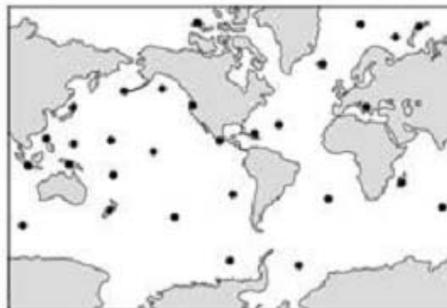
B. Mostly along the margins of the Pacific Ocean



C. Mostly in warm climates



D. Mostly on continents



E. Mostly on islands

9. The following maps show the position of the Earth's continents and oceans. The dots on each map mark the locations where volcanic eruptions occur. Which map most closely represents the places where these volcanoes are typically observed?

- A.
- B.
- C.
- D.
- E.

10. Which answer best describes Earth's surface when the Earth first formed as a planet?

-

- A. The Earth's surface was covered with jungles
- B. The Earth's surface was covered with water
- C. The Earth's surface was covered with undeveloped land
- D. The Earth's surface was covered with melted rock
- E. The Earth's surface was covered with ice

11. If you could travel back in time to when the Earth first formed as a planet, what type(s) of life might you encounter?

- A. No life would exist in water or on land
- B. One-celled organisms in water
- C. Animal and plant life in water
- D. All types of life in water and on land, except people
- E. All types of life in water and on land, including people

12. How far do you think continents move in a single year?

- A. A few inches
- B. A few hundred feet
- C. A few miles
- D. We have no way of knowing
- E. Continents do not move

13. Some people believe there was once a single continent on Earth.

Which of the following statements best describes what happened to this continent?

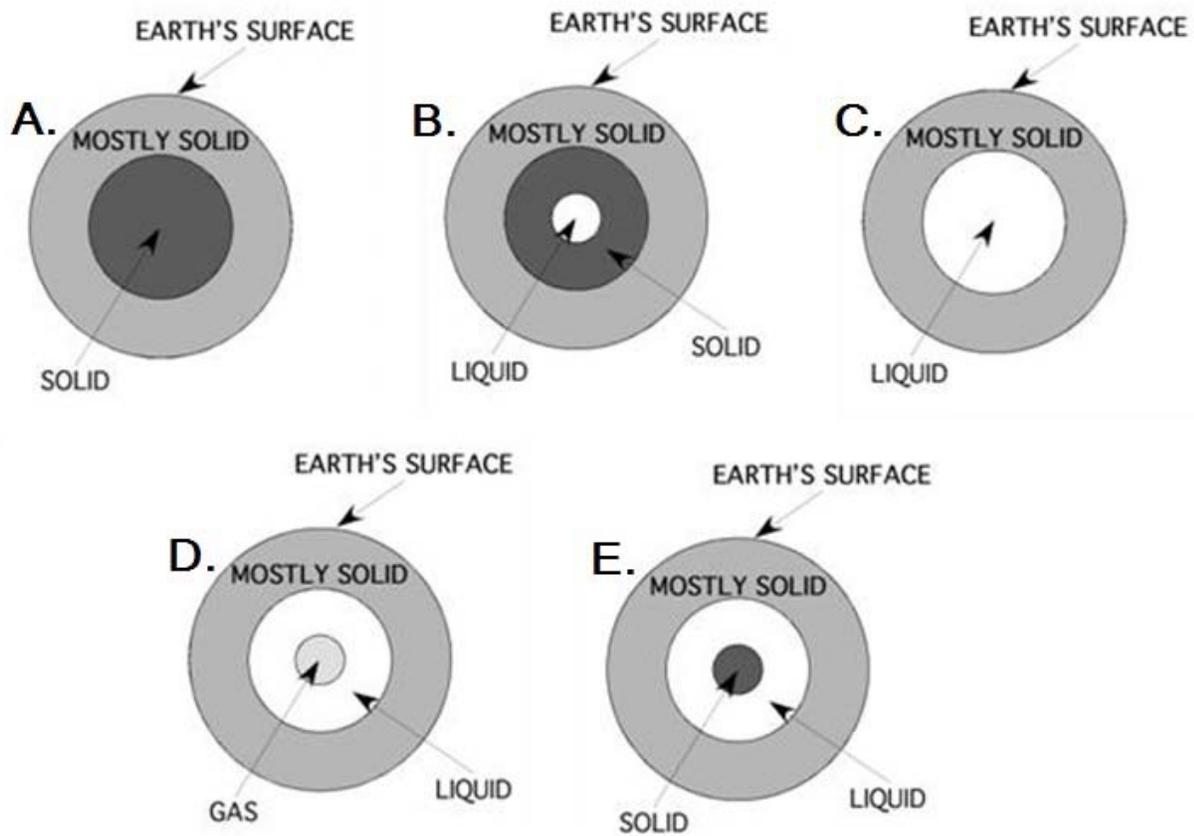
- A. Meteors hit the Earth, causing the continent to break into smaller pieces
- B. The Earth lost heat over time, causing the continent to break into smaller pieces
- C. Material beneath the continent moved, causing the continent to break into smaller pieces
- D. The Earth gained heat over time, causing the continent to break into smaller pieces
- E. The continents have always been in roughly the same place as they are today

14. A scientist collects all of the fossils ever discovered into one room.

This room now contains:

- A. Fossils of a few of the plants and animals that ever lived
- B. Fossils of most of the plants and animals that ever lived
- C. Fossils of most of the types of plants and animals that ever lived
- D. Fossils of all of the plants and animals that ever lived
- E. Fossils of all of the types of plants and animals that ever lived

Image 5



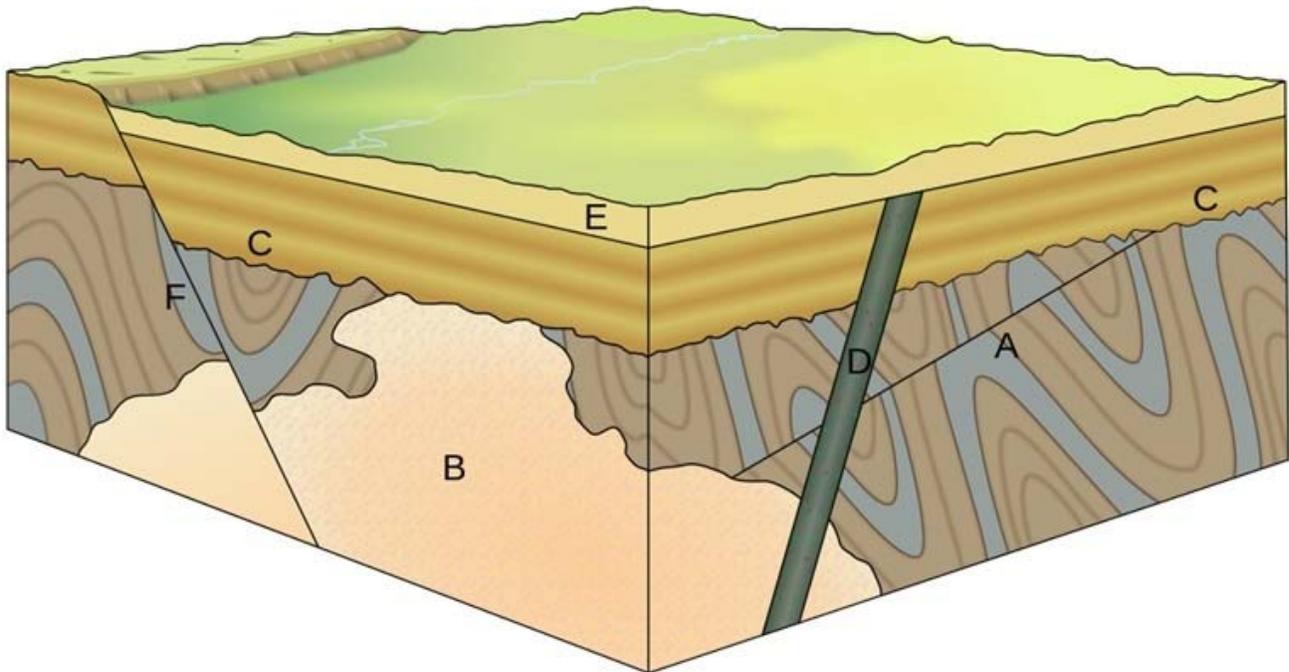
15. See Image 5. Which of the diagrams is most closely related to what you might see if you cut the Earth in half?

- A.
- B.
- C.
- D.
- E.

16. Below the outermost rocky shell of the Earth, it becomes:

- A. Hotter, melted, and gravity increases
- B. Hotter, gaseous, and magnetism increases
- C. Colder, solid, and pressure increases
- D. Hotter, denser, and pressure increases
- E. Colder, denser, and pressure increases

Image 6



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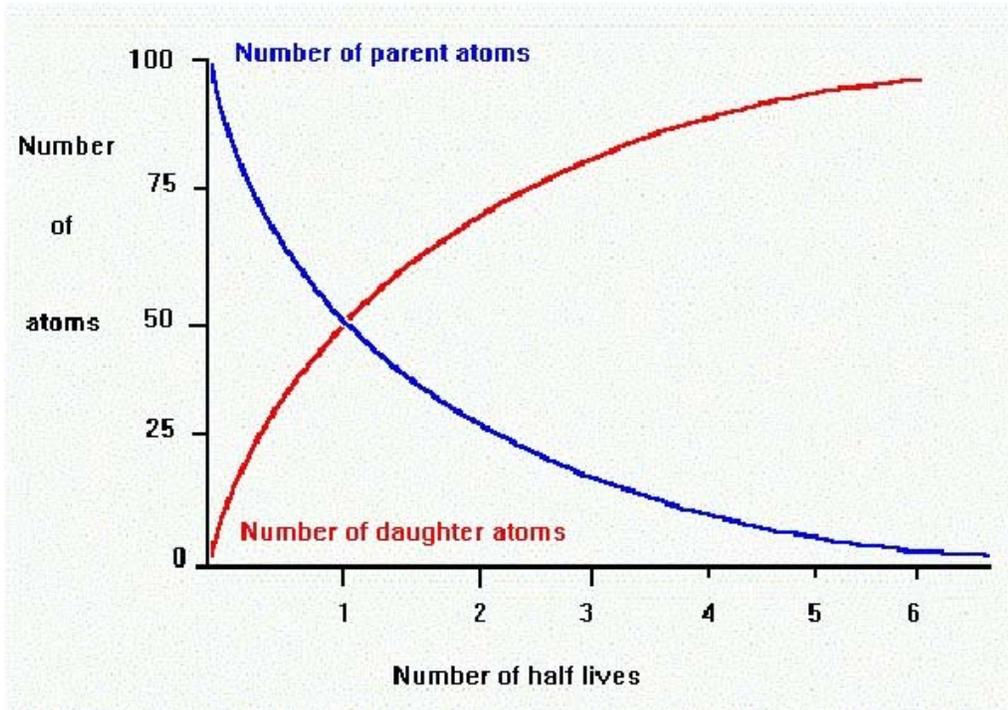
17. In the diagram (Image 6, above), you are looking at

- A. Rocks as they would appear below ground (in two slices at right angles to each other), with the surface of the earth on top.
- B. A map showing different roads crossing from a desert (B), and heading towards a forested region (F), and then into a grassland (E).
- C. A map showing water in the ocean and the "plumbing" below the earth that brings the water to the surface.
- D. None of the above.

18. You are looking at rocks in a cliff at the side of the road. The bottommost rocks are sandstones that contain fossils of a lizard known to live in a desert. The rocks above that include plant fossils typical of those from a swamp. The topmost rocks are a sandstone containing clam fossils. Which of the following must have happened at this location as these rocks were being deposited?

- A. a mountain eroded away
- B. sea level dropped
- C. sea level rose
- D. the climate got cooler

Image 7



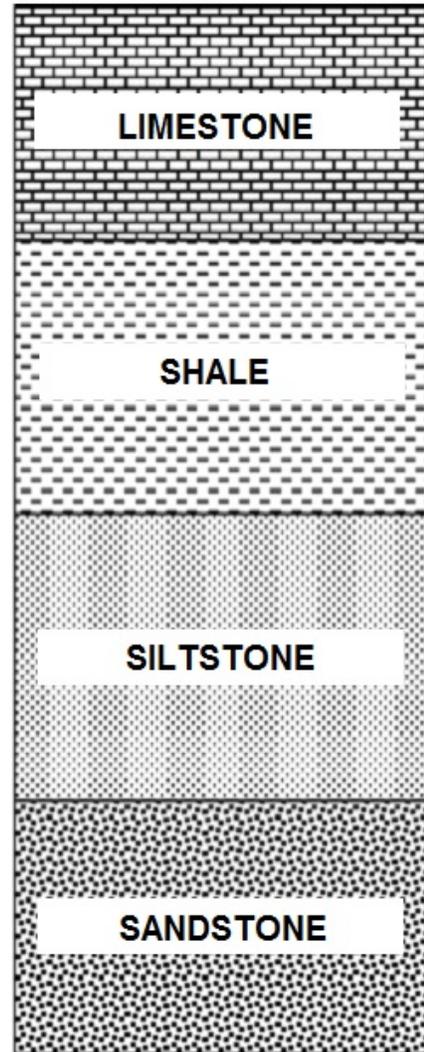
19. Look at the diagram (Image 7) above, which is used for determining the age of rocks. The two lines are labeled and represent number of parent and daughter atoms in a sample. As you move from left to right across the graph (along the x-axis)

- A. the total number of atoms in the sample decreases
- B. the total number of atoms in the sample increases
- C. the amount of time since the sample solidified increases
- D. the amount of time since the sample solidified decreases

Image 8

Questions 18 and 19 refer to the diagram to the right, which is a sketch of a rock layers in a cliff.

Limestone is the topmost layer and sandstone is the bottommost layer.



20. See Image 8: Which rock layer is the oldest?

- A. limestone
- B. shale
- C. siltstone
- D. sandstone

21. See Image 8: Which best describes how sea level was changing as these Rock layers were deposited?

- A. remained constant
- B. sea level was falling (water depth becomes shallower)
- C. sea level was rising (water depth becomes deeper)
- D. can't tell

22. One type of fish fossil is found only in a rock layer near the bottom of a canyon formed in undisturbed rock. A different kind of fish fossil is found only in a rock layer 4,000 feet higher, near the top of the canyon. Which statement would a scientist most likely offer to explain this situation?

⌋

- A. The fish in the lower layer lived in deeper water than the other fish.
- B. The fish in the upper layer lived more recently than the other fish.
- C. The rock in the lower layer is denser than the rock in the upper layer.
- D. The rock in the upper layer must have formed in fresh water.
- E. None of the above; there is not enough information provided.

23. Have you taken any Geology or General Science classes before? *CHOOSE ALL THAT APPLY*

- A. Yes, at Portland Community College
- B. Yes, at another college or university
- C. Yes, but not at a college or university (an example would be at high school)
- D. No

Done

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G 207 Assessment

G207 - Geology of the Pacific Northwest

Instructions: For each question, select the best possible response unless prompted to "Choose all that apply". If you see "Choose all that apply", then you should choose all of the responses that correctly answer the question.

*** 1. Please enter the 5 digit Course Number (CRN) and name of the class you are taking this survey for. For example: "27999 GS 106"**

2. *ONLY IF YOUR INSTRUCTOR HAS REQUESTED THIS INFORMATION*, Please enter your name and email address below. Leave these fields blank if your instructor has not made this request.

Your Name (First and Last)

Your pcc.edu email address

3. Which statement explains what a physiographic province is? *CHOOSE ALL THAT APPLY*

- A. Political unit
- B. Section of seafloor
- C. Region having a characteristic rock type and age
- D. Region having a characteristic geography (e.g. mountainous, large basin)

4. The group called the Pacific Border Provinces is subdivided into five provinces. Which have the lowest average elevation? *CHOOSE ALL THAT APPLY*

- A. Puget Sound
- B. Willamette Valley
- C. Klamath Mountains
- D. Coast Range
- E. Olympic Mountains

5. The Cascades Provinces group consists of the Cascades Range and the North Cascades. Which of the following statements best describes the differences in the characteristic rock found in each province?

- A. The Cascades consists largely of intrusive igneous rock, while volcanic rock is the dominant type of rock in the North Cascades.
- B. The Cascades consists largely of relatively young sedimentary rock, while the North Cascades consists largely of much older volcanic rock.
-

C. The North Cascades consists largely of intrusive igneous and metamorphic rock, while volcanic rock is the dominant type of rock in the Cascades.

6. Which of the following provinces contains a large system of faults indicating that the region is being stretched apart?

- A. North Cascades
- B. Basin and Range
- C. Rocky Mountains
- D. Columbia Plateau

7. The Intermontane province group consists of six provinces. Which of these has been shaped by a series of large ice-age floods?

