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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. ​The concept of a single world ocean emphasizes the interdependence of ocean and land, life and water, atmospheric and oceanic circulation, and natural and human-made environments.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2. The total amount of fresh water on Earth makes up only about 2.5% of all the water on the planet.​   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 3. ​Physical oceanographers design and build oil platforms, ships, harbors, and other structures that enable us to use the ocean wisely.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | |

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| 4. ​Although oceanographers may specialize in one particular area of study, the nature of the science is interdisciplinary, meaning that marine scientists must have a general knowledge of all areas of oceanography in order to study the system as a whole.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | |

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| 5. Once established, a theory is always correct and cannot be changed.​   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 6. ​The condensation theory explains how the ocean on Earth was formed.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 7. The fusion of hydrogen atoms into helium atoms occurs near the end of a star’s life.​   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | |

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| 8. ​During the early years of Earth, lighter elements such as silicon, magnesium, and aluminum rose to the surface, forming Earth’s crust.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | |

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| 9. ​Earth’s moon is thought to have formed soon after the big bang similarly to how Earth formed.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | |

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| 10. Earth’s early atmosphere was similar to the present day atmosphere, composed mostly of oxygen and nitrogen.​   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11. An anoxic atmosphere was needed for life to first form on Earth.​   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | |

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| 12. ​The fact that all life cells depend on saline water suggests that life evolved in the ocean.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 13. Earth’s sun will become a supernova near the end of its life cycle.​   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | |

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| 14. One of the conditions necessary for a planet to have a permanent ocean of liquid water is to have a solid cold core.​   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 15. Magnetometer data has been used to determine if other planets and moons in our solar system have salty oceans.​   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | True | |

