



High School Science Proficiency Review #1

Earth Science: Atmospheric Processes and the Water Cycle

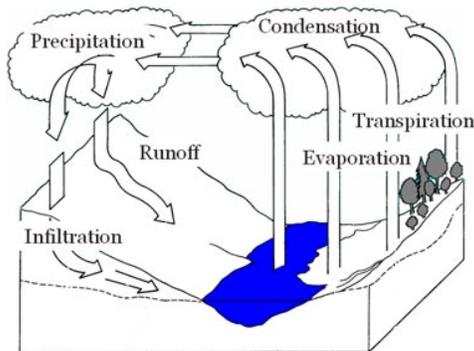
High School Science Proficiency Exam-Style Items from http://rpd.net/sciencetips_v3/

Critical Information to focus on while reviewing Earth Science Atmospheric Processes and the Water Cycle

- E.12.A.1 Students know the Sun is the major source of Earth's energy, and provides the energy driving Earth's weather and climate. E/S**
- ♦ Explain how solar energy powers the water cycle.
 - ♦ How uneven heating of Earth's surface determines weather and climate patterns.
- E.12.A.2 Students know the composition of Earth's atmosphere has changed in the past and is changing today. I/S**
- ♦ Explain how variations in the ozone layer affect the amount of ultraviolet radiation entering the Earth's atmosphere.
 - ♦ Describe how life forms have affected the composition of the atmosphere over time.
 - ♦ Describe how natural events have affected the composition of the atmosphere over time (e.g., volcanoes and meteorites).
- E.12.A.3 Students understand the role of the atmosphere in Earth's greenhouse effect. E/S**
- ♦ Explain how the proportions of gases in the atmosphere affect weather and climate.
 - ♦ Identify sources of greenhouse gases.
 - ♦ Explain why a certain level of greenhouse effect is essential for life on Earth.
- E.12.A.4 Students know convection and radiation play important roles in moving heat energy in the Earth system. E/S**
- ♦ Explain how the processes of radiation, conduction, and convection occur in the atmosphere.
 - ♦ Explain how the processes of radiation, conduction, and convection affect weather and climate.
- E.12.A.5 Students know Earth's rotation affects winds and ocean currents. I/S**
- ♦ Identify that wind and ocean currents form global patterns based on Earth's rotation.

Sample Proficiency-Style Questions Related to Atmospheric Processes and the Water Cycle

1. Use the diagram below to answer the following question.



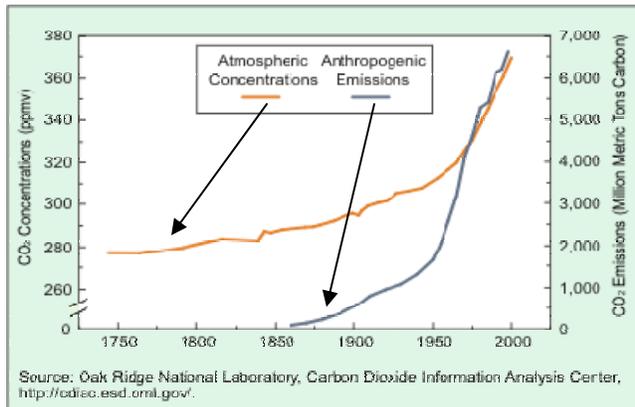
Which is the process of water vapor changing to a liquid?

- A. Condensation
 - B. Convection
 - C. Radiation
 - D. Transpiration
2. What is the primary energy source behind the water cycle?
- A. Earth's internal energy
 - B. Sun's electromagnetic radiation
 - C. Moon's gravitational attraction
 - D. Radioactive decay of elements
3. What would the most likely effect on the water cycle be if the amount of insolation received by a given area were to **DECREASE**?
- A. Evaporation increases, transpiration decreases
 - B. Evaporation increases, transpiration increases
 - C. Evaporation decreases, transpiration decreases
 - D. Evaporation decreases, transpiration increases
4. Earth's tropical regions receive more of the Sun's energy than polar regions because they
- A. contain a greater percentage of dry land.
 - B. have more vegetation to absorb the Sun's energy.
 - C. have a thinner atmosphere than the polar regions.
 - D. receive a greater concentration of the Sun's rays.
5. As solar radiation passes through Earth's atmosphere, which of the following does **NOT** occur? Some of the solar radiation
- A. reflects back into space.
 - B. scatters into the atmosphere.
 - C. decays into stable elements.
 - D. is absorbed by Earth's surface.



