|  |
| --- |
| **True / False** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. ​The vibrant color of much of Earth’s terrestrial landscape has been present since the origin of the planet.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2. The two major disciplines of geology are historical geology and physical geology.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 3. The universe is presently contracting.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4. ​The red-shift is an example of the Doppler effect.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5. Our solar system is the center of the universe.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 6. Earth is approximately 4.6 billion years old.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 7. Theories are factually stronger than hypotheses.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8. The Jovian planets (e.g., Jupiter) are primarily composed of heavy elements such as uranium (U) and lead (Pb).​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 9. The asteroids in the asteroid belt are the remnants of a very large planet in the early solar system that was broken apart through impact with another planetary body.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 10. The asthenosphere is the outer layer of Earth, which is rigid and is broken into individual plates.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11. ​Earth’s mean global temperature has changed significantly over the course of our planet’s history.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 12. A tectonic plate can consist of continental crust or oceanic crust, but not both.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 13. Radiometric dating has allowed scientists to assign absolute ages to the relative geologic time scale.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 14. The two types of Earth’s crust are known as lithospheric and oceanic.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 15. Oceanic crust is less dense than continental crust.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16. The “Goldilocks zone” is a region around a star where conditions are favorable for the presence of liquid water.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 17. The solar nebula theory of the formation of the solar system accounts for the differences in composition between the terrestrial and Jovian planets.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 18. The central thesis of the theory of organic evolution is that the current diversity of species on Earth is the same as that of the past.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 19. Natural selection refers to the survival of organisms that are best adapted to their environment.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20. The most interior division of planet Earth is the core, which is liquid at its center because of extreme pressures, but solid toward Earth’s surface.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 21. Uniformitarianism states that geologic processes today operated with equal intensities and rates in the past.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 22. Terrestrial planets in our solar system have thick atmospheres, while the outer planets are primarily atmosphere-free.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 23. In the 19th century, the geologic time scale was based primarily on rock exposures and the vertical sequence of fossils in the rock record.

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 24. The majority of earthquakes and volcanic activity occur along plate boundaries.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | True |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25. Saturn is the largest planet in the solar system.​

|  |  |  |
| --- | --- | --- |
|   | a.  | True |
|   | b.  | False |

|  |  |
| --- | --- |
| *ANSWER:* | False |

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|  |
| --- |
| **Multiple Choice** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 26. Although rocks are affected by interactions among all six major subsystems of Earth, rocks are physically classified in the \_\_\_\_ subsystem.​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​atmosphere |
|   | b.  | ​hydrosphere |
|   | c.  | ​biosphere |
|   | d.  | lithosphere​ |
|   | e.  | ​inner core |

|  |  |
| --- | --- |
| *ANSWER:* | d |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. Historical geology can best be described as the study of \_\_\_\_.​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​how the solar system formed |
|   | b.  | ​rocks and minerals |
|   | c.  | ​the evolution of organisms |
|   | d.  | ​earthquakes, volcanoes, and other processes on Earth |
|   | e.  | ​the origin and evolution of Earth |

|  |  |
| --- | --- |
| *ANSWER:* | e |

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|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 28. Liquid water in Earth’s oceans are part of the Earth’s \_\_\_\_.

|  |  |  |
| --- | --- | --- |
|   | a.  | biosphere |
|   | b.  | hydrosphere |
|   | c.  | lithosphere |
|   | d.  | mesosphere |
|   | e.  | atmosphere |

|  |  |
| --- | --- |
| *ANSWER:* | b |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 29. Which concept explains some natural phenomenon that is testable and is supported by a large body of evidence (e.g., plate tectonics)?​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​hypothesis |
|   | b.  | ​scientific law |
|   | c.  | ​transgression |
|   | d.  | ​principle |
|   | e.  | ​theory |

|  |  |
| --- | --- |
| *ANSWER:* | e |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30. Earth becomes \_\_\_\_ with increasing depth.​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​more dense |
|   | b.  | ​less dense |
|   | c.  | ​liquid |
|   | d.  | ​enriched in silica and aluminum |
|   | e.  | ​depleted in iron and magnesium |

|  |  |
| --- | --- |
| *ANSWER:* | a |

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|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 31. The largest layer of Earth, in terms of volume, is the \_\_\_\_.​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​lithosphere |
|   | b.  | ​asthenosphere |
|   | c.  | ​crust |
|   | d.  | ​core |
|   | e.  | ​mantle |