- A. Blue Mountains
- B. Owyhee Uplands
- C. High lava plains
- D. Columbia Plateau
- E. Basin and Range

8. The Pacific Northwest is an active continental margin. What does this mean?

- A. There are no crustal plate boundaries in the region.
- B. There are plate boundaries adjacent to the continent that are in this area but there is little or no volcanic activity or earthquakes.
- C. There are plate boundaries adjacent to the continent that are in this area. Movement along these boundaries produces considerable volcanic activity, earthquakes, and mountain building.

Figure 1

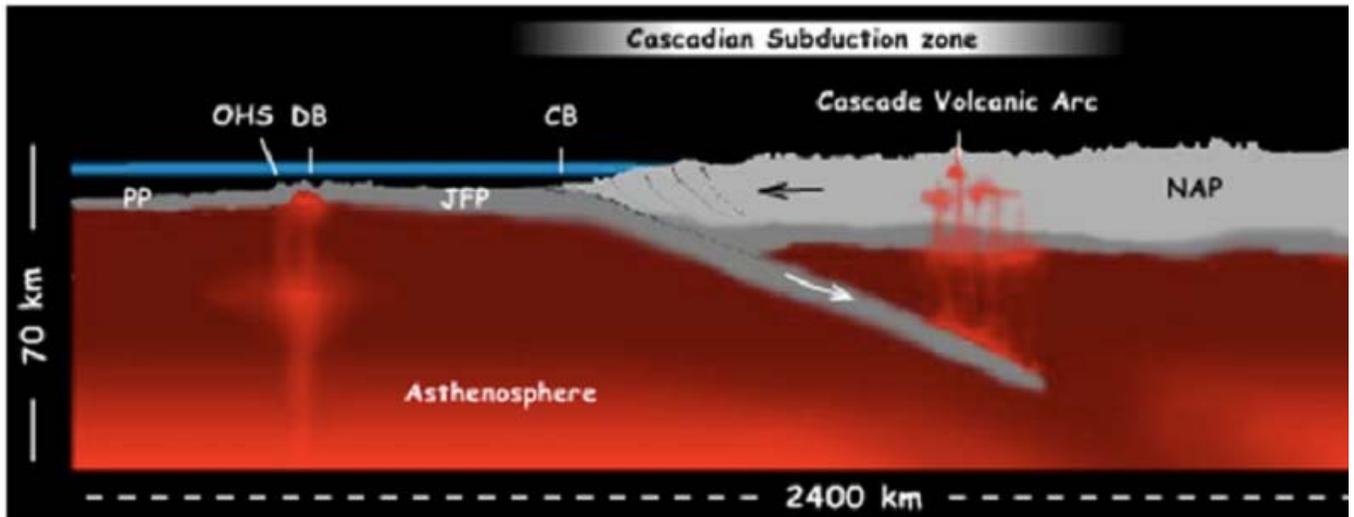


Figure 1

Legend: CB = Converging boundary DB = Diverging boundary
 OHS = Oceanic Hotspot CHS = Continental hotspot
 PP = Pacific Plate JFP = Juan de Fuca Plate NAP = North American Plate

9. Figure 1 is a cross-section of the earth's crust and upper mantle in the Pacific Northwest. What is happening at the place marked DB? *CHOOSE ALL THAT APPLY*

- A. Oceanic crust being pulling apart resulting in volcanic activity on the seafloor.
- B. Rock deep below the surface is melting due to changes in pressure.
- C. Seafloor is being subducted under the continent.
- D. Volcanic activity is caused by continental crust riding over the top of a plume of hot, rising rock in the upper mantle.

10. See Figure 1. What geologic processes are occurring in the area marked Cascadian subduction zone? *CHOOSE ALL THAT APPLY*

- A. Frequent earthquakes.
- B. Seafloor sediment being scraped off subducting seafloor
- C. Volcanic activity like the 1980 eruption of Mt. St. Helens.
- D. Ocean crust being pulled apart resulting in volcanic activity on the seafloor.

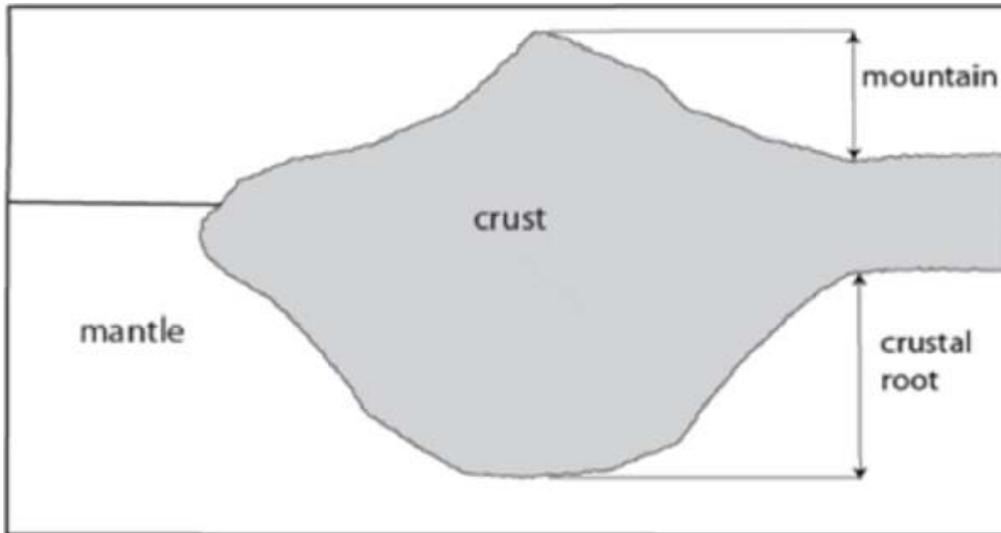
11. Are rocks and minerals alive?

- A. Yes, rocks and minerals grow
- B. Yes, rocks are made up of minerals
- C. Yes, rocks and minerals are always changing
- D. No, rocks and minerals do not reproduce
- E. No, rocks and minerals are not made up of atoms

12. What is the relationship between rock formation and Earth's surface?

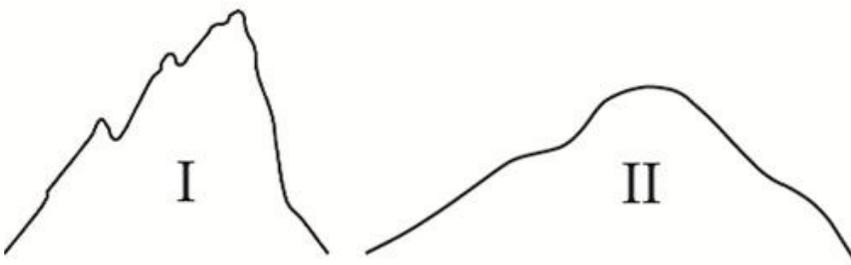
- A. Most rocks form underground and reach the Earth's surface as melted rock moves

- B. Most rocks form underground and reach the Earth's surface as other rocks are destroyed
- C. Most rocks form underground and never reach the Earth's surface
- D. Most rocks form at the Earth's surface and stay there for a long time

Figure 2

13. See Figure 2, above: How will the base of the crustal root respond to erosion of the overlying mountain?

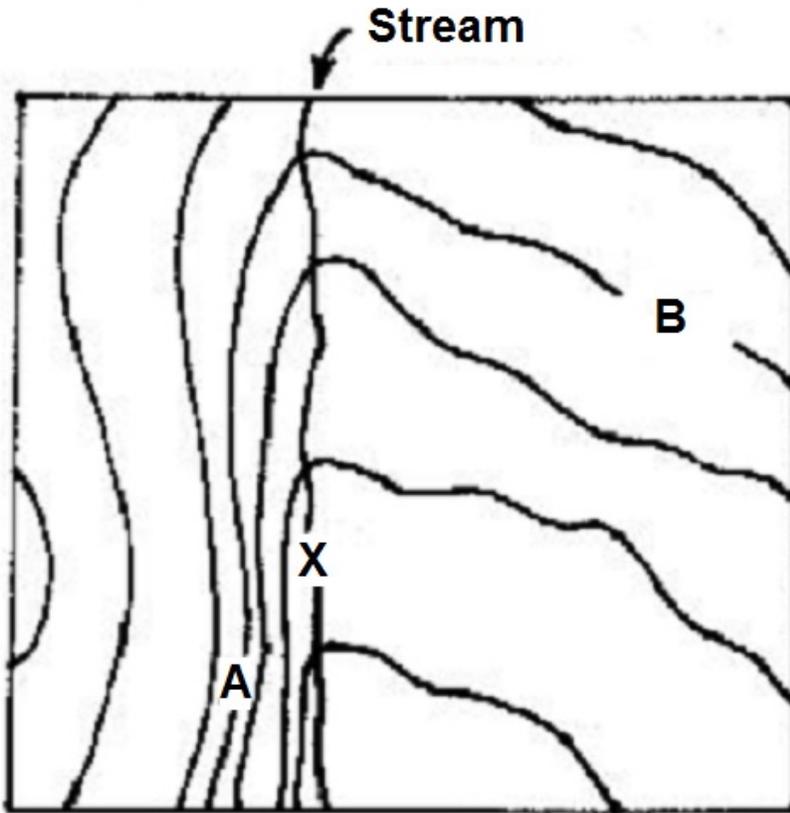
- A. The base of the crustal root will move down.
- B. The base of the crustal root will not move.
- C. The base of the crustal root will move up.

Figure 3

14. Figure 3 shows the outline of two mountains made up of the same type of rock. The mountains have finished growing. Which of the following reasons best explains the differences in the two sketches.

- A. Mountain I is older than Mountain II.
- B. Mountain II is older than Mountain I.
- C. Mountain I has more vegetation on it when compared to Mountain II.
- D. Mountain II is a more arid region than Mountain I.

Figure 4



15. Figure 4 shows contour lines as they cross stream X, which is drawn from North to South across the map area. If point B has an elevation of 400 feet, and the map has a contour interval of 20 feet what is the possible elevation of stream X as it leaves the map area?

- A. 410 feet
- B. 390 feet.
- C. 370 feet.
- D. 350 feet.
- E. 330 feet.

16. Which of the following best describes mountains?

- A. The oldest mountains are taller than the youngest mountains because the oldest mountains have been growing longer.
- B. The oldest mountains have gentler slopes than the youngest mountains because the oldest mountains have been wearing down longer.
- C. The oldest mountains have more vegetation than the youngest mountains because the oldest mountains have been wearing down longer.
- D. The oldest mountains have more jagged surfaces than the youngest mountains because the oldest mountains have been around longer.
- E. All mountains are roughly the same age regardless of shape size, vegetation, and jaggedness.

17. How far do you think continents move in a single year?

- A. A few inches
- B. A few hundred feet.
- C. A few miles.
- D. We have no way of knowing.
- E. Continents do not move.

18. Which of the following best describes the way in which the Willamette Valley formed?

- A. Erosion by the Willamette River.
- B. The valley floor staying flat while the Coast and Cascade Mountains rose on either side of it.
- C. The valley floor dropping along faults.
- D. None of the above.

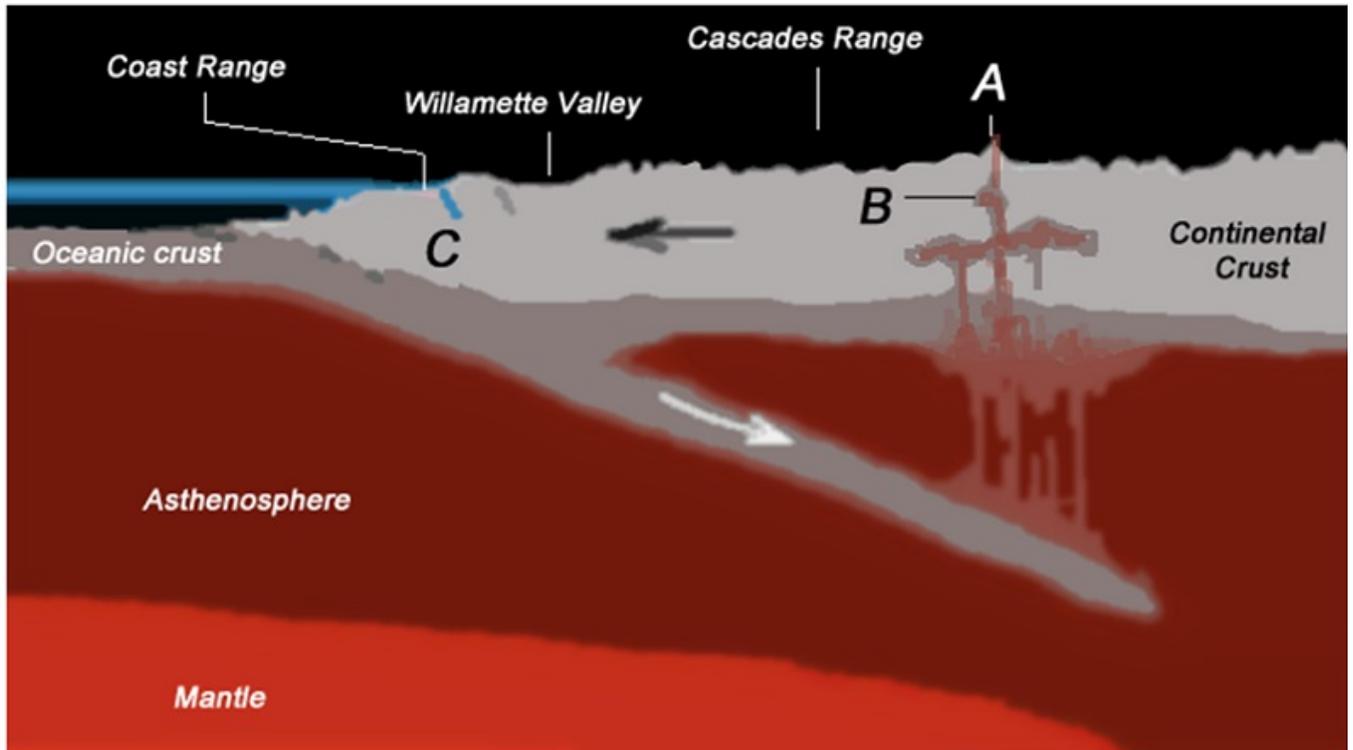
19. The Snake River plain contains a series of buried and visible Calderas. How did these structures form?

- A. By meteorite impacts.
- B. By glacial erosion.
- C. By volcanic activity above a continental hot spot.
- D. By volcanic activity above a subducting plate.

20. As you move from Yellowstone National Park to the Oregon border what happens to age of the Calderas in the Snake River Plain?

- A. They become older.
- B. They stay the same age.
- C. They become younger.
- D. There is no trend in their age.

Figure 5



A = Stratovolcano in the Cascades Range
 B = Magma chamber below stratovolcano
 C = Accretionary wedge

21. Where in figure 5 would plutonic igneous rocks such as granite form?

- A. Location A.
- B. Location B.
- C. Location C.
- D. None of the previous

22. Where in figure 5 are seafloor sediment, and marine sedimentary and metamorphic rock being added to the edge of the continent?

- A. Location A.
- B. Location B.
- C. Location C.
- D. None of the previous

23. Have you taken any Geology or General Science classes before? *CHOOSE ALL THAT APPLY*

- A. Yes, at Portland Community College
- B. Yes, at another college or university
- C. Yes, but not at a college or university (an example would be at high school)
- D. No

Done

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<style type="text/css" media="all">form {display:none;} #jserror {text-align:center;margin-top:50px;}</style><div id="jserror" class="qHeader">Javascript is required for this site to function, please enable.</div>



G 208 Assessment

G208 - Volcanoes

Instructions: For each question, select the best possible response unless prompted to "Choose all that apply". If you see "Choose all that apply", then you should choose all of the responses that correctly answer the question.

*** 1. Please enter the 5 digit Course Number (CRN) and name of the class you are taking this survey for. For example: "27999 GS 106"**

2. *ONLY IF YOUR INSTRUCTOR HAS REQUESTED THIS INFORMATION*, Please enter your name and email address below. Leave these fields blank if your instructor has not made this request.

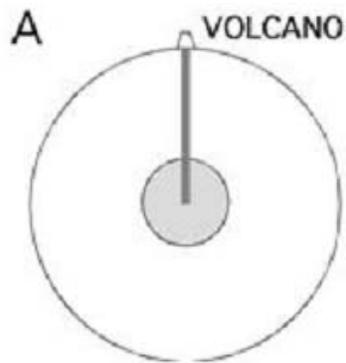
Your Name (First and Last)

Your pcc.edu email address

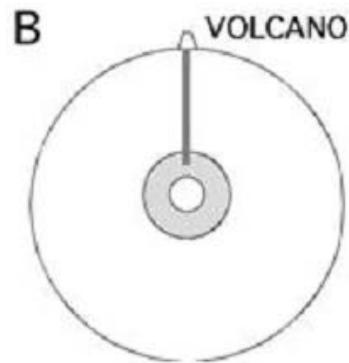
3. A student has a black rock that does not reflect light. The student cuts it open and the inside is the same as the outside. Can the student determine that this rock contains iron-rich minerals simply by looking at it? [

- A. Yes. The student would know that black rocks do not contain iron.
- B. Yes. The student would be able to see silver specks if the rock contains iron.
- C. Yes. The student can use a magnifying glass to see if the rock contains iron.
- D. No. The student would not be able to see if the rock contains iron even with a magnifying glass.
- E. No. The student cannot look at the rock since it does not reflect light and is therefore invisible.