Earth Science Review Atmospheric Processes and the Water Cycle

6. The two most abundant greenhouse gases in Earth's atmosphere are
- water vapor (H_2O) and carbon dioxide (CO_2).
 - carbon dioxide (CO_2) and methane (CH_4).
 - ozone (O_3) and carbon monoxide (CO).
 - nitrogen (N_2) and oxygen (O_2).
7. The term "anthropogenic emissions" refers to greenhouse gases released into the atmosphere as a result of human activities. Use the diagram to answer the following question.



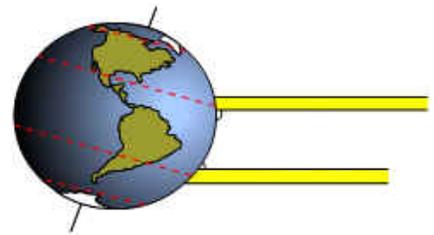
Which statement is an accurate interpretation of the graph?

- Atmospheric concentrations of CO_2 have steadily decreased as anthropogenic emissions have steadily increased.
 - Before 1850, humans were releasing so much CO_2 into Earth's atmosphere that the values will not even fit on the scale of this graph.
 - There is absolutely no correlation between anthropogenic emissions and atmospheric concentrations of CO_2 .
 - Since the 1960s, atmospheric concentrations of CO_2 have risen at a rate approximately equal to that of anthropogenic emissions.
8. Greenhouse gases help keep Earth at a habitable temperature by
- blocking the cold winds and ices originating in outer space.
 - servicing as essential nutrients for atmospheric phytoplankton.
 - allowing only infrared light to reach Earth's surface.
 - retaining some of the Sun's energy in our lower atmosphere.
9. Carbon dioxide (CO_2) is added to the atmosphere by each of the following **EXCEPT**
- burning fossil fuels.
 - decay of organic matter.
 - hydrogen fuel cells.
 - eruption of volcanoes.

10. Air is a poor conductor. Which of the following is **NOT** true of how the atmosphere is primarily affected by conduction?
- Most energy transfer by conduction occurs right at Earth's surface.
 - At night, the ground cools, conducting heat away from the adjacent air.
 - During the day, solar radiation heats the ground, heating the air next to it.
 - Molecules in the atmosphere are heated, causing the atmosphere to vibrate.
11. A deflection of winds and currents resulting from Earth's rotation is known as the
- Coriolis Effect.
 - Greenhouse Effect.
 - Tectonic Effect.
 - Adiabatic Effect.

12. Winds in the United States of America generally blow from the
- North Pole toward the Equator.
 - Equator toward the North Pole.
 - east toward the west.
 - west toward the east.

13. Use the diagram below to answer the following question.



Which of the following is **NOT** a contributing factor to the uneven warming of Earth's surface?

- Different surfaces warm at different rates.
- Different surfaces retain energy differently.
- The Sun is farther from Earth during winter.
- The Sun's rays hit the surface at varied angles.



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Critical Information to focus on while reviewing Earth Science Atmospheric Processes and the Water Cycle

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- ♦ Explain how solar energy powers the water cycle.
- ♦ How uneven heating of Earth's surface determines weather and climate patterns.

E.12.A.2 Students know the composition of Earth's atmosphere has changed in the past and is changing today. I/S

- ♦ Explain how variations in the ozone layer affect the amount of ultraviolet radiation entering the Earth's atmosphere.
- ♦ Describe how life forms have affected the composition of the atmosphere over time.
- ♦ Describe how natural events have affected the composition of the atmosphere over time (e.g., volcanoes and meteorites).

E.12.A.3 Students understand the role of the atmosphere in Earth's greenhouse effect. E/S

- ♦ Explain how the proportions of gases in the atmosphere affect weather and climate.
- ♦ Identify sources of greenhouse gases.
- ♦ Explain why a certain level of greenhouse effect is essential for life on Earth.

E.12.A.4 Students know convection and radiation play important roles in moving heat energy in the Earth system. E/S

- ♦ Explain how the processes of radiation, conduction, and convection occur in the atmosphere.
- ♦ Explain how the processes of radiation, conduction, and convection affect weather and climate.

E.12.A.5 Students know Earth's rotation affects winds and ocean currents. I/S

- ♦ Identify that wind and ocean currents form global patterns based on Earth's rotation.