|  |  |
| --- | --- |
| *ANSWER:* | e |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 32. Which part of the upper mantle behaves plastically and flows slowly?​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​lithosphere |
|   | b.  | ​asthenosphere |
|   | c.  | ​crust |
|   | d.  | ​atmosphere |
|   | e.  | ​core |

|  |  |
| --- | --- |
| *ANSWER:* | b |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 33. Tectonic plates move in response to \_\_\_\_.​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​convection cells in the mantle |
|   | b.  | ​convection cells in the core |
|   | c.  | ​subduction cells in the mantle |
|   | d.  | ​subduction cells in the core |
|   | e.  | ​unequal heating of crust by the sun |

|  |  |
| --- | --- |
| *ANSWER:* | a |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 34. The advent of \_\_\_\_ allowed geologists to assign numeric dates to the geologic time scale.

|  |  |  |
| --- | --- | --- |
|   | a.  | uniformitarianism |
|   | b.  | radiometric dating |
|   | c.  | relative dating |
|   | d.  | fossil succession |
|   | e.  | stratigraphic nomenclature |

|  |  |
| --- | --- |
| *ANSWER:* | b |

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|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 35. Which principle asserts that processes operating in the present world can be used to interpret events of the past?​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​catastrophism |
|   | b.  | ​uniformitarianism |
|   | c.  | ​lithification |
|   | d.  | ​unconformity |
|   | e.  | ​weathering |

|  |  |
| --- | --- |
| *ANSWER:* | b |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 36. Who proposed the concept of natural selection?​

|  |  |  |
| --- | --- | --- |
|   | a.  | James ​Hutton |
|   | b.  | ​William Smith |
|   | c.  | ​Charles Darwin |
|   | d.  | ​Abraham Werner |
|   | e.  | ​Alfred Wegener |

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| --- | --- |
| *ANSWER:* | c |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 37. What mechanism accounts for differential survival and reproduction among members of a species?​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​neptunism |
|   | b.  | ​stratigraphy |
|   | c.  | ​formation |
|   | d.  | ​natural selection |
|   | e.  | ​orogeny |

|  |  |
| --- | --- |
| *ANSWER:* | d |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 38. Scientific evidence suggests that Earth formed approximately \_\_\_\_ ago.​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​4.6 trillion years |
|   | b.  | ​4.6 million years |
|   | c.  | 4.6 billion years​ |
|   | d.  | ​4600 years |
|   | e.  | ​460 years |

|  |  |
| --- | --- |
| *ANSWER:* | c |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 39. ​What term refers to a combination of related parts that interact in an organized manner?

|  |  |  |
| --- | --- | --- |
|   | a.  | ​system |
|   | b.  | ​hypothesis |
|   | c.  | ​theory |
|   | d.  | ​uniformitarianism |
|   | e.  | ​scientific method |

|  |  |
| --- | --- |
| *ANSWER:* | a |

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|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. What is the study of the origin and evolution of Earth, its continents, oceans, atmosphere, and life?​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​physical geology |
|   | b.  | ​scientific method |
|   | c.  | ​cosmology |
|   | d.  | ​historical geology |
|   | e.  | ​solar nebula |

|  |  |
| --- | --- |
| *ANSWER:* | d |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 41. Which division of Earth exists below the crust and above the core?​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​inner sphere |
|   | b.  | ​lithosphere |
|   | c.  | ​mantle |
|   | d.  | ​hydrosphere |
|   | e.  | ​molten zone |

|  |  |
| --- | --- |
| *ANSWER:* | c |

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|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. Which statement about the asthenosphere is *false*?​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​It lies beneath the lithosphere. |
|   | b.  | ​It is a rigid rock layer. |
|   | c.  | ​It behaves plastically. |
|   | d.  | ​It acts like a lubricating layer allowing plates to move. |
|   | e.  | ​It has the same composition as the lower mantle. |

|  |  |
| --- | --- |
| *ANSWER:* | b |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 43. The oceanic crust is composed mostly of \_\_\_\_.​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​granite |
|   | b.  | ​peridotite |
|   | c.  | ​basalt |
|   | d.  | ​rhyolite |
|   | e.  | ​gneiss |

|  |  |
| --- | --- |
| *ANSWER:* | c |

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|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 44. The geologic time scale was originally based upon \_\_\_\_.