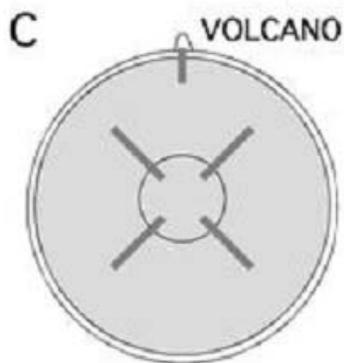
Image 1



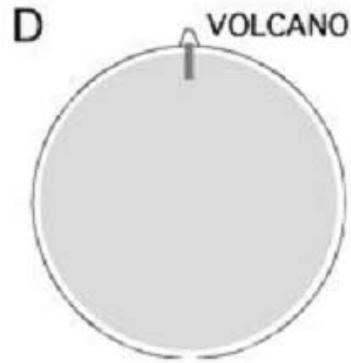
A. Material comes from the Earth's melted center



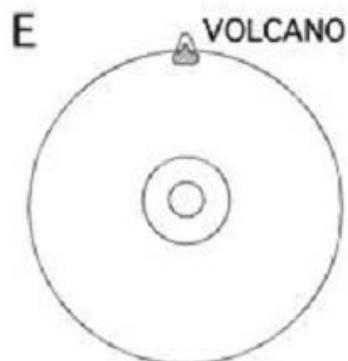
B. Material comes from a melted layer near the Earth's center



C. Material travels from the Earth's melted center and mixes with a melted layer beneath the Earth's surface



D. Material comes from a melted layer beneath the Earth's surface



E. Material comes from pockets of melted material beneath the Earth's surface

4. See Image 1. When volcanoes erupt, which diagram most closely represents where most volcanic material come from?

- A.
- B.
- C.
- D.

E.

Image 2 (A - D)



(A)



(B)



(C)



(D)

Examine the pictures of the rocks above before answering question number 4.

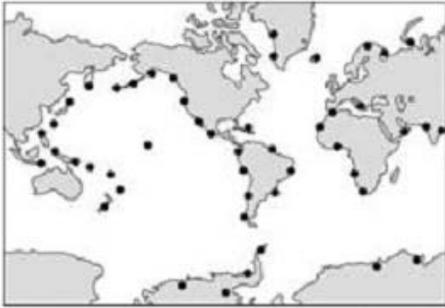
5. Which rock formed when gas-rich lava erupted explosively at the Earth's surface?

- A.
- B.
- C.
- D.

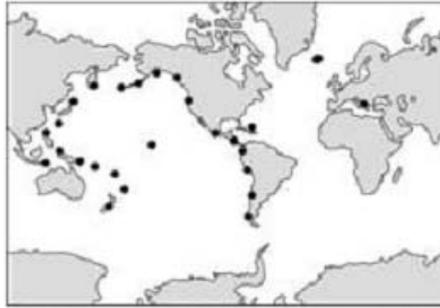
6. Which rock formed when magma deep below the Earth's surface cooled and solidified?

- A.
- B.
- C.
- D.

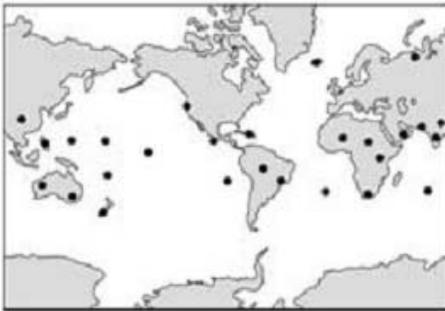
Image 3



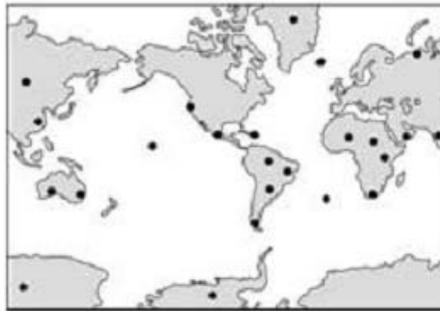
A. Mostly along the margins of the Pacific and Atlantic Oceans



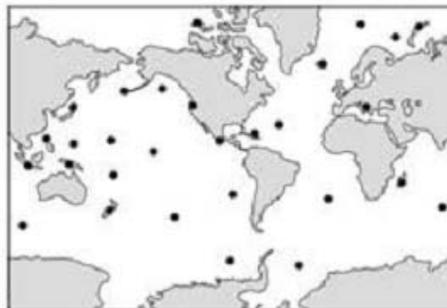
B. Mostly along the margins of the Pacific Ocean



C. Mostly in warm climates



D. Mostly on continents



E. Mostly on islands

7. See Image 3. The above maps show the position of the Earth's continents and oceans. The dots on each map mark the locations where volcanic eruptions occur.

Which map most closely represents the places where these volcanoes are typically observed?

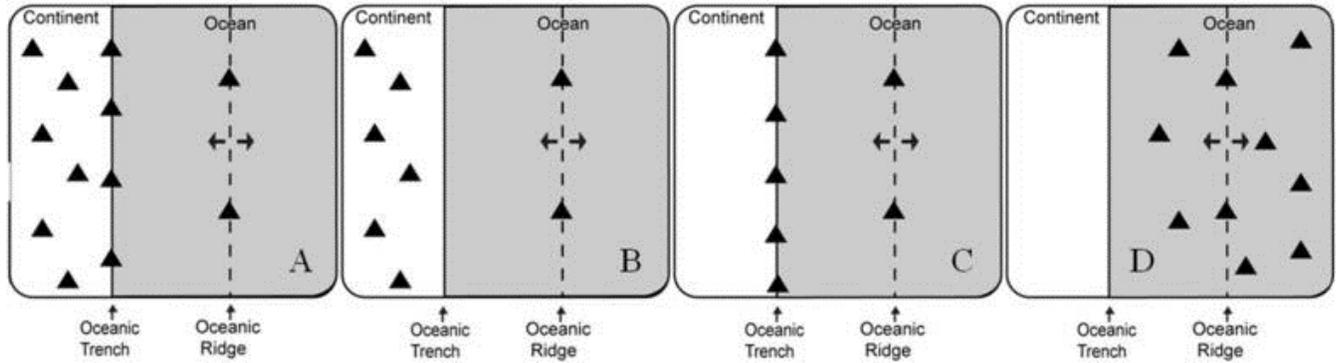
- A.
- B.
- C.
- D.
- E.

8. Which of the following are necessary for a volcano to form?

-

- A. Warm climate
- B. Fault lines
- C. Melted rocks
- D. Cold climate

Image 4



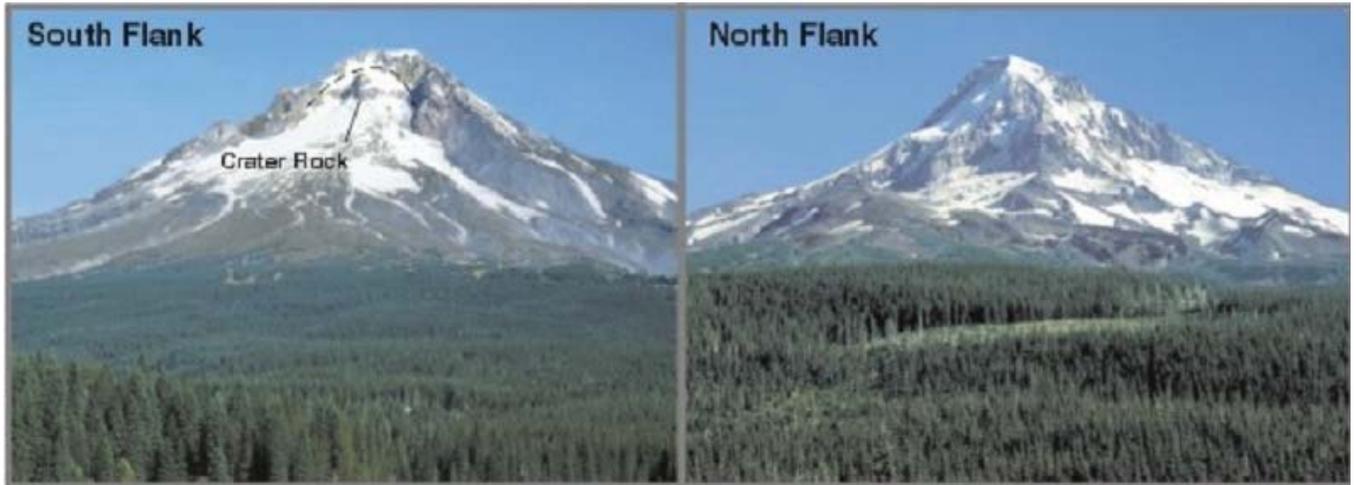
9. See Image 4. The maps above show the surface of the Earth as viewed from the sky. Which map best illustrates where volcanoes, marked with ▲ symbol, would be located?

- A.
- B.
- C.
- D.

10. A large, ashy volcanic eruption occurs in Europe. What effect could this eruption have on the air temperature at the Earth's surface one year later?

- A. Volcanic eruptions do not affect air temperature at the Earth's surface
- B. Air at the Earth's surface would be warmer, but only in the northern hemisphere
- C. Air would be warmer at most of the Earth's surface
- D. Air at the Earth's surface would be colder, but only in the northern hemisphere
- E. Air would be colder at most of the Earth's surface

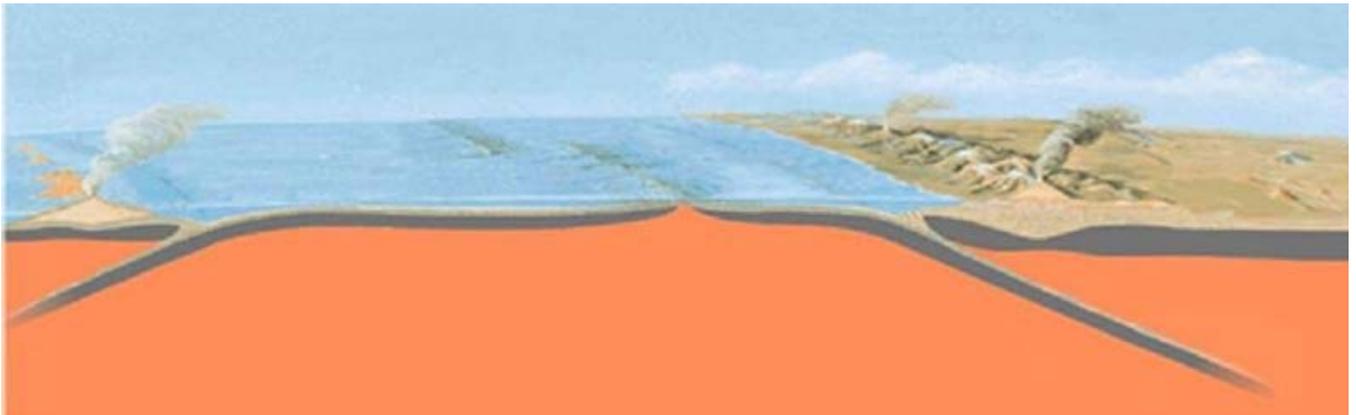
Image 5



11. Crater Rock shown in the picture of Mount Hood above is likely formed from what type of rock?

- A. andesite
- B. basalt
- C. granite
- D. gabbro

Image 6



12. In the figure (Image 6) above, how many tectonic plates are illustrated?

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

13. Which of the following is/are hazard(s) related to volcanoes? *CHOOSE ALL THAT APPLY*

- A. Mudflows
- B. Lava flows
- C. Hurricanes

- D. Thunderstorms
- E. Earthquakes

14. Rock melts due to: *CHOOSE ALL THAT APPLY*

- A. an increase in pressure
- B. an increase in heat
- C. a decrease in pressure
- D. addition of water to the rock

15. A volcanic eruption can be generated by: *CHOOSE ALL THAT APPLY*

- A. molten rock rising to the Earth's surface
- B. wind moving over the top of the volcano
- C. a hotter than usual summer climate
- D. a full moon

16. Which of the following can describe a volcano? *CHOOSE ALL THAT APPLY*

- A. a tall mountain with a crater at the top
- B. a large, round depression in the Earth's surface
- C. a broad, shallow-sloped hill
- D. a large crack in the ground
- E. a small, steep cone-shaped hill

17. Basalt is a type of rock that forms from some volcanic eruptions. This rock:

- A. occurs on continents
- B. occurs in the oceans
- C. occurs on islands
- D. can occur in two of these locations
- E. can occur in all of these locations

18. Scientists today:

- A. have been able to predict eruptions to the day and time
- B. have been able to forecast eruptions within a few days
- C. have been able to forecast eruptions within a few years
- D. still do not know when a volcano is about to erupt

19. A volcano that has not erupted in 100 years is considered:

- A. active
- B. dormant
-

C. extinct

D. may be any of these

20. Volcanic eruptions that are presently occurring in Hawaii:

- A. only occur on one island
- B. only occur on two islands
- C. only occur on three islands
- D. occur on all the Hawaiian islands
- E. there are no volcanic eruptions currently occurring in Hawaii

21. Over time, an individual volcano can have different volcanic eruptions of: *CHOOSE ALL THAT APPLY*

- A. only volcanic ash
- B. only lava flows
- C. volcanic ash and lava flows
- D. only steam (hot gas)

22. Mount St. Helens in Washington last erupted in:

- A. 1780
- B. 1808
- C. 1980
- D. 2008
- E. Mount St. Helens has not erupted since humans have been living in the northwest U.S.

23. Have you taken any Geology or General Science classes before? *CHOOSE ALL THAT APPLY*

- A. Yes, at Portland Community College
- B. Yes, at another college or university
- C. Yes, but not at a college or university (an example would be at high school)
- D. No

Done

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<style type="text/css" media="all">form {display:none;} #jserror {text-align:center;margin-top:50px;}</style><div id="jserror" class="qHeader">Javascript is required for this site to function, please enable.</div>
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G 209 Assessment

G209 - Earthquakes

Instructions: For each question, select the best possible response unless prompted to "Choose all that apply". If you see "Choose all that apply", then you should choose all of the responses that correctly answer the question.

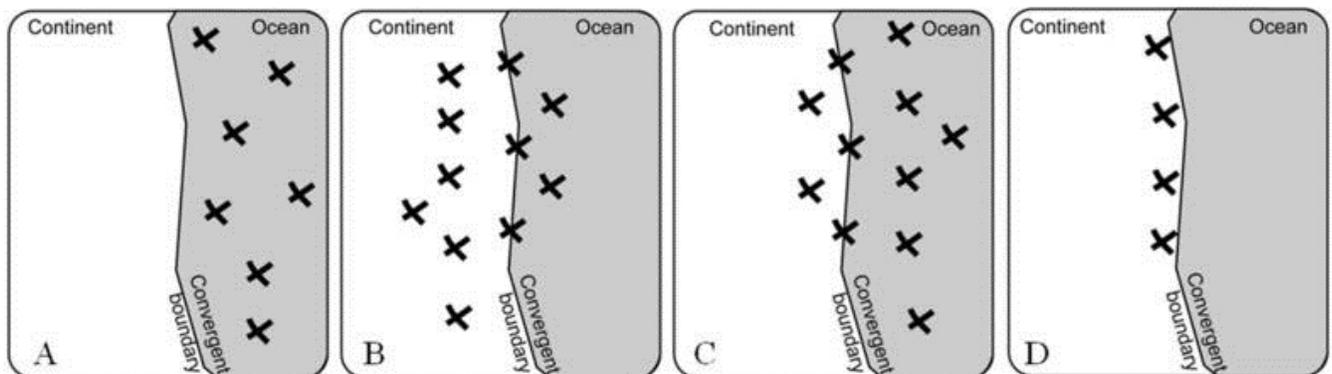
*** 1. Please enter the 5 digit Course Number (CRN) and name of the class you are taking this survey for. For example: "27999 GS 106"**

2. *ONLY IF YOUR INSTRUCTOR HAS REQUESTED THIS INFORMATION*, Please enter your name and email address below. Leave these fields blank if your instructor has not made this request.

Your Name (First and Last)

Your pcc.edu email address

Image 1



3. The maps in Image 1 (above) show the surface of the Earth as viewed from the sky. Which map best illustrates where earthquake epicenters, marked with an X, would be located?

- A.
- B.
- C.
- D.