Sample Proficiency-Style Questions Related to Atmospheric Processes and the Water Cycle

1. A, DOK Level 1
2. B, DOK Level 1
3. C, DOK Level 2
4. D, DOK Level 1
5. C, DOK Level 1
6. A, DOK Level 1
7. D, DOK Level 2
8. D, DOK Level 1
9. C, DOK Level 1
10. D, DOK Level 2
11. A, DOK Level 1
12. D, DOK Level 1
13. C, DOK Level 1



High School Science Proficiency Review #2

Earth Science: Solar System and Universe

High School Science Proficiency Exam-Style Items from http://rpd.net/sciencetips_v3/

Critical Information to focus on while reviewing Earth Science Solar System and Universe

E.12.B.1 Students know common characteristics of stars. I/S

- ♦ Identify the processes of stellar evolution.
- ♦ Recognize that stars change in temperature, size, color, and brightness as they age.
- ♦ Demonstrate the general relationship between the color and temperature of stars.

E.12.B.2 Students know stars are powered by nuclear fusion of lighter elements into heavier elements, which results in the release of large amounts of energy. I/S

- ♦ Know that stars are composed mostly of hydrogen and helium and ultimately produce all other elements through nuclear reactions.

E.12.B.3 Students know ways in which technology has increased understanding of the universe. I/S

- ♦ Describe the uses of optical and radio telescopes, probes, and artificial satellites in astronomy.

E.12.B.4 Students know the on-going processes involved in star formation and destruction. W/L

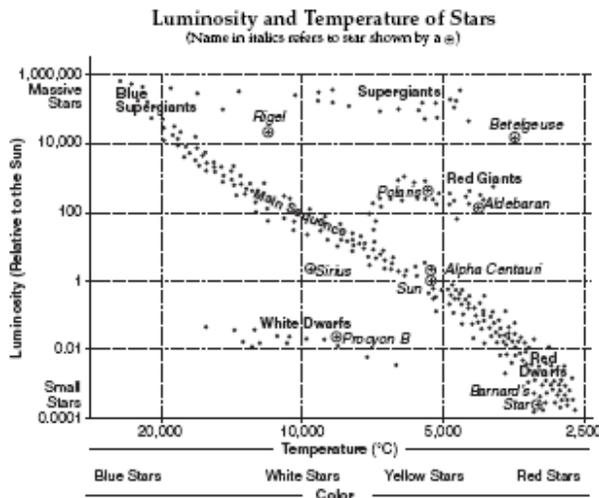
- ♦ Identify the processes of stellar evolution.
- ♦ Recognize the life-cycles of mid-size and massive stars and their stellar remnants.

E.12.B.5 Students know scientific evidence suggest that the universe is expanding. I/S

- ♦ Recognize the red shift effect and know that the most distant objects have the greatest degree of red shift.

Sample Proficiency-Style Questions Related to Solar System and Universe

Use the diagram below to answer questions 1 and 2.



1. Which of these stars is considered a main sequence star?

- A. Aldebaran
- B. Alpha Centauri
- C. Betelgeuse
- D. Procyon B

2. What is the approximate temperature of Rigel?

- A. 6,000 °C
- B. 8,000 °C
- C. 10,000 °C
- D. 12,000 °C

3. Rank the order of a blue, a yellow, and a red star from **COOLEST** to **HOTTEST**.

- A. Red → blue → yellow
- B. Red → yellow → blue
- C. Yellow → red → blue
- D. Yellow → blue → red

4. Elements from helium through iron are created

- A. through nuclear fusion in stars, while elements heavier than iron are made in supernova shockwaves.
- B. in supernova shockwaves, while elements heavier than iron are created through nuclear fusion in stars.
- C. by chemical reactions in stars, while elements heavier than iron are made through nuclear reactions.
- D. by nuclear reactions in stars, while elements heavier than iron are made through chemical reactions.



Earth Science Review

Solar System and Universe

5. The process of converting hydrogen into helium in stars is called

- A. nuclear fusion.
- B. nuclear fission.
- C. chemical reaction.
- D. physical change.