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16. How much of the water on Earth is found in the ocean?​   |  |  |  | | --- | --- | --- | |  | a. | ​3% | |  | b. | ​67% | |  | c. | ​71% | |  | d. | ​90% | |  | e. | 97%​ |  |  |  | | --- | --- | | *ANSWER:* | e | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 17. Water covers approximately \_\_\_\_ of the surface of Earth.​   |  |  |  | | --- | --- | --- | |  | a. | ​25% | |  | b. | ​5% | |  | c. | ​50% | |  | d. | ​75% | |  | e. | 95%​ |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 18. What is the approximate average depth of Earth’s ocean?​   |  |  |  | | --- | --- | --- | |  | a. | ​3,600 m | |  | b. | ​12,000 m | |  | c. | ​810 m | |  | d. | ​15,500 m | |  | e. | 1,200 m​ |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 19. ​Joann, a marine scientist, is studying the amount of dissolved iron, nitrate, and phosphate in the upper water column of the open ocean to determine if nutrients are limiting for phytoplankton growth. What kind of marine scientist is she?   |  |  |  | | --- | --- | --- | |  | a. | ​physical oceanographer | |  | b. | ​chemical oceanographer | |  | c. | ​marine biologist | |  | d. | ​marine geologist | |  | e. | marine engineer​ |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20. A marine scientist who is testing the amount of oxygen needed by microorganisms in deep ocean sediments is conducting a(n) \_\_\_\_.​   |  |  |  | | --- | --- | --- | |  | a. | ​hypothesis | |  | b. | ​experiment | |  | c. | ​theory | |  | d. | ​scientific method | |  | e. | marine law​ |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 21. A(n) \_\_\_\_ is an explanation that can be tested by additional observations and controlled experiments.​   |  |  |  | | --- | --- | --- | |  | a. | ​question | |  | b. | ​science | |  | c. | ​hypothesis | |  | d. | ​scientific method | |  | e. | law​ |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 22. A marine scientist who studies the movements of the seafloor at mid-ocean ridges and subduction zones is a \_\_\_\_.​   |  |  |  | | --- | --- | --- | |  | a. | ​physical oceanographer | |  | b. | ​marine climatologist | |  | c. | ​chemical oceanographer | |  | d. | ​marine geologist | |  | e. | marine biologist​ |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 23. A(n) \_\_\_\_ usually takes the form of a concise mathematical or verbal expression; a(n) \_\_\_\_ provides an explanation for the observations.​   |  |  |  | | --- | --- | --- | |  | a. | ​law; theory | |  | b. | ​theory; law | |  | c. | ​hypothesis; theory | |  | d. | ​law; hypothesis | |  | e. | theory; hypothesis​ |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 24. The water for Earth’s ocean originated from \_\_\_\_.​   |  |  |  | | --- | --- | --- | |  | a. | ​volcanic activity and other planets | |  | b. | ​volcanic activity and comets | |  | c. | ​other planets | |  | d. | ​the sun | |  | e. | solar nebula​ |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 25. Which sequence correctly describes the stages in the life cycle of a star?​   |  |  |  | | --- | --- | --- | |  | a. | ​protostar, stability, nuclear fusion, red giant, supernova | |  | b. | ​supernova, red giant, nuclear fusion, stability, protostar | |  | c. | ​red giant, protostar, stability, nuclear fusion, supernova | |  | d. | ​protostar, nuclear fusion, stability, red giant, supernova | |  | e. | nuclear fusion, protostar, stability, supernova, red giant​ |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 26. Planet building occurs through the process of \_\_\_\_, which involves the clumping of small particles into larger masses.​   |  |  |  | | --- | --- | --- | |  | a. | ​condensation | |  | b. | ​coagulation | |  | c. | ​secretion | |  | d. | ​accretion | |  | e. | aggregation​ |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| 27. The process by which stars form helium atoms from hydrogen is \_\_\_\_.​   |  |  |  | | --- | --- | --- | |  | a. | ​accretion | |  | b. | ​condensation | |  | c. | ​nuclear fusion | |  | d. | ​density stratification | |  | e. | compression​ |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 28. How long ago did the big bang catalyze the beginning of the universe?​   |  |  |  | | --- | --- | --- | |  | a. | ​13.7 billion years ago | |  | b. | ​1.37 billion years ago | |  | c. | ​4 billion years ago | |  | d. | ​40 million years ago | |  | e. | 5 million years ago​ |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 29. What created Earth's moon?​   |  |  |  | | --- | --- | --- | |  | a. | ​The initial big bang expansion event | |  | b. | ​The formation of a new star | |  | c. | ​Ejection of rocky mantle material from Earth after a collision with a smaller planet | |  | d. | ​The collision of two older moons | |  | e. | Ejection of rocky mantle material following an explosive volcanic event on Earth​ |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 30. ​Through gravitational compression, Earth’s layers were formed by the process of \_\_\_\_.   |  |  |  | | --- | --- | --- | |  | a. | ​plate tectonics | |  | b. | ​accretion | |  | c. | ​density stratification | |  | d. | ​subduction | |  | e. | condensation​ |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 31. How long did the process of density stratification of Earth last?​   |  |  |  | | --- | --- | --- | |  | a. | ​100 million years | |  | b. | ​100 thousand years | |  | c. | ​10 billion years | |  | d. | ​1 billion years | |  | e. | 50 million years​ |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| 32. ​Earth’s early atmosphere contained high concentrations of \_\_\_\_.   |  |  |  | | --- | --- | --- | |  | a. | ​oxygen and nitrogen | |  | b. | ​carbon dioxide and oxygen | |  | c. | ​oxygen and methane | |  | d. | ​oxygen and ammonia | |  | e. | ​carbon dioxide and nitrogen |  |  |  | | --- | --- | | *ANSWER:* | e | |