4. How far do you think continents move in a single year?

- A. A few inches
- B. A few hundred feet

- C. A few miles
- D. We have no way of knowing
- E. Continents do not move

5. Which of the following will NOT cause a tsunami?

- A. deep-focus earthquake in Wadati-Benioff zone
- B. landslide into water
- C. impact of meteoroid into water
- D. explosive eruption of volcanic island
- E. shallow-focus earthquake along locked portion of subduction zone

6. What else besides the size of the earthquake affects the amount of shaking felt at a particular location?

- A. the depth of earthquake
- B. the distance to the earthquake
- C. the type of material at the Earth's surface
- D. all of the above

7. Which type of material will produce the least shaking?

- A. bedrock
- B. artificial fill
- C. river sediments
- D. lake sediments

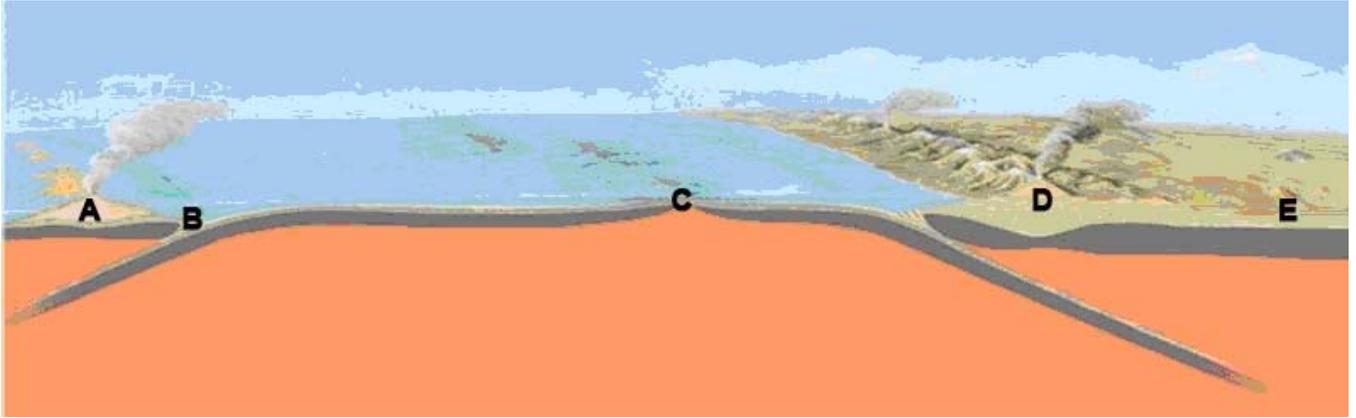
8. Earthquakes occur in which layers of the Earth?

- A. inner core
- B. outer core
- C. asthenosphere
- D. lithosphere

9. According to the elastic rebound theory for earthquake generation, the energy released by earthquakes represents stored energy associated with

- A. bending of the earth
- B. pressure within the earth
- C. heating of the earth
- D. volcanic activity within the earth
- E. tidal deformation of the earth

Image 2



10. Examine the lettered regions in the figure (Image 2) above. Which region is expected to have the largest magnitude earthquakes?

- A.
- B.
- C.
- D.
- E.

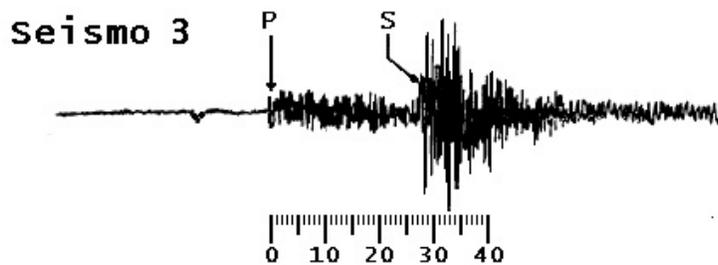
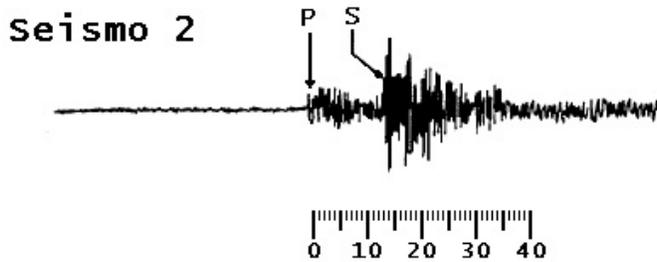
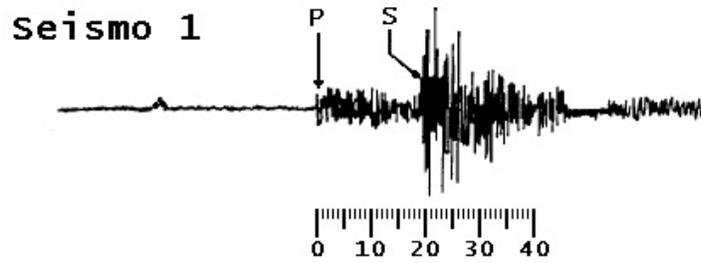
11. In the figure (Image 2, above), how many tectonic plates are illustrated?

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

12. What controls how fast seismic waves travel?

- A. the size of the earthquake
- B. the size of the fault which caused the earthquake
- C. the type of fault which caused the earthquake
- D. the material the earthquake waves travel through
- E. the direction in which the earthquake waves travel through the material

Image 3



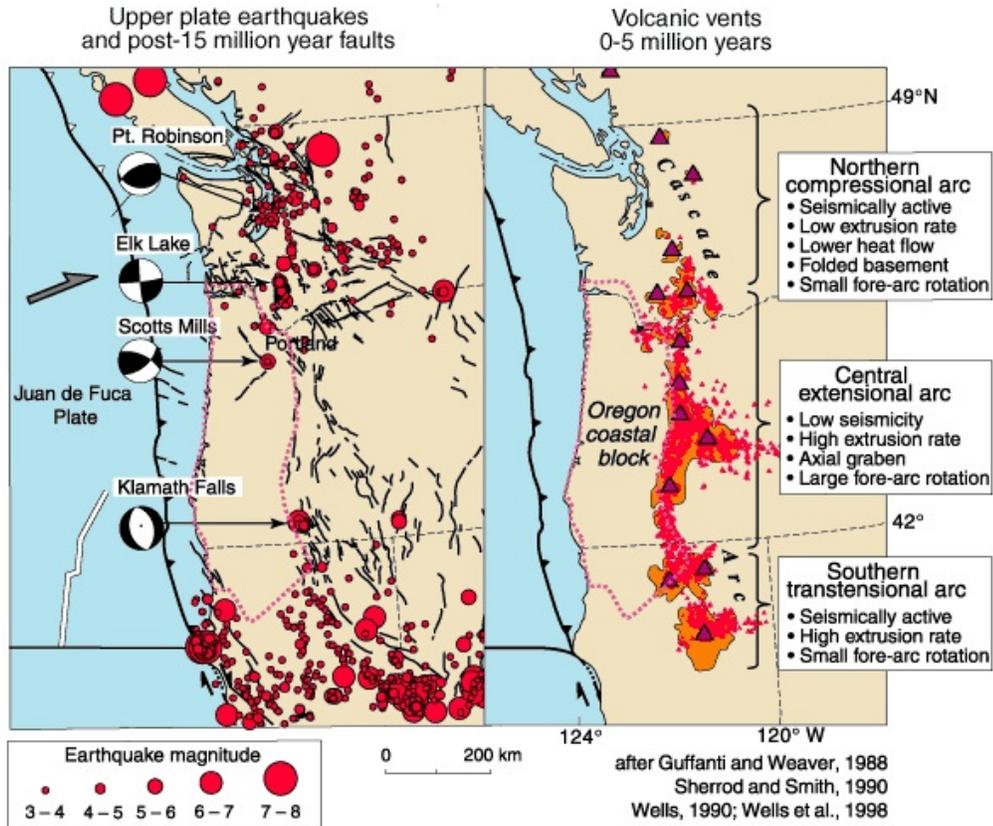
13. Seismograms Seismo 1, Seismo 2 and Seismo 3 (Image 3, above) are all from the same earthquake. Which seismometer was located furthest from the earthquake?

- A. Seismo 1
- B. Seismo 2
- C. Seismo 3

14. What controls how fast tsunami travel?

- A. the size of the earthquake triggering the tsunami
- B. the type of motion on the fault triggering the tsunami
- C. the depth of the water through which the tsunami travels
- D. the temperature of the water through which the tsunami travels
- E. the phase of the tides when the when the earthquake strikes

Image 4



15. In the figure (Image 4, above), which earthquake is caused by strike slip motion?

- A. Pt. Robinson
- B. Elk Lake
- C. Scott Mills
- D. Kalamath Falls

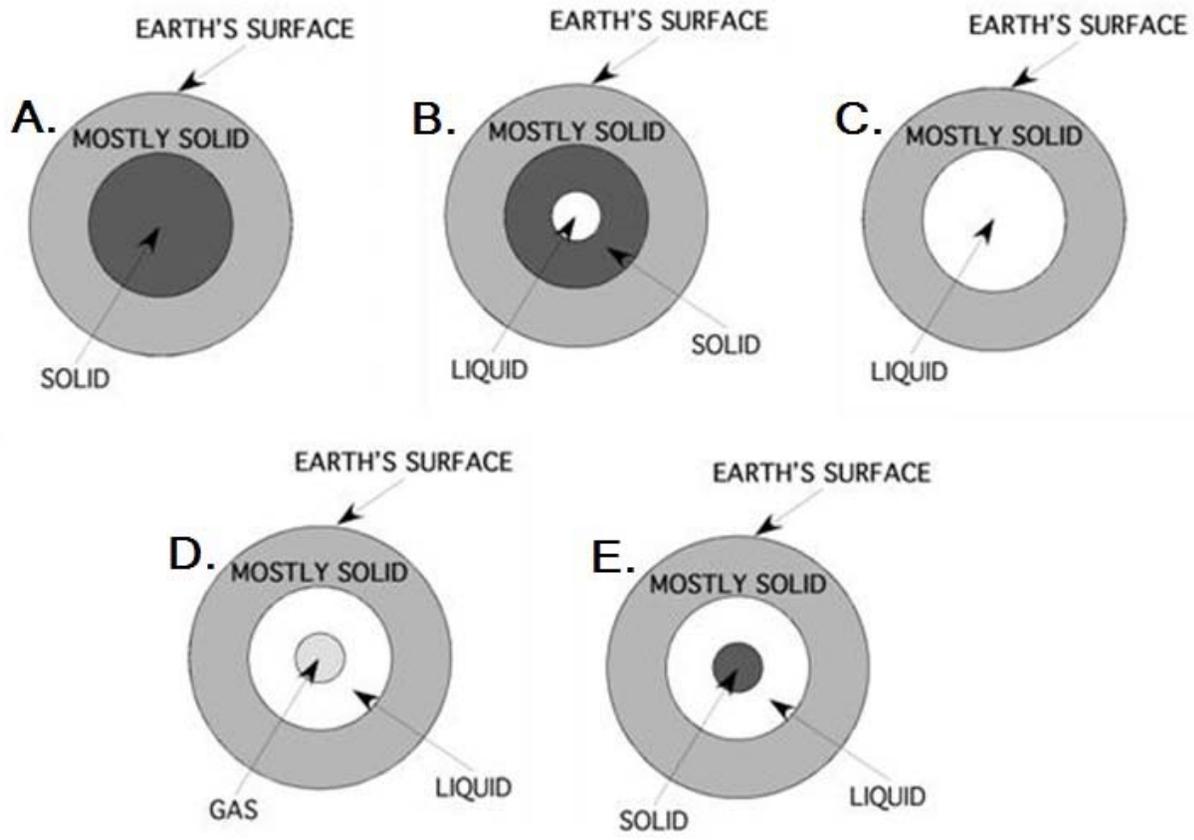
16. Where do deep earthquakes most commonly occur?

- A. Along transform plate boundaries
- B. Along divergent plate boundaries
- C. Along convergent plate boundaries
- D. Beneath volcanic hot spot volcanoes

17. Which of the following describes what scientists mean when they use the word “earthquake”?

- A. When an earthquake occurs, visible cracks appear on the Earth’s surface
- B. When an earthquake occurs, people can feel the earth shake
- C. When an earthquake occurs, man-made structures are damaged
- D. When an earthquake occurs, energy is released inside the Earth
- E. When an earthquake occurs, the gravitational pull of the Earth increases

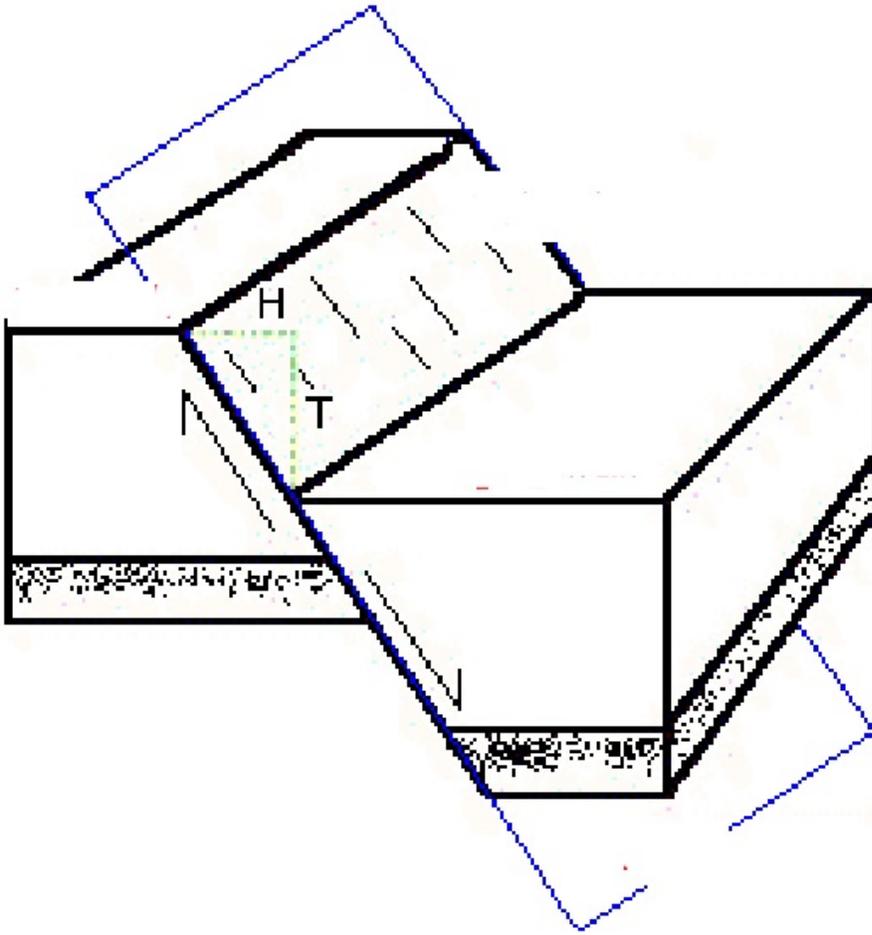
Image 5



18. Which of the following is most closely related to what you might see if you cut the Earth in half?

- A.
- B.
- C.
- D.
- E.

Image 6



19. The fault in the figure (Image 6) above is an example of which kind of fault?

- A. normal
- B. reverse
- C. right-lateral strike-slip
- D. left-lateral strike-slip

20. The fault in the figure (Image 6) above is caused by

- A. tension
- B. compression
- C. shearing (rotational stress)

21. The fault in the figure (Image 6) above is typically found at which type of plate boundary?

- A. convergent
- B. transform
- C. divergent

22. Which of the following is/are hazard(s) related to earthquakes? *CHOOSE ALL THAT APPLY*

A. Landslides

- B. Building Collapses
- C. Hurricanes
- D. Thunderstorms
- E. Fires

23. Have you taken any Geology or General Science classes before? *CHOOSE ALL THAT APPLY*

- A. Yes, at Portland Community College
- B. Yes, at another college or university
- C. Yes, but not at a college or university (an example would be at high school)
- D. No

Done

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<style type="text/css" media="all">form {display:none;} #jserror {text-align:center;margin-top:50px;}</style><div id="jserror" class="qHeader">Javascript is required for this site to function, please enable.</div>



GS 106 Assessment

GS 106 - Physical Science (Geology)

Instructions: For each question, select the best possible response unless prompted to "Choose all that apply". If you see "Choose all that apply", then you should choose all of the responses that correctly answer the question.

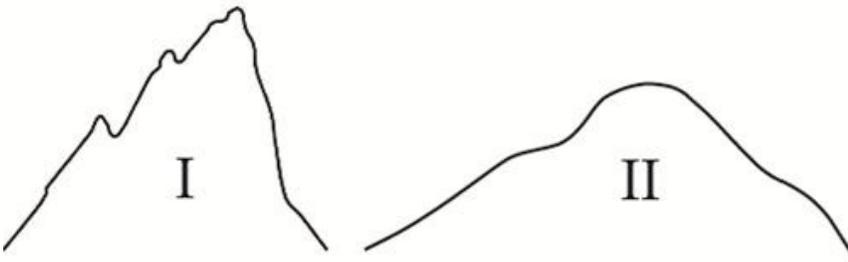
*** 1. Please enter the 5 digit Course Number (CRN) and name of the class you are taking this survey for. For example: "27999 GS 106"**

2. *ONLY IF YOUR INSTRUCTOR HAS REQUESTED THIS INFORMATION*, Please enter your name and email address below. Leave these fields blank if your instructor has not made this request.