6. When a star is first formed, it is made mostly of which element?

- A. Oxygen
- B. Hydrogen
- C. Carbon
- D. Nitrogen

7. Why are some telescopes placed in space above Earth's atmosphere?

- A. Having the telescope above the atmosphere puts it closer to the object for better magnification.
- B. Having the telescope above the atmosphere puts it closer to the object for better sound detection.
- C. Some types of electromagnetic radiation from stars are absorbed by Earth's atmosphere.
- D. Some of the light being sent out from telescopes can be blocked by Earth's atmosphere.

8. Human astronauts have landed on

- A. the Moon with regularity since July 1969, but have not ventured farther.
- B. Mars and the Moon, but have not returned since the late 1970s.
- C. Mars in the late 1990s and the Moon in the late 1960s and early 1970s.
- D. the Moon in the late 1960s and early 1970s, but have not returned.

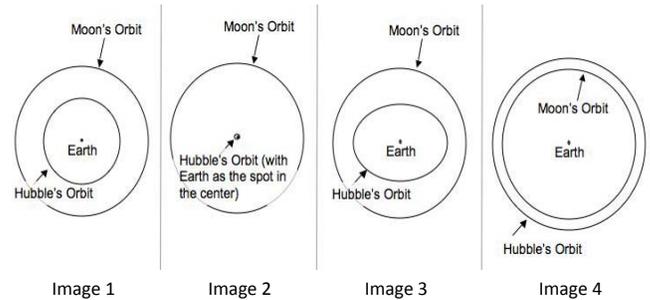
9. The force that dominates the formation of a star is

- A. pressure.
- B. magnetism.
- C. gravity.
- D. electricity.

10. When fusion of hydrogen ceases in our Sun's core, the Sun will

- A. explode as a supernova.
- B. collapse into white dwarf star.
- C. contract into a black hole.
- D. expand into a red giant star.

11. Use the images below to answer the next question.



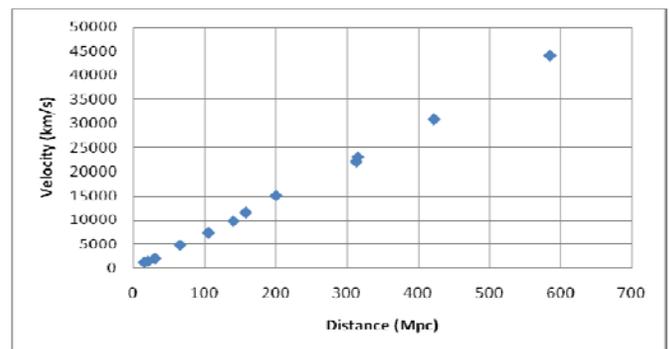
Which image best represents the orbit of the Hubble Space Telescope compared to the orbit of Earth's Moon?

- A. Image 1
- B. Image 2
- C. Image 3
- D. Image 4

12. What can we conclude from the observation that nearly all galaxies are moving away from us?

- A. The once-smaller universe is expanding in all directions.
- B. The Sun and Earth are located at the center of the universe.
- C. Everything in the universe is moving the same direction.
- D. Massive black holes are drawing galaxies away from Earth.

13. The graph below shows the relationship between the distance and velocity of several galaxies.



If you observed a new galaxy moving with a velocity of 38,000 km/s, at what distance should it be located?

- A. 60 Mpc
- B. 500 Mpc
- C. 600 Mpc
- D. 28,000 Mpc



High School Science Proficiency Review #2

Earth Science: Solar System and Universe

KEY

High School Science Proficiency Exam-Style Items from <http://rpd.net/sciencetips v3/>

Critical Information to focus on while reviewing Earth Science Solar System and Universe

E.12.B.1 Students know common characteristics of stars. I/S

- ♦ *Identify the processes of stellar evolution.*
- ♦ *Recognize that stars change in temperature, size, color, and brightness as they age.*
- ♦ *Demonstrate the general relationship between the color and temperature of stars.*

E.12.B.2 Students know stars are powered by nuclear fusion of lighter elements into heavier elements, which results in the release of large amounts of energy. I/S

- ♦ *Know that stars are composed mostly of hydrogen and helium and ultimately produce all other elements through nuclear reactions.*

E.12.B.3 Students know ways in which technology has increased understanding of the universe. I/S

- ♦ *Describe the uses of optical and radio telescopes, probes, and artificial satellites in astronomy.*

E.12.B.4 Students know the on-going processes involved in star formation and destruction. W/L

- ♦ *Identify the processes of stellar evolution.*
- ♦ *Recognize the life-cycles of mid-size and massive stars and their stellar remnants.*