|  |  |  |
| --- | --- | --- |
|   | a.  | vertical changes in fossil assemblages in sedimentary layers |
|   | b.  | the theory of organic evolution |
|   | c.  | the isotopes of minerals |
|   | d.  | absolute ages of rocks based on radiometric age dates |
|   | e.  | geographic mineral locations |

|  |  |
| --- | --- |
| *ANSWER:* | a |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 45. Organic evolution is predictive, supported by a multitude of evidence, and offers a good explanation of observed phenomena. Organic evolution, therefore, is considered a \_\_\_\_.​

|  |  |  |
| --- | --- | --- |
|   | a.  | ​hypothesis |
|   | b.  | ​law |
|   | c.  | ​theory |
|   | d.  | ​unifying concept |
|   | e.  | ​working model |

|  |  |
| --- | --- |
| *ANSWER:* | c |

 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 46. Which process is responsible for the planetary formation of Earth?

|  |  |  |
| --- | --- | --- |
|   | a.  | Accretion of small bodies called planetesimals |
|   | b.  | Erosion of an existing, larger planet |
|   | c.  | Collision of two medium-sized moons |
|   | d.  | Massive eruptions of magma which built up Earth’s rocky surface |
|   | e.  | Implosion of a nearby supernova |

|  |  |
| --- | --- |
| *ANSWER:* | a |

 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. Evidence for the Big Bang includes the \_\_\_\_.

|  |  |  |
| --- | --- | --- |
|   | a.  | blue-shift of adjacent galaxies |
|   | b.  | presence of background radiation |
|   | c.  | warm temperature of the universe |
|   | d.  | separation of the four fundamental forces |
|   | e.  | invariable speed at which galaxies are moving away from Earth in all directions |

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| *ANSWER:* | b |

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| 48. What are the four basic forces in the universe?​

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|   | a.  | ​gravity, electric, magnetic, and strong nuclear |
|   | b.  | ​gravity, electromagnetic, strong nuclear, and atomic |
|   | c.  | ​gravity, electromagnetic, strong nuclear, and weak nuclear |
|   | d.  | ​gravity, electric, magnetic, and atomic |
|   | e.  | ​gravity, electromagnetic, atomic, and nuclear |

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| *ANSWER:* | c |

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| 49. Planets located outside of our solar system are called \_\_\_\_.​

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|   | a.  | ​Goldilocks planets |
|   | b.  | ​exoplanets |
|   | c.  | ​gas giants |
|   | d.  | ​Jovian planets |
|   | e.  | ​terrestrial planets |

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| *ANSWER:* | b |

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| 50. Planets located farther from the Sun are \_\_\_\_, and are \_\_\_\_ than planets closer to the Sun.​

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|   | a.  | ​colder; denser |
|   | b.  | ​smaller; colder |
|   | c.  | ​larger; denser |
|   | d.  | ​larger; warmer |
|   | e.  | ​colder; larger |

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| *ANSWER:* | e |

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| **Completion** |

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| 51. ​The science of geology is divided into two broad areas: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ geology and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ geology.

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| *ANSWER:* | physical, historicalhistorical, physical |

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| 52. ​Solar system planets are classified as either \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ planets based upon their chemical and physical properties.

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| *ANSWER:* | errestrial, JovianJovian, terrestrial​ |

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| 53. Darwin suggested that the *mechanism* by which evolution proceeds is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.​

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| *ANSWER:* | natural selection​ |

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| 54. Scientists use the term \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to analyze and gather facts and data about a problem in a rational, orderly manner.

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| *ANSWER:* | scientific method​ |

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| 55. ​A combination of related parts that interact in an organized manner is a(n) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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| *ANSWER:* | system |

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| 56. Earth’s age is thought by most geologists to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ years old.

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| *ANSWER:* | 4.6 billion​ |

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| 57. The Doppler effect suggests that the universe is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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| *ANSWER:* | expandinggrowing |

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| 58. Our solar system is part of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Galaxy.​

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| *ANSWER:* | Milky Way |

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| 59. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are the remains or traces of once-living organisms.