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| 33. The dependence of all living cells on \_\_\_\_ to survive strongly suggests that simple, living molecules originated in the ocean.​   |  |  |  | | --- | --- | --- | |  | a. | ​fresh water | |  | b. | ​saline water | |  | c. | ​carbon dioxide | |  | d. | ​oxygen | |  | e. | methane​ |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 34. ​Which condition of early Earth contributed to biosynthesis?   |  |  |  | | --- | --- | --- | |  | a. | ​oxygen-depleted atmosphere | |  | b. | ​ozone in the upper atmosphere | |  | c. | ​oxygen in the atmosphere | |  | d. | ​extreme high temperatures | |  | e. | aerobic conditions​ |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 35. What had the most influence in irreversibly changing Earth's atmosphere?​   |  |  |  | | --- | --- | --- | |  | a. | ​Formation of carbonic acid in the ocean | |  | b. | ​Production of oxygen from photosynthesis | |  | c. | ​Chemical breakup of water vapor by sunlight | |  | d. | ​Fluctuation in the atmospheric composition | |  | e. | Anaerobic respiration by deep-sea organisms​ |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 36. What is the age of the oldest evidence yet found with remnants of life?​   |  |  |  | | --- | --- | --- | |  | a. | ​1.5 billion years old | |  | b. | ​2.7 million years old | |  | c. | ​3.85 billion years old | |  | d. | ​4.2 billion years old | |  | e. | 6 million years old​ |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| 37. Which extreme environment may have favored the origin of life on Earth?​   |  |  |  | | --- | --- | --- | |  | a. | ​polar sea ice | |  | b. | ​hydrothermal vents | |  | c. | ​estuarine bays | |  | d. | ​dry mountain rocky outcrops | |  | e. | rainforest sediments​ |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 38. The end of Earth’s life cycle will occur as a result of the sun’s \_\_\_\_ phase.​   |  |  |  | | --- | --- | --- | |  | a. | ​supernova | |  | b. | ​red giant | |  | c. | ​protostar | |  | d. | ​nebula | |  | e. | accretion​ |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 39. Which condition is necessary for a planet to have a permanent liquid ocean?​   |  |  |  | | --- | --- | --- | |  | a. | ​low gravity | |  | b. | ​double sun | |  | c. | ​toxic atmosphere | |  | d. | ​irregular orbits | |  | e. | optimum distance from star​ |  |  |  | | --- | --- | | *ANSWER:* | e | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40. The moon Europa has an icy ocean with perhaps 40 times the water as Earth. Which planetary body does Europa orbit?​   |  |  |  | | --- | --- | --- | |  | a. | ​Titan | |  | b. | ​Jupiter | |  | c. | ​Saturn | |  | d. | ​Ganymede | |  | e. | Mars​ |  |  |  | | --- | --- | | *ANSWER:* | b | |

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| 41. Photographs of smoothed streambed rock with surfaces eroded by water-driven pebbles from the surface of \_\_\_\_ provide evidence of past water flow.​   |  |  |  | | --- | --- | --- | |  | a. | ​Europa | |  | b. | ​Saturn | |  | c. | ​Jupiter | |  | d. | ​Mars | |  | e. | Titan​ |  |  |  | | --- | --- | | *ANSWER:* | d | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42. High levels of \_\_\_\_ could indicate life on other planets.​   |  |  |  | | --- | --- | --- | |  | a. | ​free nitrogen | |  | b. | ​carbon dioxide | |  | c. | ​free oxygen | |  | d. | ​methane | |  | e. | ozone​ |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 43. What could ultimately be linked to the present absence of water on Mars?​   |  |  |  | | --- | --- | --- | |  | a. | ​The large decrease in carbon dioxide | |  | b. | ​The proximity to the sun | |  | c. | ​The lack of free oxygen in the atmosphere | |  | d. | ​The lack of outgassing from the interior of the planet | |  | e. | Excess carbon dioxide​ |  |  |  | | --- | --- | | *ANSWER:* | a | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 44. Which environment on Earth could possibly mimic conditions on other planets, and, therefore, be of scientific interest?​   |  |  |  | | --- | --- | --- | |  | a. | ​open ocean surface waters | |  | b. | ​estuarine marsh ecosystems | |  | c. | ​dry Arctic rock environments | |  | d. | ​prairie grass ranges | |  | e. | tropical forest regions​ |  |  |  | | --- | --- | | *ANSWER:* | c | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 45. An ocean of \_\_\_\_ has been photographed on the surface of Titan.​   |  |  |  | | --- | --- | --- | |  | a. | icy, slushy water​ | |  | b. | ​frozen water | |  | c. | ​water-smoothed rock | |  | d. | ​liquid hydrocarbons | |  | e. | liquid nitrogen​ |  |  |  | | --- | --- | | *ANSWER:* | d | |