E.12.B.5 Students know scientific evidence suggest that the universe is expanding. I/S

- ♦ *Recognize the red shift effect and know that the most distant objects have the greatest degree of red shift.*

Sample Proficiency-Style Questions Related to Solar System and Universe

1. B, DOK Level 2
2. D, DOK Level 2
3. B, DOK Level 2
4. A, DOK Level 2
5. A, DOK Level 1
6. B, DOK Level 1
7. C, DOK Level 1
8. D, DOK Level 1
9. C, DOK Level 1
10. D, DOK Level 1
11. B, DOK Level 1
12. A, DOK Level 1
13. B, DOK Level 2



High School Science Proficiency Review #3

Earth Science: Earth's Composition and Structure

High School Science Proficiency Exam-Style Items from http://rpd.net/sciencetips_v3/

Critical Information to focus on while reviewing Earth Science Earth's Composition and Structure

E.12.C.1 Students know how successive rock strata and fossils can be used to confirm the age, history, and changing life forms of the Earth, including how this evidence is affected by the folding, breaking, and uplifting of layers. E/S

- ♦ Explain the basics of the process of fossil formation.
- ♦ Apply the principles of superposition to relative dating of rock layers.
- ♦ Describe the process of absolute dating.
- ♦ Sequence the age, history, and changing life forms of Earth using strata and fossil evidence.
- ♦ Describe how folding, breaking, and uplifting of strata complicate geological evidence.

E.12.C.2 Students understand the concept of plate tectonics including the evidence that supports it (structural, geophysical and paleontological evidence). E/S

- ♦ Describe how convection in Earth's mantle has changed the locations + shapes of continents based on tectonic plate movement.
- ♦ Identify the evidence for seafloor spreading.
- ♦ Identify the three major types of tectonic plate boundaries.

E.12.C.3 Students know elements exist in fixed amounts and move through solid earth, oceans, atmosphere and living things as part of biogeochemical cycles. E/S

- ♦ Explain how matter and energy are transferred chemically through systems that include living and non-living components.

E.12.C.4 Students know processes of obtaining, using, and recycling of renewable and non-renewable resources. E/S

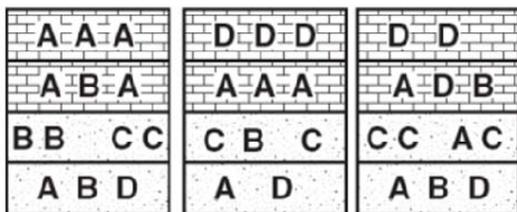
- ♦ Identify the differences between renewable and non-renewable resources.
- ♦ Explain how recycling reduces the rate of depletion of nonrenewable resources.
- ♦ Identify the processes used to obtain natural resources (e.g., mining, oil production, water, and agriculture).

E.12.C.5 Students know soil, derived from weathered rocks and decomposed organic material, is found in layers. E/S

- ♦ Describe the structure of soil, its components, and its formation

Sample Proficiency-Style Questions Related to Earth's Composition and Structure

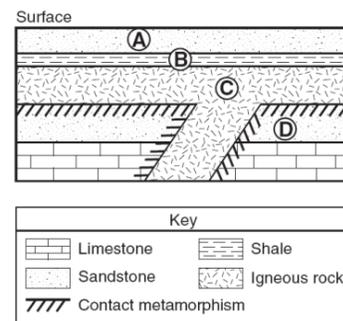
1. The three cross sections of sedimentary bedrock shown below represent widely separated surface exposures of layers that contain fossils. Letters A, B, C, D represent four different marine fossils found in these rock layers.



Which letter best represents an index fossil?

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

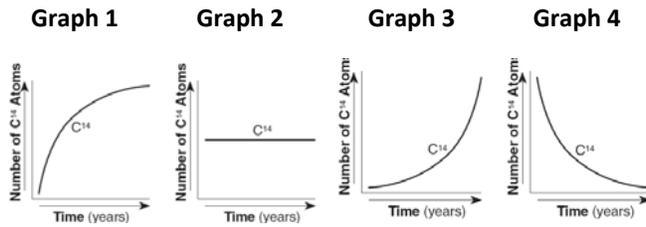
2. The diagram below shows a geologic cross section. Letters A through D represent different rock units.



Which sequence correctly shows the age of the lettered rock units, from **OLDEST** to **YOUNGEST**?