Your Name (First and Last)

Your pcc.edu email address

Image 1

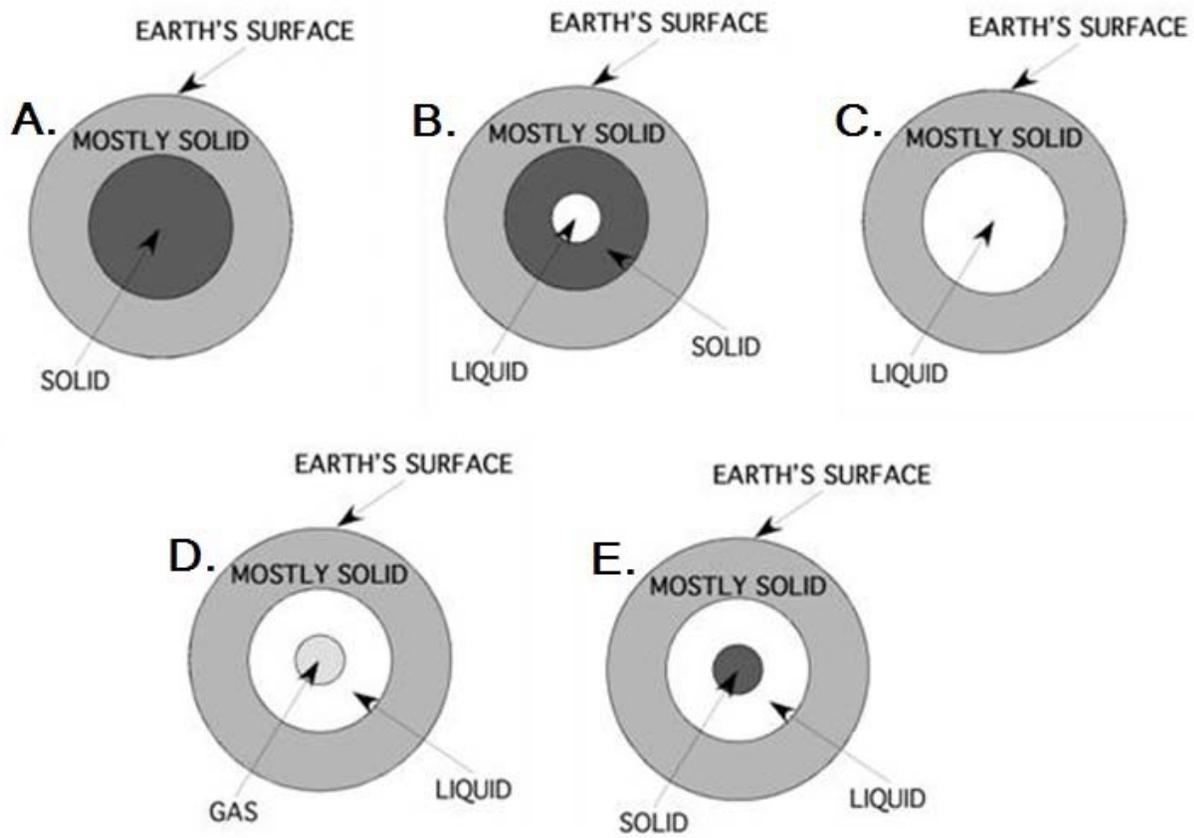


3. The sketches in Image 1 represent the outlines of two mountains made up of the same type of rock. The mountains have finished growing.

Which of the following reasons best explains the differences in the two sketches?

- A. Mountain I is older than Mountain II
- B. Mountain II is older than Mountain I
- C. Mountain I is on a continent that is moving faster than the continent Mountain II is on
- D. Mountain I is on a continent that is moving slower than the continent Mountain II is on

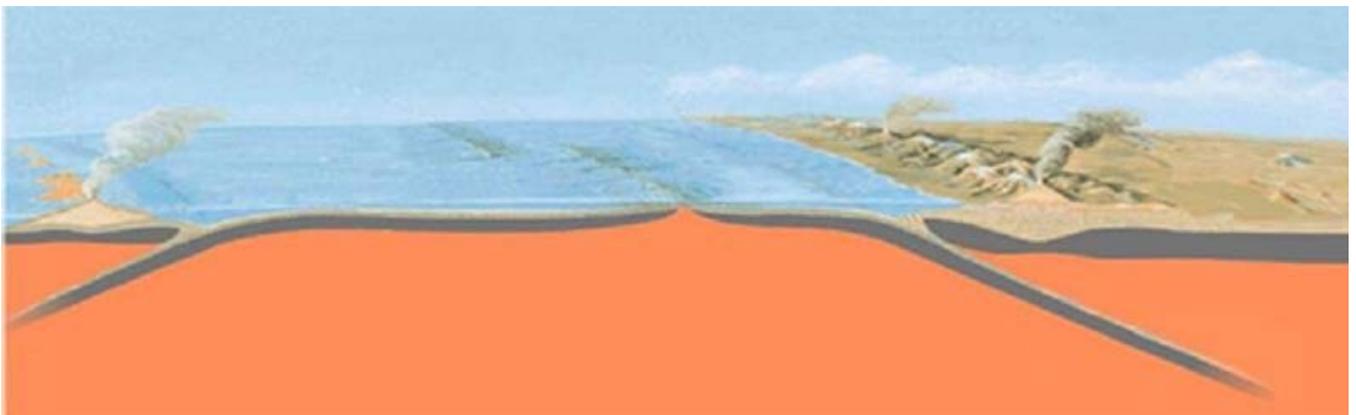
Image 2



4. From Image 2, which of the following is most closely related to what you might see if you cut the Earth in half?

- A.
- B.
- C.
- D.
- E.

Image 3



5. In Image 3, how many tectonic plates are illustrated?

- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

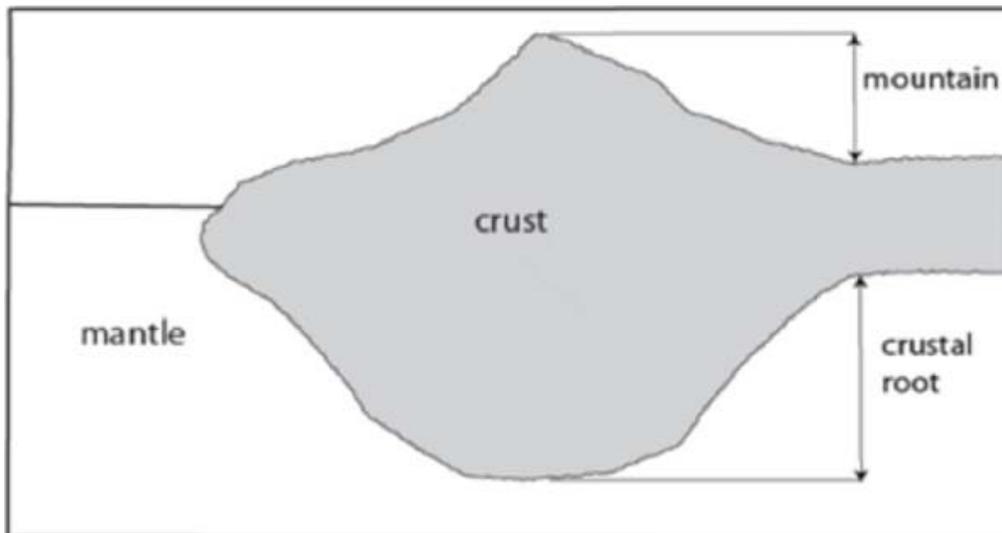
6. How far do you think continents move in a single year?

- A. A few inches
- B. A few hundred feet
- C. A few miles
- D. We have no way of knowing
- E. Continents do not move

7. How far do you think the oceanic crust moves in a single year?

- A. A few inches
- B. A few hundred feet
- C. A few miles
- D. We have no way of knowing
- E. Oceanic crust does not move

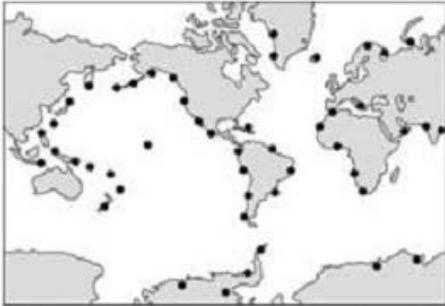
Image 4



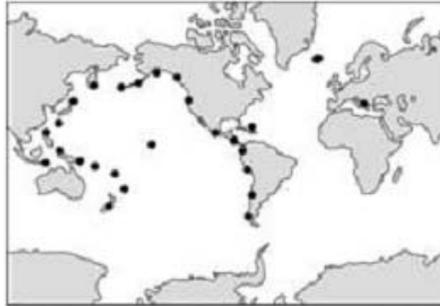
8. See Image 4: How will the base of the crustal root respond to erosion of the overlying mountain?

- A. The base of the crustal root will move down
- B. The base of the crustal root will not move
- C. The base of the crustal root will move up

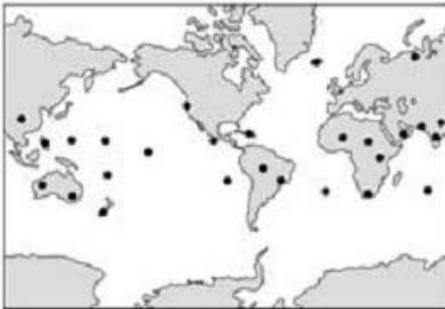
Image 5



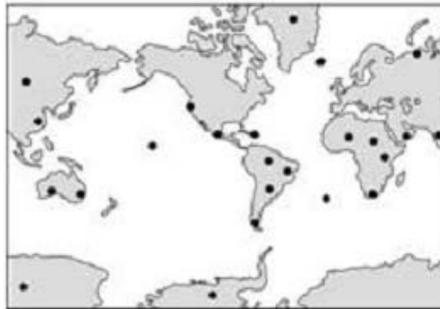
A. Mostly along the margins of the Pacific and Atlantic Oceans



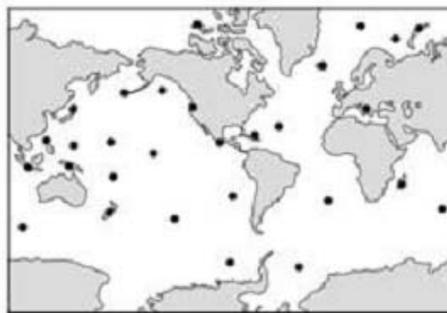
B. Mostly along the margins of the Pacific Ocean



C. Mostly in warm climates



D. Mostly on continents



E. Mostly on islands

9. The maps in Image 5 show the position of the Earth's continents and oceans.

The dots on each map mark the locations where volcanic eruptions occur.

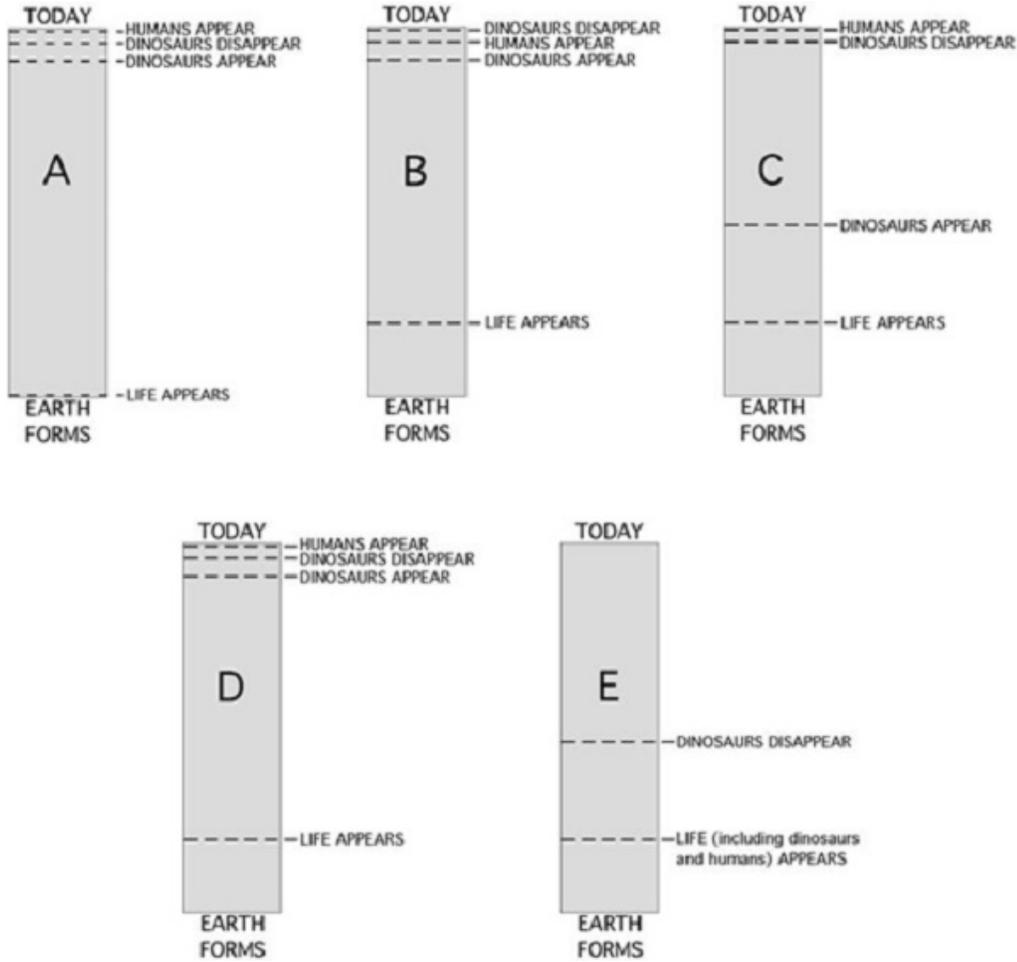
Which map do you think most closely represents the places where these volcanoes are typically observed?

- A.
- B.
- C.
- D.
- E.

10. Which of the following statements about the age of rocks is most likely true?

- A. Rocks found in the ocean are about the same age as rocks found on continents
- B. Rocks found on continents are generally older than rocks found in the ocean
- C. Rocks found in the ocean are generally older than rocks found on continents
- D. Ages of rocks are not precise enough to determine which rock type is older

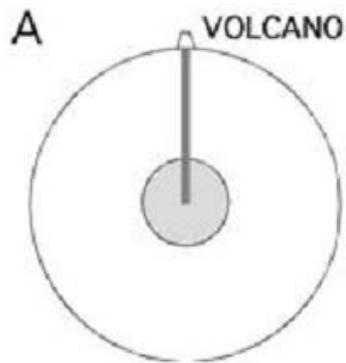
Image 6



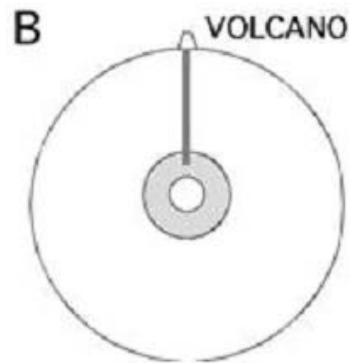
11. Which of the figures in Image 6 do you think most closely represents changes in life on Earth over time?

- A.
- B.
- C.
- D.
- E.