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| --- |
| **Matching** |

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| ​*Match the term with the corresponding description*   |  |  | | --- | --- | | a. | ​accretion | | b. | ​theory | | c. | ​outgassing | | d. | ​nebulae | | e. | ​waves and currents | |

|  |  |  |
| --- | --- | --- |
| 46. ​Ocean dynamics studied by physical oceanographers   |  |  | | --- | --- | | *ANSWER:* | e | |

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| --- | --- | --- |
| 47. ​A statement that explains experimental observations   |  |  | | --- | --- | | *ANSWER:* | b | |

|  |  |  |
| --- | --- | --- |
| 48. ​Large, diffuse clouds of dust and gas within galaxies   |  |  | | --- | --- | | *ANSWER:* | d | |

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| 49. ​The process by which new planets formed from rotating dust and debris   |  |  | | --- | --- | | *ANSWER:* | a | |

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| 50. ​Volcanic venting of volatile substances   |  |  | | --- | --- | | *ANSWER:* | c | |

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| **Completion** |

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| 51. The \_\_\_\_\_\_\_\_\_\_\_\_ may be defined as the vast body of saline water that occupies the depressions of Earth’s surface.​   |  |  | | --- | --- | | *ANSWER:* | ​ocean | |

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| 52. ​Earth’s ocean and sea divisions, such as the Pacific and Atlantic Oceans, are but temporary features of a(n) \_\_\_\_\_\_\_\_\_\_\_\_ world ocean.   |  |  | | --- | --- | | *ANSWER:* | single​ | |

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| 53. \_\_\_\_\_\_\_\_\_\_\_\_ is a systematic process of asking questions about the observable world by gathering and then studying information (data).​   |  |  | | --- | --- | | *ANSWER:* | ​Science | |

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| 54. The \_\_\_\_\_\_\_\_\_\_\_\_ method is an orderly process by which theories are verified or rejected.​   |  |  | | --- | --- | | *ANSWER:* | ​scientific | |

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| 55. A(n) \_\_\_\_\_\_\_\_\_\_\_\_ is a huge, rotating aggregation of stars, dust, gas, and other debris held together by gravity.​   |  |  | | --- | --- | | *ANSWER:* | ​galaxy | |

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| 56. During nuclear fusion on a protostar, \_\_\_\_\_\_\_\_\_\_\_\_ atoms fuse to form helium atoms.​   |  |  | | --- | --- | | *ANSWER:* | hydrogen​ | |

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| 57. Soon after Earth’s formation, gravity pulled most of the iron and nickel inward to form the planet’s core in a process call density \_\_\_\_\_\_\_\_\_\_\_\_.​   |  |  | | --- | --- | | *ANSWER:* | ​stratification | |

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| 58. Earth’s \_\_\_\_\_\_\_\_\_\_\_\_ was formed from an ejection of debris caused by the collision of a planetary body with Earth.​   |  |  | | --- | --- | | *ANSWER:* | ​moon | |

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| 59. ​The oxygen in Earth’s atmosphere was formed from the process of \_\_\_\_\_\_\_\_\_\_\_\_.   |  |  | | --- | --- | | *ANSWER:* | ​photosynthesis | |