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

3. Use graphs #1-4 to answer the following question.



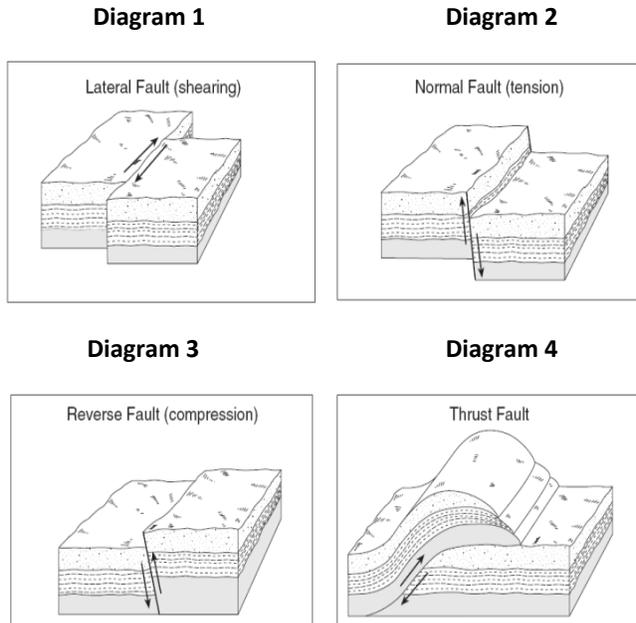
Which graph best shows the radioactive decay of carbon-14?

- A. Graph 1
- B. Graph 2
- C. Graph 3
- D. Graph 4

4. The best indicator of an area's ancient environmental conditions and climate would be the

- A. type and distribution of fossils.
- B. present plant and animal life.
- C. amount of carbon-14 in rock layers.
- D. depth and composition of soil.

5. The diagram below shows four major types of fault motion occurring in Earth's crust.



Which type of fault motion best matches the general pattern of crustal movement at California's San Andreas Fault?

- A. Diagram 1
- B. Diagram 2
- C. Diagram 3
- D. Diagram 4

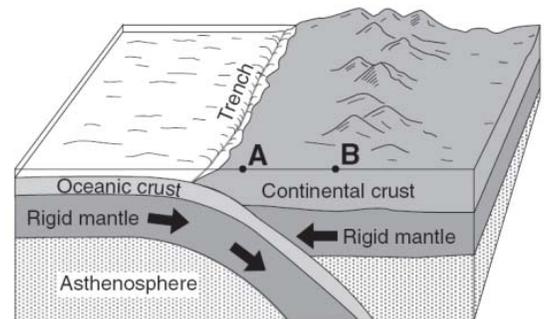
6. The movement of tectonic plates is inferred by many scientists to be driven by

- A. tidal motions in the hydrosphere.
- B. density differences in the troposphere.
- C. convection currents in the asthenosphere.
- D. solidification in the lithosphere.

7. Which information indicates that new seafloor rock is forming along the mid-ocean ridge and then moving horizontally away from the ridge?

- A. Most volcanoes are located under ocean water and found near the continental shelves.
- B. Paleomagnetic studies of the ocean floor demonstrate that the orientation of Earth's magnetic field has remained constant.
- C. Fossils of marine organisms can be found at high elevations on continents.
- D. The age of the seafloor rock increases as the distance from the mid-ocean ridge increases.

8. Use the diagram to answer the following question.



(Not drawn to scale)

Which type of plate boundary is shown in the diagram?

- A. Divergent
- B. Transform
- C. Convergent
- D. Universal

9. What are the two energy sources that are responsible for cycling matter through living and non-living components on Earth?

- A. Sun and Moon
- B. Moon and tides
- C. Earth's core and Moon
- D. Earth's core and the Sun



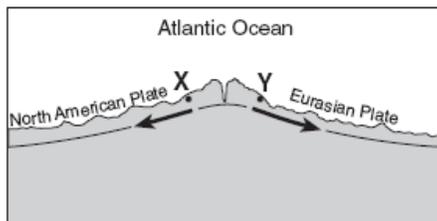
Earth Science Review

Earth's Composition and Structure

10. Which of the following is the best statement comparing the water of today with the water that was here 100 million years ago?
- Water enters and leaves Earth during evaporation and precipitation cycles.
 - The water present on Earth today is made of the same atoms but the molecules have been recycled through biologic activity.
 - The atoms that made the water then were destroyed when they were used; the atoms that make up water now were made more recently.
 - The molecules of water then are the same molecules that exist today.