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| *ANSWER:* | Fossils |

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| 60. A proposed explanation for an observed natural phenomena is a(n) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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| *ANSWER:* | hypothesis |

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| **Essay** |

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| 61. Explain one way in which the hydrosphere, biosphere, and atmosphere each interact with or affect the lithosphere.​

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| *ANSWER:* | ​A selection of answers is given below, but more are possible.​The hydrosphere and lithosphere interact to affect the shape of ocean basins and water is a major erosional agent.​Gases in the atmosphere and precipitation cause weathering of rocks. Heat reflected from land surfaces affects temperatures, and the location of mountain ranges affect weather patterns.​Organisms break down rock into soil. Humans alter the landscape. Plate tectonics affects the evolution and distribution of Earth’s biota. |

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| 62. Write a brief essay discussing the scientific method. What are the important steps in this method? Provide a specific example of a concept that has been considered by this method and its results.​

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| *ANSWER:* | The student should discuss the definitions of hypothesis, theory, and natural law. Especially important is the recognition that the scientific method is an iterative, pragmatic process. How does the layman’s concept of the term “theory” contrast with the scientific definition of the term?​ |

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| 63. One line of evidence supporting the Big Bang is the expansion of the universe. Explain how we know the universe is expanding and how it helps us determine an age for the universe.​

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| *ANSWER:* | Edwin Hubble first realized the universe was expanding. He concluded all galaxies were moving away from Earth by observing a red-shift in their spectral lines. Additionally, the farther away a galaxy was from Earth, the faster it was moving away. Knowing the expansion rate allows scientists to calculate at what point all matter was together. They have concluded it was approximately 14 billion years ago. |

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| 64. Write a short essay discussing the origin and development of the early solar system. What evidence do we have for events that took place during this period?​

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| *ANSWER:* | The student should discuss solar nebula theory, the accretion of planetesimals, and the origin of the raw materials that made up the early solar nebula. Evidence is derived from mathematical modeling of the early solar system and from materials contained within various types of meteorites.​ |

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| 65. Terrestrial planets and Jovian planets have unique characteristics. List and describe four ways terrestrial and Jovian planets differ.​

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| *ANSWER:* | Terrestrial planets are closer to the sun, smaller, denser, composed of rocks, and have fewer moons.​Jovian planets are larger, farther from the sun, composed of gasses, less dense, and have many moons. |

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| 66. Provide a brief discussion of the internal structure of Earth. What are the physical characteristics of each of the layers? What caused the “differentiation” of early Earth?​

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| *ANSWER:* | The student should provide a description of the internal physical and chemical layers of Earth, including the crust, mantle, inner core, outer core, lithosphere, and asthenosphere. This discussion should also include information about the internal heating mechanisms of Earth, including radioactive decay and accretional energy and how these mechanisms influenced differentiation of the original “raw material” that formed Earth. |

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| 67. Plate tectonic theory provides a framework for the study of geology due to its predictive and explanatory powers. Define plate tectonics and give three examples of what plate tectonics predicts or explains.​

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| *ANSWER:* | Plate tectonic theory states that the lithosphere is broken into several plates that move atop the asthenosphere in response to mantle convection.​This theory explains why earthquakes and volcanoes occur where they do, how mountain ranges form and why they are located where they are, the distribution and formation of natural resources, the distribution and evolution of Earth’s biota, and many other geological occurrence. |

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| 68. Provide a brief discussion of the theory of organic evolution. What evidence supports this theory?​

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| *ANSWER:* | The student should explain the concepts of organic evolution and natural selection. Evidence may include changes in fossil organisms in the rock record.​ |

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| 69. Prior to differentiation, Earth was a molten homogenous mass. What three sources of heating were responsible for Earth’s molten state? Which source contributes to Earth’s internal temperature today?​

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| *ANSWER:* | Answers should include:1. Meteorite impacts2. Gravitational compression3. heat from radioactive decay​Radioactive decay continues to contribute to Earth’s internal temperature.​ |

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| 70. Why is it a misconception to assume that because scientific theories can change, that they cannot be trusted?​

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| *ANSWER:* | Scientific theories have been rigorously tested by repeated experiments. There is strong evidence to support them. As test methods improve and new technology becomes available, scientists can refine a theory. Change in science is generally a matter of refining existing evidence.​ |

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