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| 60. \_\_\_\_\_\_\_\_\_\_\_\_ is the process by which living organisms are formed from simple organic molecules.​   |  |  | | --- | --- | | *ANSWER:* | ​Biosynthesis | |

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| 61. Life in the ocean may have originated near \_\_\_\_\_\_\_\_\_\_\_\_ vents.​   |  |  | | --- | --- | | *ANSWER:* | ​hydrothermal | |

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| 62. The dying of Earth’s \_\_\_\_\_\_\_\_\_\_\_\_ will mark the end of Earth’s solar system.​   |  |  | | --- | --- | | *ANSWER:* | ​sun | |

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| 63. A salty, liquid-water ocean has been detected on \_\_\_\_\_\_\_\_\_\_\_\_, a moon of Jupiter.​   |  |  | | --- | --- | | *ANSWER:* | ​Europa or Ganymede | |

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| 64. Evidence suggests that water recently flowed on the planet \_\_\_\_\_\_\_\_\_\_\_\_; however, water is not detected now.​   |  |  | | --- | --- | | *ANSWER:* | ​Mars | |

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| 65. The presence of \_\_\_\_\_\_\_\_\_\_\_\_ on a planet could be an indication of past or present forms of life.​   |  |  | | --- | --- | | *ANSWER:* | ​oxygen | |

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| **Subjective Short Answer** |

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| 66. ​Describe the processes by which Earth formed.   |  |  | | --- | --- | | *ANSWER:* | The universe began during an expansion event known as the big bang approximately 13.7 billion years ago. During its early phases, the universe was very hot, but over time cooled and expanded to form hydrogen atoms. Further cooling led to the formation of galaxies, large, rotating aggregations of stars, dust, and gas held together by gravity. Stars and planets formed according to the condensation theory and accretion. | |

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| 67. Explain the process of density stratification as it applies to the formation of Earth.   |  |  | | --- | --- | | *ANSWER:* | ​During the accretion phase in the formation of Earth, gravitational compression combined with radioactive decay caused Earth to partially melt. Gravity pulled most of the heavier elements, such as iron and nickel, inward to form the planet’s core. Lighter elements, such as silicon, magnesium, and aluminum, rose toward the surface, forming Earth’s crust. | |

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| 68. ​Identify the components of early Earth’s atmosphere, and explain how it changed to that of present day.   |  |  | | --- | --- | | *ANSWER:* | Earth’s early atmosphere was rich in carbon dioxide, nitrogen, and water vapor, with traces of ammonia and methane. This mixture was gradually altered by carbon dioxide dissolving in seawater, the chemical breakup of water vapor by sunlight to form ozone, and photosynthesis of green plants to form oxygen. Earth’s present atmosphere is composed primarily of nitrogen and oxygen. | |

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| 69. Briefly, describe the formation of Earth’s ocean.   |  |  | | --- | --- | | *ANSWER:* | ​During Earth’s formation, gases trapped within the planet began to vent to the surface through volcanic outgassing. As the hot vapors rose, they condensed into clouds in the cool upper atmosphere. In addition, icy comets or asteroids colliding with Earth may have contributed a portion of the accumulating water on Earth. As Earth cooled, outgassed water began to form droplets and hot rains fell to Earth for millions of years forming a deep ocean. | |

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| 70. Outline the conditions necessary for a planet to maintain an ocean of liquid water permanently.​   |  |  | | --- | --- | | *ANSWER:* | The conditions necessary to maintain a large, permanent liquid ocean include the following: (1) a planet that moves in a nearly circular orbit around a stable star; (2) the distance of the planet from the star must be such to provide a temperate environment in which water is liquid; (3) the planet’s sun must not be a double or multiple star that provides orbital years with irregular periods of intense heat and cold; (4) materials that accreted to form the planet must have included water and substance capable of forming a solid crust; and (5) the planet must be large enough that its gravity will keep the atmosphere and ocean from drifting off into space. | |