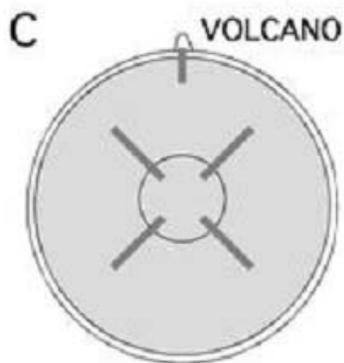
Image 7



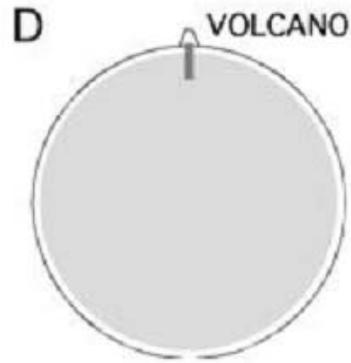
A. Material comes from the Earth's melted center



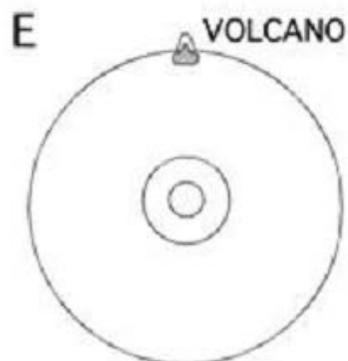
B. Material comes from a melted layer near the Earth's center



C. Material travels from the Earth's melted center and mixes with a melted layer beneath the Earth's surface



D. Material comes from a melted layer beneath the Earth's surface



E. Material comes from pockets of melted material beneath the Earth's surface

12. See Image 7: When volcanoes erupt, which diagram most closely represents where most volcanic material come from?

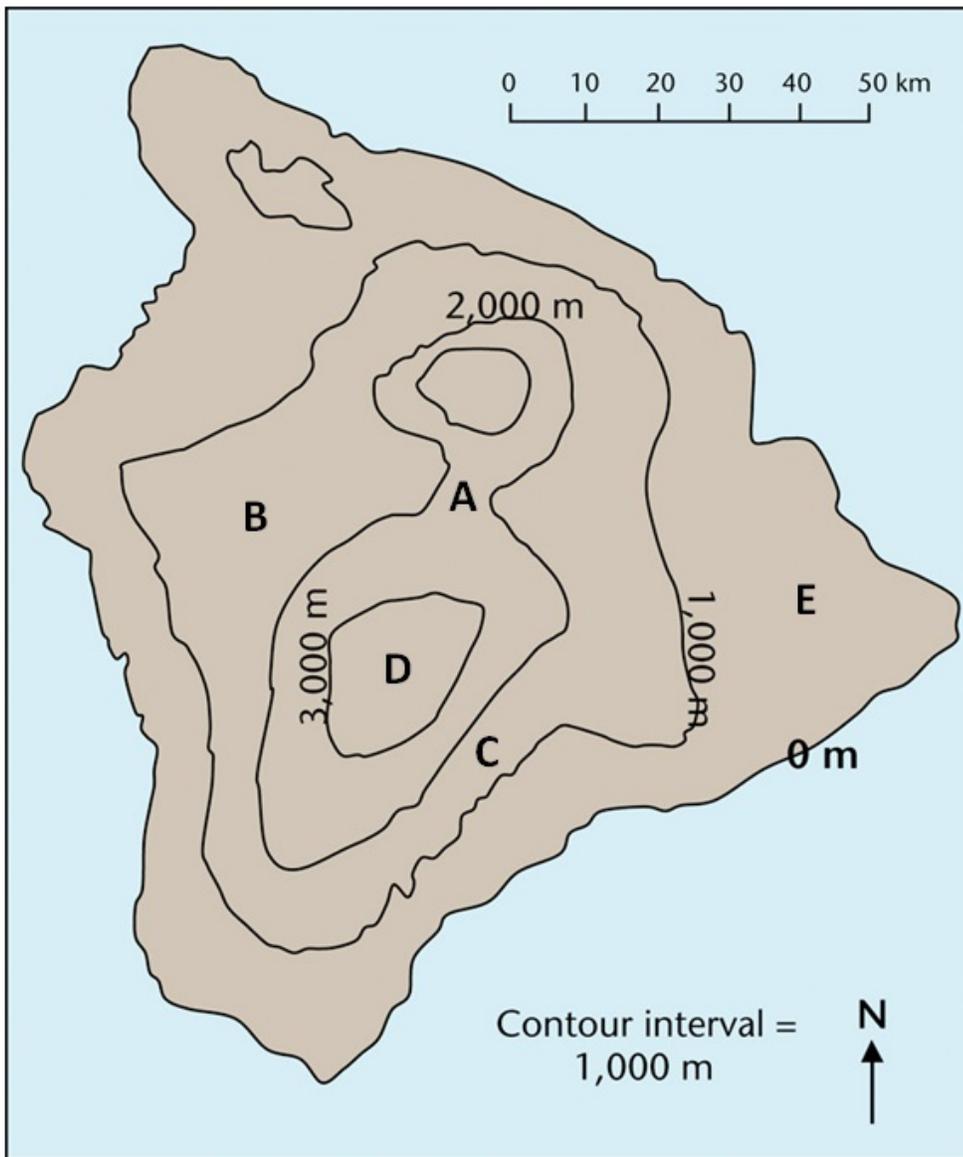
- A.
- B.
- C.
- D.

E.

13. Scientists think the Earth formed approximately ____ ago.

- A. 4000 years
 B. 100 million years
 C. 4.5 billion years
 D. 13.8 billion years
 E. we have no estimate for when the Earth formed.

Image 8



14. Examine the topographic map above (Image 8). If you were standing a location A what would best describe the landscape in your immediate vicinity?

- A. mountain top

- B. ridge
- C. saddle
- D. valley
- E. pit

15. Examine the topographic map above (Image 8). If you were standing a location A what would best describe your elevation?

- A. 1,500 m
- B. 2,000 m
- C. 2,500 m
- D. 3,000 m
- E. 3,500 m

16. Examine the topographic map above (Image 8). If you were standing a location C which direction would be downhill?

- A. NW
- B. NE
- C. SE
- D. SW
- E. S

Image 9 (A - E)



(A)



(B)



(C)



(D)



(E)

Examine the pictures of the rocks above before answering questions 15-17

17. See Images 9 (a), (b), and (c). Which rock was formed from material deposited by running water?

- A.
- B.
- C.
- D.
- E.

18. Which rock formed when a lava flow at the Earth's surface cooled and solidified?

- A.
- B.
- C.
- D.
- E.

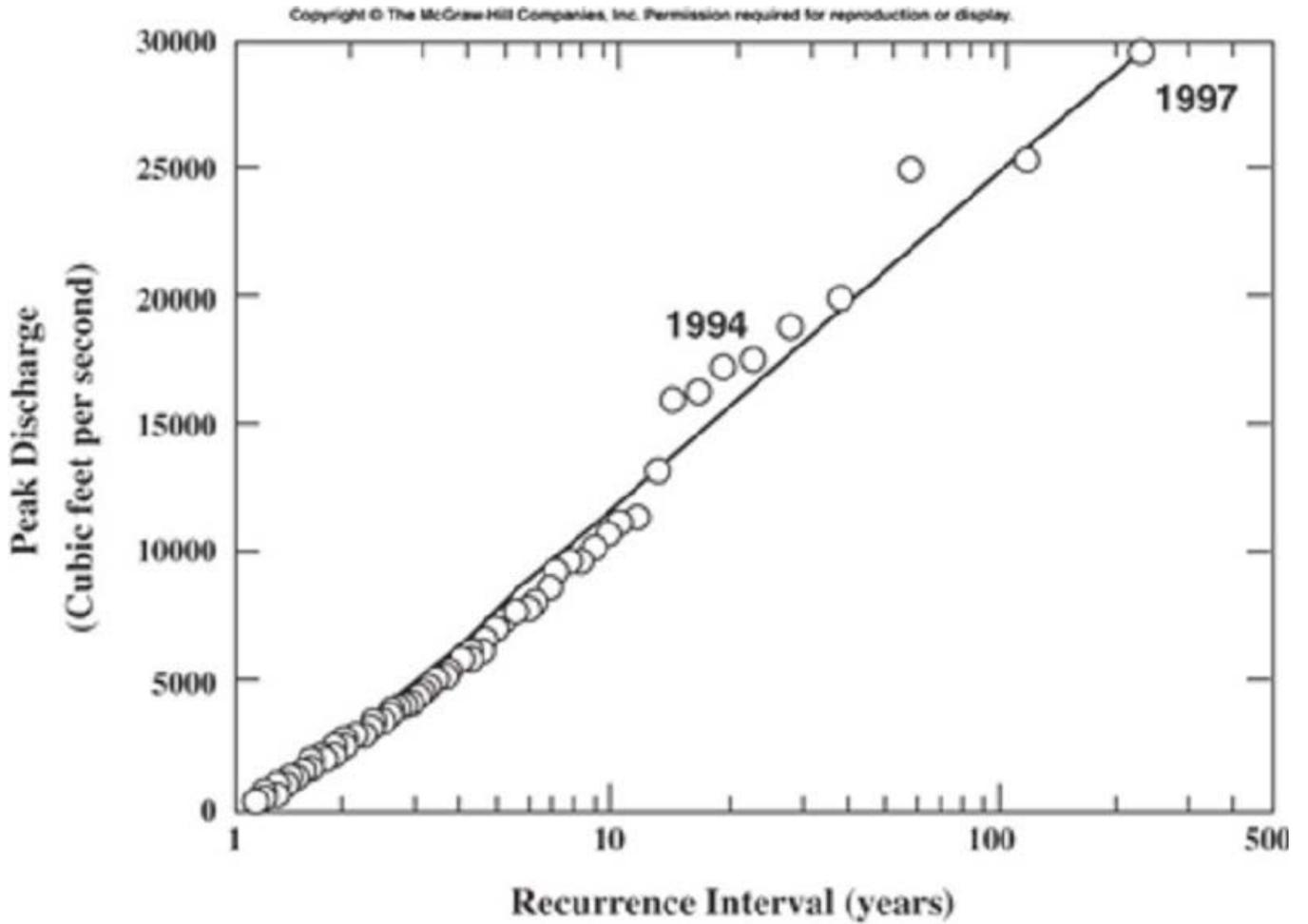
19. Which rock formed by solid state alteration of a pre-existing rock during a continent-continent collision?

- A.
- B.
- C.
- D.
- E.

20. Where do you think glaciers can be found today? *CHOOSE ALL THAT APPLY*

- A. In the mountains
- B. At sea level
- C. At the South pole
- D. Along the equator only
- E. Anywhere except along the equator

Image 10

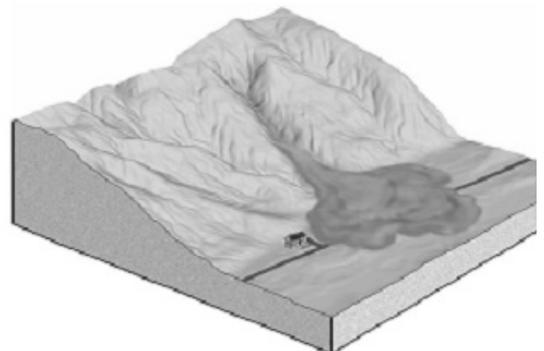


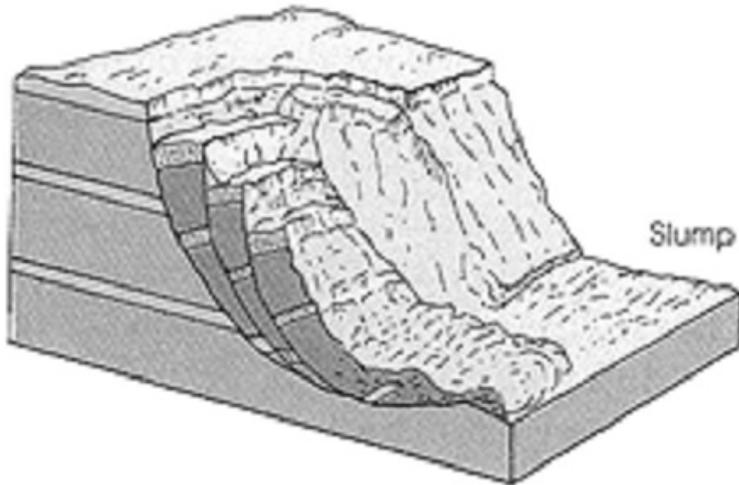
21. Above is a plot for a river near Fargo, North Dakota (Image 10). Which stage is defined by a peak discharge of 25,000 cubic feet per second?

- A. Annual flood stage
- B. 5 year flood stage
- C. 10 year flood stage
- D. 100 year flood stage
- E. 500 year flood stage

Figure A

Figure B





22. Based on field observations and aerial reconnaissance, two different 3-D illustrations were constructed for two different geographic locations as shown in Figure A and Figure B above. Which conditions most likely caused the mass wasting scenario in figure B?

- A. Continued seasonal variation in temperature causing freezing and thawing of the saturated loose sediment.
- B. Unstable geologic layers due to plate tectonic deformation.
- C. Frequent episodes of recent precipitation causing saturation of the loose sediment.
- D. Increased vegetative cover resulting in more root mass which breaks up the loose sediment below.

23. Have you taken any Geology or General Science classes before? *CHOOSE ALL THAT APPLY*

- A. Yes, at Portland Community College
- B. Yes, at another college or university
- C. Yes, but not at a college or university (an example would be at high school)
- D. No

Done

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<style type="text/css" media="all">form {display:none;} #jserror {text-align:center;margin-top:50px;}</style><div id="jserror" class="qHeader">Javascript is required for this site to function, please enable.</div>



GS 107 Assessment

GS 107 Physical Science: Astronomy

Instructions: For each question, select the best possible response unless prompted to "Choose all that apply". If you see "Choose all that apply", then you should choose all of the responses that correctly answer the question.

*** 1. Please enter the 5 digit Course Number (CRN) and name of the class you are taking this survey for. For example: "27999 GS 106"**

2. *ONLY IF YOUR INSTRUCTOR HAS REQUESTED THIS INFORMATION*, Please enter your name and email address below. Leave these fields blank if your instructor has not made this request.

Your Name (First and Last)

Your pcc.edu email address

3. Calcutta, India, is half way around the Earth east of Chicago. If it is noon in Chicago, in Calcutta it would be about:

- A. Sunrise
- B. Sunset
- C. Noon
- D. Midnight
- E. Noon the next day.

4. As Earth and Mars move they:

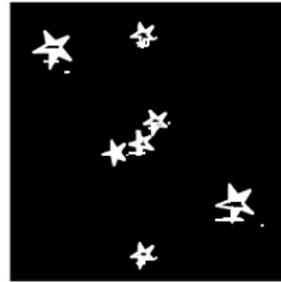
- A. exchange positions with one another.
- B. both get farther from the Sun than Jupiter.
- C. move randomly through the solar system.
- D. travel around the Sun with Earth always closer.
- E. This isn't a good question because planets don't move.

5. How long does it take for Earth to turn once on its axis?

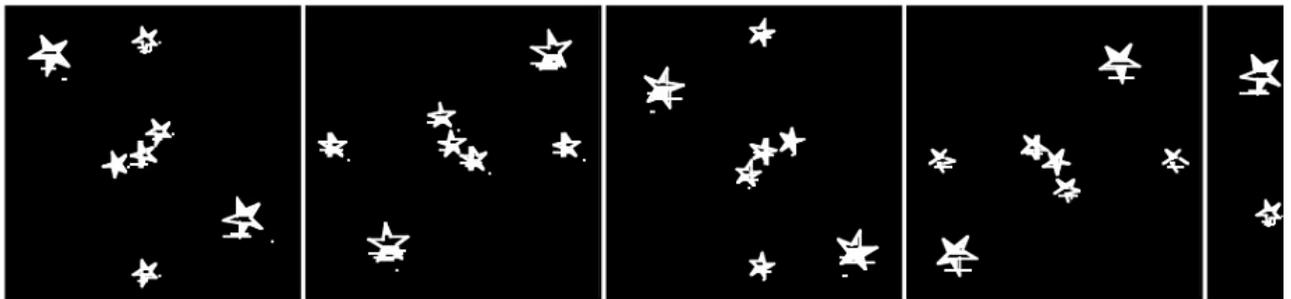
- A. One day.
- B. One week.
- C. One month.
- D. One year.
- E. It never happens

Image 1

You go outside one night and see the pattern of stars in the southern sky st



Which of the views below shows how the stars would look 6 hours later?



A.

B.

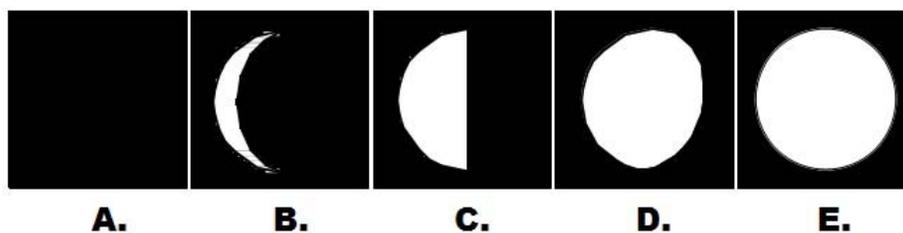
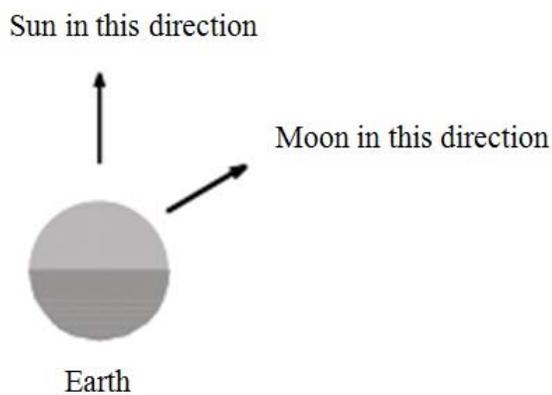
C.

D.

6. See Image 1: Six hours later, the stars would look like:

- A.
- B.
- C.
- D.
- E.

Image 2



7. See Image 2: If you could look down from space at Earth from far above its north pole, the Sun and Moon would be in the directions shown by the arrows in the picture.