11. If the need for copper becomes greater in the future then copper mining will increase. One way of supplying this possible copper need without further depleting the resource would be to
- import copper from other countries.
 - make copper in laboratories.
 - recycle copper that is no longer used.
 - outlaw the use of copper.

12. Base your answer to the question on the cross section below, which shows an underwater mountain range in the Atlantic Ocean. The oceanic bedrock is composed mainly of basalt. Points X and Y are locations in the bedrock that have been diverging at the same rate. The movement of the North American Plate and Eurasian Plate is shown by the two arrows.

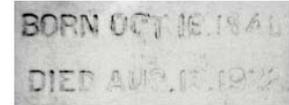


(Not drawn to scale)

Which statements best describe the age and magnetic orientation of the basalts found at locations X and Y?

- The basalt at location X is younger than the basalt at location Y. Both locations have the same magnetic orientation.
- The basalts at location X and Y are the same age. Both locations have the same magnetic orientation.
- The basalt at location X and Y are the same age. Location X has normal magnetic orientation and location Y has reversed magnetic orientation.
- The basalt at location X is older than the basalt at location Y. Location X has reversed magnetic orientation and location Y has normal magnetic orientation.

13. Two tombstones, located in the same cemetery approximately 10 meters apart, face east. Tombstone A had dates cut into the rock in 1922. Tombstone B had dates cut into the rock in 1892.



Tombstone A (1922)



Tombstone B (1892)

Which statement best explains why the dates are more difficult to read on Tombstone A than on Tombstone B?

- Tombstone A contains minerals less resistant to weathering than Tombstone B.
 - Tombstone A has undergone a longer period of weathering than Tombstone B.
 - Tombstone A has experienced cooler temperatures than Tombstone B.
 - Tombstone A was exposed to less acid rain than Tombstone B.
14. Geothermal, wind, and solar are some of the energy resources in which Nevada has an abundant supply. The benefits of their usage compared to other energy sources is that these resources
- are relatively cheap to establish.
 - are constantly being replenished.
 - produce large amounts of carbon dioxide.
 - cover relatively small amounts of land.

15. Which activity demonstrates chemical weathering?

- Freezing of water in the cracks of a granite boulder
- Abrasion of a streambed by tumbling rocks
- Dissolving of limestone by carbonic acid
- Boulders falling from a cliff and shattering on the rocks below



High School Science Proficiency Review #3

Earth Science: Earth's Composition and Structure

KEY

High School Science Proficiency Exam-Style Items from <http://rpd.net/sciencetips v3/>

Critical Information to focus on while reviewing Earth Science Earth's Composition and Structure

E.12.C.1 Students know how successive rock strata and fossils can be used to confirm the age, history, and changing life forms of the Earth, including how this evidence is affected by the folding, breaking, and uplifting of layers. E/S

- ♦ Explain the basics of the process of fossil formation.
- ♦ Apply the principles of superposition to relative dating of rock layers.
- ♦ Describe the process of absolute dating.
- ♦ Sequence the age, history, and changing life forms of Earth using strata and fossil evidence.
- ♦ Describe how folding, breaking, and uplifting of strata complicate geological evidence.

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- ♦ Explain how matter and energy are transferred chemically through systems that include living and non-living components.

E.12.C.4 Students know processes of obtaining, using, and recycling of renewable and non-renewable resources. E/S

- ♦ Identify the differences between renewable and non-renewable resources.
- ♦ Explain how recycling reduces the rate of depletion of nonrenewable resources.
- ♦ Identify the processes used to obtain natural resources (e.g., mining, oil production, water, and agriculture).

E.12.C.5 Students know soil, derived from weathered rocks and decomposed organic material, is found in layers. E/S

- ♦ Describe the structure of soil, its components, and its formation

Sample Proficiency-Style Questions Related to Earth's Composition and Structure

1. C, DOK Level 2
2. D, DOK Level 2
3. D, DOK Level 1
4. A, DOK Level 1
5. A, DOK Level 1
6. C, DOK Level 1
7. D, DOK Level 1
8. C, DOK Level 1
9. D, DOK Level 1
10. B, DOK Level 2
11. C, DOK Level 1
12. B, DOK Level 2
13. A, DOK Level 2
14. B, DOK Level 1
15. C, DOK Level 1