What would the Moon look like to a person on Earth facing the Moon?

- A.
- B.
- C.
- D.
- E.

8. Stars begin their lives composed primarily of:

- A. propane.
- B. hydrogen.
- C. neon.
- D. molten rock.
- E. uranium.

9. Of the locations below, the most distant place we have had a spacecraft fly by is:

- A. the Moon.
- B. Mars.
- C. Neptune.
- D. the star Betelgeuse.
- E. the Andromeda Galaxy

10. Scientists believe that the scientific laws they have discovered on Earth are:

- A. different from those that govern the Sun.
- B. different from those governing nearby stars.
- C. different from those in distant parts of our galaxy.
- D. different from those in other galaxies.
-

E. the same everywhere in the universe.

11. The Sun is unusual compared to other stars in that:

- A. it is a binary star.
- B. its energy is formed by nuclear reactions.
- C. it has no companion star.
- D. it has a magnetic field.
- E. its energy is produced by chemical processes.

12. Of the locations below, the most distant place we have detected with space-based telescopes is:

- A. the Moon.
- B. Mars.
- C. Saturn.
- D. the star Betelgeuse.
- E. the Andromeda Galaxy.

13. In order for scientists to detect distant objects in space, electromagnetic radiation must:

- A. reach a detector.
- B. be converted into matter.
- C. be converted into light.
- D. be converted into radio waves.
- E. be converted into energy.

14. The "Big Bang" refers to the origin of:

- A. the Sun.
- B. Earth.
- C. our solar system.
- D. the Milky Way galaxy.
- E. the universe.

15. According to scientists, where were oxygen, carbon and iron atoms created?

- A. In the Big Bang.
- B. In Earth's core.
- C. In the interior of stars.
- D. In the spaces between the stars.
- E. They weren't created, they were always here.

16. Which of these elements found on Earth is, or are, also present in the Sun? *CHOOSE ALL THAT APPLY*

- A. Helium
- B. Hydrogen
- C. Iron
- D. Neon
- E. Silicon

17. Our solar system:

- A. was formed by the Big Bang.
- B. contains material from other stars.
- C. contains the oldest star in the universe.

- D. was made from meteors exploding.
- E. is made from materials found nowhere else in the universe.

18. An eclipse of the Moon can only occur:

- A. when the Moon passes between Earth and the Sun.
- B. when the Sun passes between Earth and the Moon.
- C. when Earth passes between the Sun and the Moon.
- D. when the Moon is closest to Earth.
- E. when the Moon is farthest from Earth.

19. How long does it take for Earth to revolve once around the sun?

- A. One day.
- B. One week.
- C. One month.
- D. One year.
- E. It never happens

20. It is warm in Oregon in August because:

- A. the Earth is closer to the sun than in winter
- B. the sun is more active during summer
- C. the northern hemisphere of the Earth is tipped towards the sun
- D. the southern hemisphere of the Earth is tipped towards the sun
- E. atmospheric currents have moved heat from the equator to the northern hemisphere of the Earth.

21. Most scientists think the universe is approximately ____ old.

- A. 4000 years
- B. 100 million years
- C. 4.5 billion years
- D. 13.8 billion years
- E. they have no estimate for the age of the universe

22. Most scientists think the Earth formed approximately ____ ago.

- A. 4000 years
- B. 100 million years
- C. 4.5 billion years
- D. 13.8 billion years
- E. they have no estimate for when the Earth formed.

23. Have you taken any Geology or General Science classes before? *CHOOSE ALL THAT APPLY*

- A. Yes, at Portland Community College
- B. Yes, at another college or university
- C. Yes, but not at a college or university (an example would be at high school)
- D. No

Done

<style type="text/css" media="all">form {display:none;} #jserror {text-align:center;margin-top:50px;}</style><div id="jserror" class="qHeader">Javascript is required for this site to function, please enable.</div>



GS 108 Assessment

GS 108 - Phys Science (Oceanography)

Instructions: For each question, select the best possible response unless prompted to "Choose all that apply". If you see "Choose all that apply", then you should choose all of the responses that correctly answer the question.

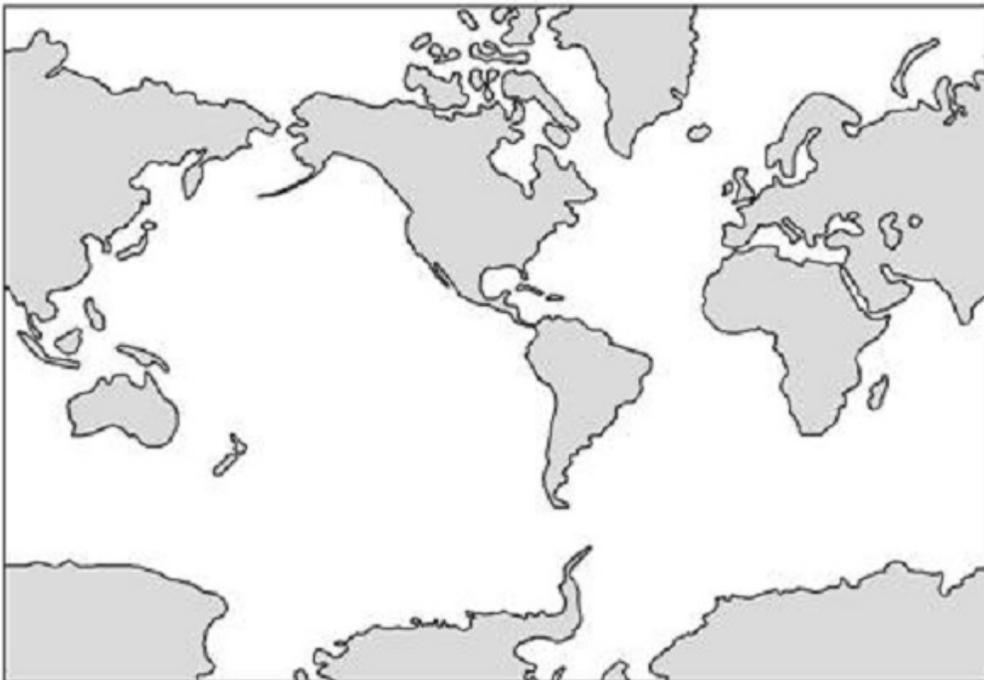
*** 1. Please enter the 5 digit Course Number (CRN) and name of the class you are taking this survey for. For example: "27999 GS 106"**

2. *ONLY IF YOUR INSTRUCTOR HAS REQUESTED THIS INFORMATION*, Please enter your name and email address below. Leave these fields blank if your instructor has not made this request.

Your Name (First and Last)

Your pcc.edu email address

Image 1



3. The map above (Image 1) shows the position of the Earth's continents and oceans today. The gray areas represent land, and the white represents water. Which of the following best explains why the ocean basins look the way they do?

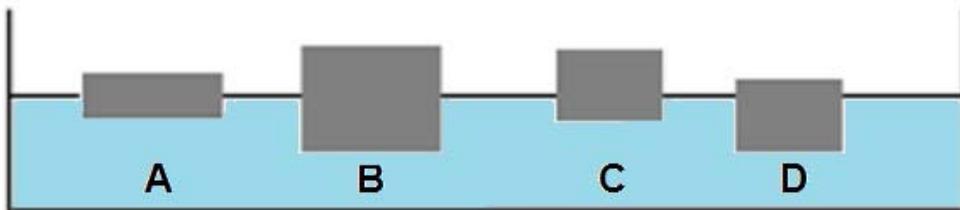
- A. Meteor impacts caused the ocean basins to form this way

- B. Continents moving caused the ocean basins to form this way
- C. The Earth cooling caused the ocean basins to form this way
- D. The Earth warming caused the ocean basins to form this way

4. What is the best explanation of the movement of tectonic plates?

- A. Lava moves the tectonic plates
- B. Currents in the ocean move the tectonic plates
- C. Earthquakes move the tectonic plates
- D. Convection currents in the upper mantle moves the tectonic plates
- E. Magnetism moves the tectonic plates

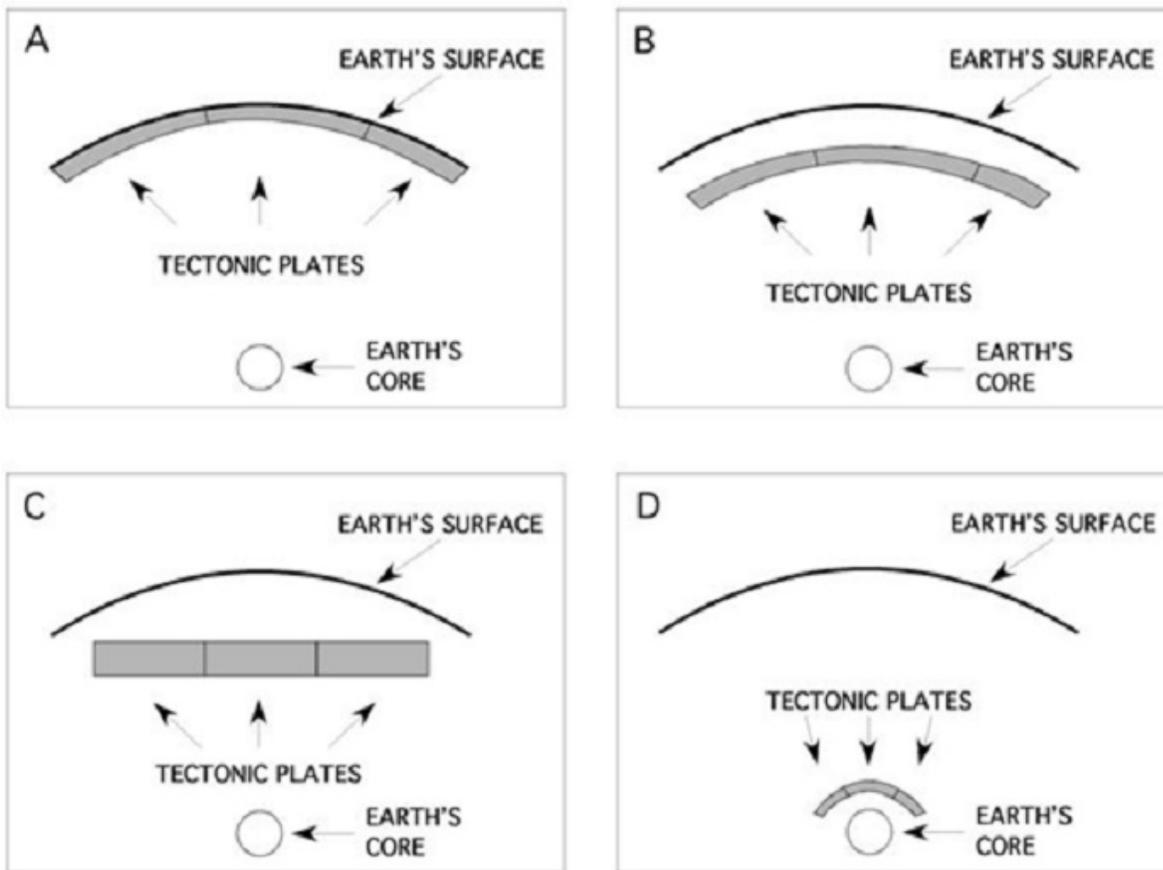
Image 2



5. The sketch above (Image 2) shows blocks floating in the ocean. Which of the blocks has the lowest density?

- A.
- B.
- C.
- D.

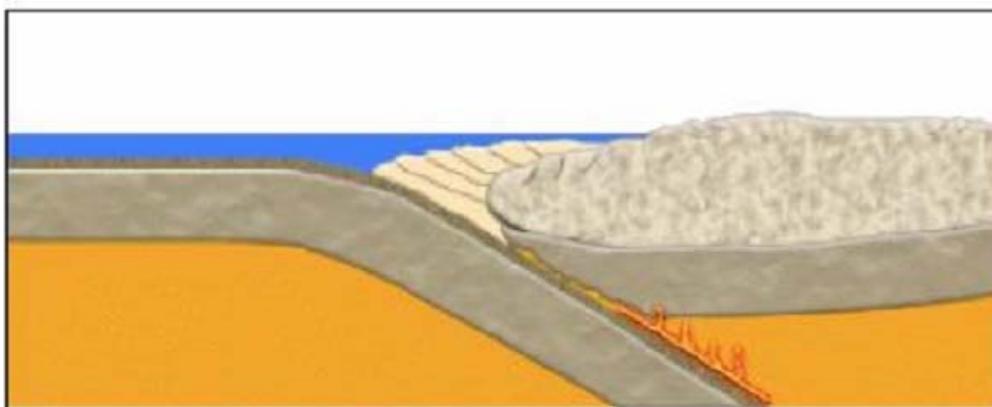
Image 3



6. Scientists often talk about the Earth's tectonic plates and their role in mountain formation, volcanism, and earthquake occurrence. In Image 3 above, which of the figures (A, B, C, or D) most closely represents the location of the Earth's tectonic plates?

- A.
- B.
- C.
- D.

Image 4



7. See Image 4, above. What happens to continental crust below the mountain shown to the right as it

collides with oceanic crust?

- A. The continental crust will become thicker below the surface
- B. The continental crust will not be affected below the surface
- C. The continental crust will become thinner below the surface

8. What is the relationship between rock formation and Earth's surface?

- A. Most rocks form underground and reach the Earth's surface as melted rock moves
- B. Most rocks form underground and reach the Earth's surface as overlying rocks are weathered to sediment and eroded away
- C. Rocks form underground and never reach the Earth's surface

9. How can rocks in the ocean be formed? *CHOOSE ALL THAT APPLY*

- A. By animals
- B. From continental rocks
- C. By volcanic activity

10. What does "density" of seawater refer to?

- A. How big the ocean is
- B. How quickly particles move in seawater
- C. How much material exists in a given volume of seawater
- D. How much air is contained in a given amount of seawater
- E. How slowly seawater moves from one location to another

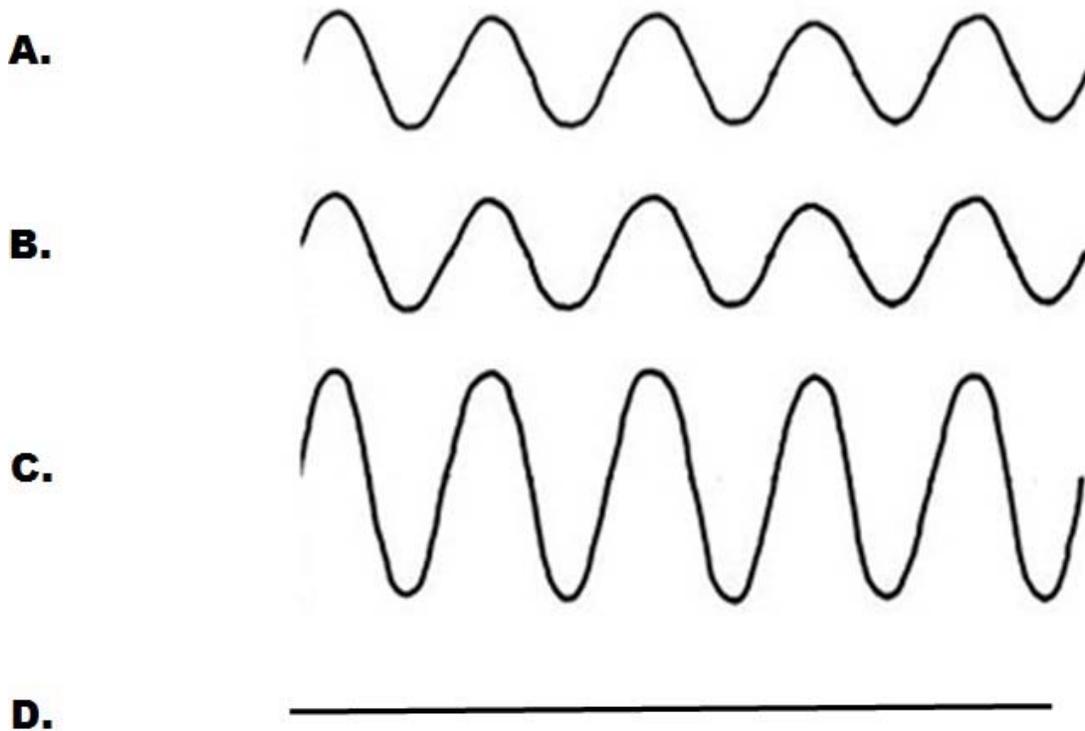
11. What are the principle factors that affect the density of seawater? *CHOOSE ALL THAT APPLY*

- A. Salinity
- B. Temperature
- C. pH
- D. Dissolved oxygen

12. What causes most of the waves in the ocean?

- A. Tides
- B. Earthquakes
- C. Wind
- D. Tsunamis

Image 5



13. See Image 5, above. The pictures depict separate waves on the surface of the ocean. When wave A and wave B meet each other as they are drawn, constructive interference occurs as is the case during rogue waves. Which picture above demonstrates constructive interference of wave A with wave B?

- A.
- B.
- C.
- D.

14. Which of the following is an accurate statement about ocean currents? *CHOOSE ALL THAT APPLY*

- A. They are driven by surface winds
- B. They are driven by differences in seawater density
- C. They are bulk movements of seawater found only at the sea surface.
- D. They are bulk movements of seawater found at and below the surface.

15. Which scenario best explains cold ocean currents such as the California Current?

- A. Cold dense water sinks and pushes less dense warm water out of the way.
- B. Warm dense water rises and pushes less dense cold water out of the way.
- C. Warm and cold water mix together forcing seawater movement.
- D. Cold dense water rises as surface wind pushes warm water out of the way.

16. At coastal locations and in the lower reaches of adjacent rivers, sea level rises and falls regularly each day. What factors control this cycle? *CHOOSE ALL THAT APPLY*

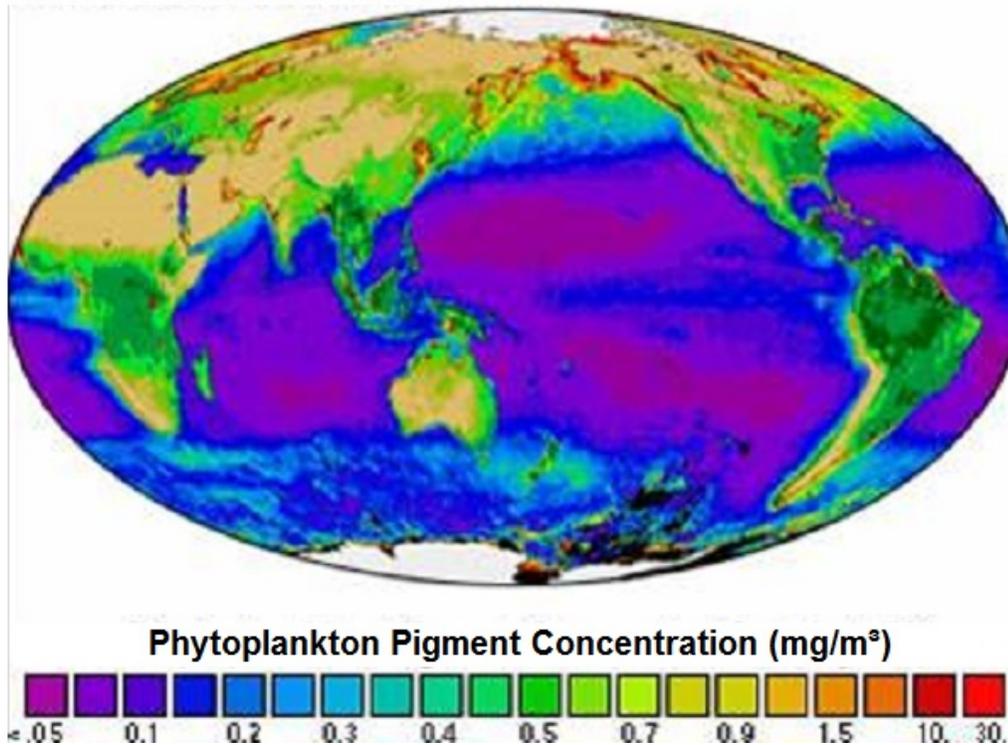
- A. The gravitational interaction of the earth, sun, and moon.
- B. The earth's rotation.
- C. Differences in the density of seawater
- D. Earthquakes

17. You are looking to build a house on the Oregon coast. What hazards do you need to take into account when selecting a site? *CHOOSE ALL THAT APPLY*

- A. The frequency of tsunamis and their probable size.
- B. Seacliff erosion.
- C. Volcanic activity at mid-ocean ridges.
- D. Sand dune migration.

Image 6

Global Biosphere (AVHRR & CZCS)



18. See Image 6, above. The world map below shows zones of phytoplankton concentrations within the Earth's oceans. Which scenario below might explain the higher concentrations of phytoplankton in high latitude regions rather than near the equator?

- A. More nutrients from land would occur further from the equator, providing necessary nutrients to phytoplankton in the ocean.
- B. The sun's rays are more direct over higher latitude regions of Earth, warming the ocean more significantly further north and south of the equator.
- C. Cool waters of higher latitude regions allow phytoplankton with dense shells to be suspended closer to the surface where

photosynthesis can take place.

19. What are some principle marine resources on which contemporary society depends? *CHOOSE ALL THAT APPLY*

- A. Freshwater
- B. Fish stocks for food and fertilizer
- C. Sediment and ore for construction
- D. Fossil fuels
- E. Timber for construction

20. When using a marine resource what factors need to be taken into account when managing it for sustainability? *CHOOSE ALL THAT APPLY*

- A. Its abundance
- B. The rate at which it is consumed
- C. Its renewability (the rate at which it is naturally replenished)
- D. The impact of its extraction on the environment in which it is found

21. The high concentration of plastic located in the middle of the Pacific Ocean is believed to be twice the size of the state of Texas. The plastic patch has proven to be detrimental to the ocean ecosystem. Which conditions resulted in the development of the Great Pacific Garbage Patch? *CHOOSE ALL THAT APPLY*

- A. Garbage generated on land was purposefully dumped in the middle of the Pacific Ocean to alleviate overcrowding of landfills.
- B. Garbage from land was carried by surface water runoff and wind and then drained into the Pacific Ocean.
- C. Ocean currents carrying plastic circulate in a clockwise direction due to the Coriolis Effect.
- D. Chemicals from the ocean formed a chemical bond with chemicals dumped into the ocean by plastic producing companies.
- E. A Subtropical Gyre in the Pacific Ocean traps plastic into a patch twice the size of Texas.

22. During El Niño years, the Western Pacific Ocean experiences drought conditions as opposed to the usual monsoon season whereas the west coast of South America experiences flooding rather than their usual dry weather. This phenomenon is perceived by scientists to be caused by which condition?

- A. Standard ocean circulation patterns.
- B. Down-welling of seawater along the coast of South America.
- C. Upwelling of seawater along the coast of South America.
- D. Upwelling of seawater in the Western Pacific Ocean basin.

23. Have you taken any Geology or General Science classes before? *CHOOSE ALL THAT APPLY*

- A. Yes, at Portland Community College
- B. Yes, at another college or university
-

- C. Yes, but not at a college or university (an example would be at high school)
- D. No

Done

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GS 109 Assessment

GS 109 - Physical Science (Meteorology)

Instructions: For each question, select the best possible response unless prompted to "Choose all that apply". If you see "Choose all that apply", then you should choose all of the responses that correctly answer the question.

*** 1. Please enter the 5 digit Course Number (CRN) and name of the class you are taking this survey for. For example: "27999 GS 106"**

2. *ONLY IF YOUR INSTRUCTOR HAS REQUESTED THIS INFORMATION*, Please enter your name and email address below. Leave these fields blank if your instructor has not made this request.

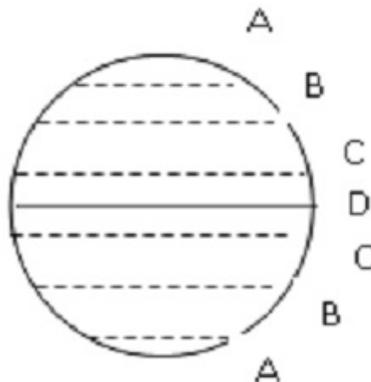
Your Name (First and Last)

Your pcc.edu email address

3. Which best explains what happens when a cold air mass collides with a warm air mass?

- A. The two air masses mix together forming an air mass with an intermediate temperature.
- B. The two air masses swirl together forming air mass that is cold in some places and cold in other places.
- C. The warmer air mass is pushed up over the colder air mass.
- D. The colder air mass is pushed up over the warmer air mass.

Figure 1

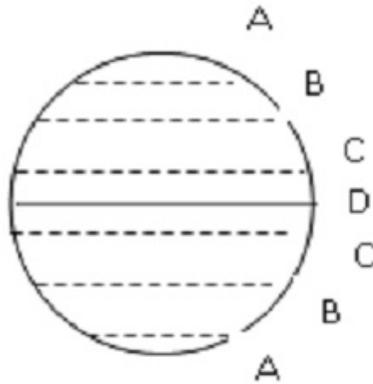


4. Based on the diagram above (Figure 1), which part of the Earth's surface is cool & moist?

- A.
- B.
-

- C.
- D.

Figure 2



5. Based on the diagram above (Figure 2), which part of the Earth's surface is hot & dry?

- A.
- B.
- C.
- D.

6. How is excess energy from lower latitudes transferred to higher latitudes? *CHOOSE ALL THAT APPLY*

- A. By conduction
- B. By winds
- C. By ocean currents
- D. By reflection from high albedo surfaces.

7. What does air density refer to?

- A. How big the atmosphere is
- B. How quickly particles move in the atmosphere
- C. The mass of a given volume of air divided by the volume
- D. How much air is contained in a given amount of seawater
- E. How slowly air moves from one location to another

8. Clouds most commonly form in what type of air?

- A. Rising
- B. Sinking
- C. Rotating
- D. Stationary air

9. What is the ozone layer?

- A. A gas layer in the atmosphere that blocks incoming ultraviolet radiation and does not cause warming of the atmosphere.
- B. A gas layer in the atmosphere that absorbs incoming ultraviolet radiation and causes warming of the atmosphere.
- C. A gas layer in the atmosphere that absorbs pollution and causes warming of the atmosphere.
- D. A gas layer in the atmosphere that blocks incoming ultraviolet radiation and causes warming of the atmosphere.
- E. A gas layer in the atmosphere that absorbs pollution and does not cause warming of the atmosphere.

10. What is the connection between clouds and rain?

- A. Clouds are empty and fill up with water. When the clouds are full, it rains.
- B. Clouds are empty and fill up with water and other things. When the clouds are full, it rains.
- C. Clouds are empty and fill up with water. When the clouds get too heavy, it rains.
- D. Clouds are made up of water. When the temperature gets high enough in the cloud, it rains.
- E. Clouds are made up of water droplets dispersed in the air. When the water droplets get large enough they fall out of the cloud as rain.

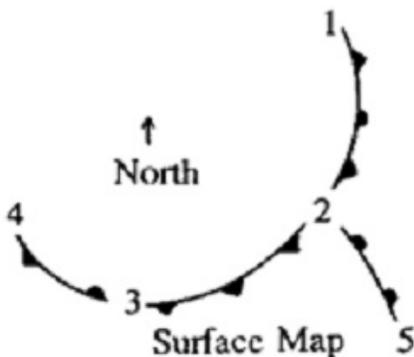
11. Which of the following takes place when a fair weather cumulus cloud forms?

- A. Warm air rises, compresses and warms, causing condensation to take place.
- B. Cold air rises, expands and warms, causing condensation to take place.
- C. Warm air rises, expands and warms, causing condensation to take place.
- D. Warm air rises, expands and cools, causing condensation to take place.

12. Under which conditions might fog form?

- A. Warm dry air moves over a cold dry surface.
- B. Warm humid air moves over a warm dry surface.
- C. Warm humid air moves over a cold surface.
- D. Cold humid air moves over a cold surface.

Image 3

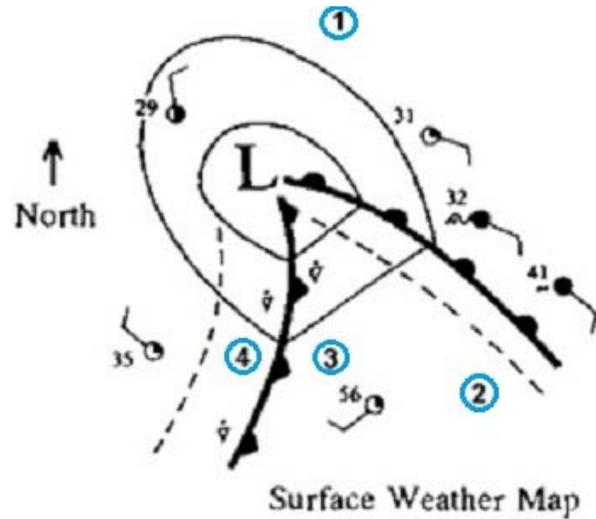


13. In the surface map (Figure 3, above), a cold front is positioned between which points?

Figure 4

- A. 1 and 2

- B. 2 and 3
- C. 2 and 5
- D. 3 and 4



14. Refer to the Surface Weather Map (Figure 4, above). At which of the 4 positions would you expect to hear the following 12-hour forecast: "Heavy thunderstorms today, turning colder by tonight?"

- 1.
- 2.
- 3.
- 4.

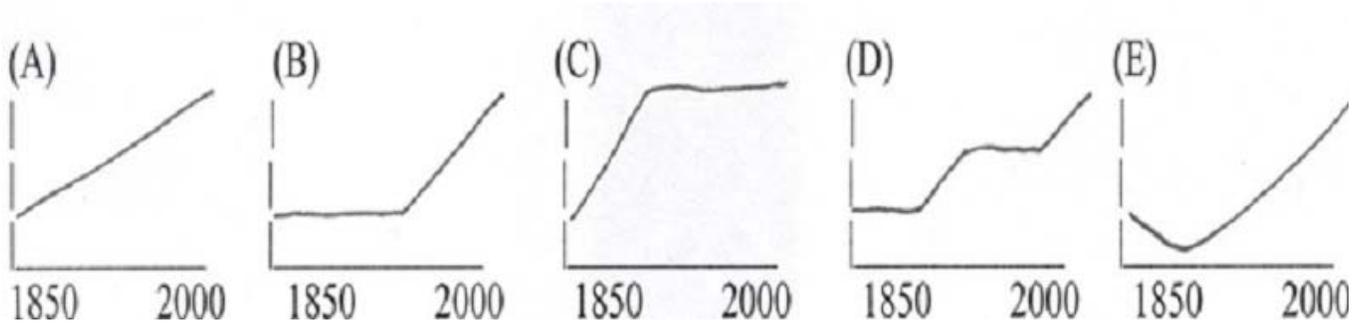
15. Refer to the previous Surface Weather Map (Figure 4). At which of the 4 positions would you expect to hear the following 12-hour forecast: "Partly cloudy with gentle rains and increasing temperatures into the evening?"

- 1.
- 2.
- 3.
- 4.

16. During El Niño years, the Western Pacific Ocean experiences drought conditions as opposed to the usual monsoon season whereas the west coast of South America experiences flooding rather than their usual dry weather. This phenomenon is perceived by scientists to be caused by which condition?

- A. Standard weather patterns across the globe.
- B. Down-welling of seawater along the coast of South America.
- C. Low pressure air off the coast of South America and high pressure air over the southwest Pacific basin.
- D. High pressure air off the coast of South America and low pressure air over the southwest Pacific basin.

Figure 5



17. See Figure 5, above. Which graph best characterizes the change in global average temperature over the last 150 years?

- A.
- B.
- C.
- D.
- E.

18. Why is the equator hotter than the poles?

- A. The Earth has a spherical shape
- B. The equator is closer to the sun
- C. The Earth produces heat at the equator
- D. The equator has more volcanoes

19. What would happen if a significant portion of the sea ice floating in the Arctic Ocean were to melt?

- A. An increase in the amount of water in the ocean would lead to more coastal flooding.
- B. An increase in the absorption of solar energy would lead to warming of the planet.
- C. An increase in the occurrence of extreme weather events would lead to more hurricanes.
- D. A decrease in the temperature of the ocean would lead to a cooling of the planet.
- E. A decrease in the reflection of solar energy would lead to cooling of the planet

20. The greenhouse effect has been linked to warming of Earth including its ocean temperatures. What are greenhouse gases?

- A. Gases in the atmosphere that absorb infrared energy.
- B. Gases in the atmosphere that absorb ultraviolet energy.
- C. Gases in the atmosphere that cause rain to become acidic.
- D. Gases in the atmosphere that are produced as plants grow.
- E. Visible energy.

21. A large, ashy volcanic eruption occurs in Europe. What effect could this eruption have on the air temperature at the Earth's surface one year later?

-

- A. Volcanic eruptions do not affect air temperature at the Earth's surface.
- B. Air at the Earth's surface would be warmer, but only in the northern hemisphere.
- C. Air would be warmer at most of the Earth's surface.
- D. Air at the Earth's surface would be colder, but only in the northern hemisphere.
- E. Air would be colder at most of the Earth's surface.

22. If you were to compare the climate of a coastal city and a midcontinental city both located at the same latitude you would find:

- A. The two cities to have similar winter and summer temperatures.
- B. The summers and winters to be warmer in the continental city.
- C. The summers and winters to be cooler in the continental city.
- D. The summers to be hotter and the winters to be cooler in the continental city
- E. The summers to be cooler and the winters to be warmer in the continental city

23. Have you taken any Geology or General Science classes before? *CHOOSE ALL THAT APPLY*

- A. Yes, at Portland Community College
- B. Yes, at another college or university
- C. Yes, but not at a college or university (an example would be at high school)
- D. No

Done

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