

Chapter 16

Earth and Other Planets:

Is Earth the only planet with life?

1. According to the nebular hypothesis, the solar system began as
 - a. a rapidly rotating sun.
 - b. a cloud of dust and gas.
 - c. a cloud containing approximately equal amounts of all naturally occurring elements.
 - d. two comets that collided with a tremendous impact.
 - e. The nebular hypothesis addresses only the formation of stars, not planets.

Ans: b

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Easy

2. Which scientist is credited with the discovery of Pluto?
 - a. Percival Lowell
 - b. Isaac Newton
 - c. Clyde Tombaugh
 - d. Galileo Galilei
 - e. Pierre Laplace

Ans: c

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Easy

3. If only Newton's laws of motion were applied to the solar system,
 - a. Venus's orbit could be the reverse of Earth's orbit.
 - b. Earth's moon could rise in the west and set in the east.
 - c. Mar's orbit could be perpendicular to Jupiter's orbit.
 - d. Saturn's rings could at random angles to their current plane.
 - e. all of the above

Ans: e

Link To: [The Formation of the Solar System](#)

Difficulty Level: Easy

4. What two elements comprise most of a nebula?
- a. hydrogen and helium
 - b. hydrogen and nitrogen
 - c. oxygen and lithium
 - d. carbon and hydrogen
 - e. helium and lithium

Ans: a

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Easy

5. Why are the Jovian planets formed from materials different from the terrestrial planets?
- a. Terrestrial planets were protected by the asteroid belt between Mars and Jupiter.
 - b. The composition of elements in a planet was a random process after the big bang.
 - c. When the solar system first formed, the heaviest elements sank toward the center of the nebulae and the lightest elements floated out.
 - d. Gaseous Jovian planets, formed farther away from the heat of the Sun, are formed from light weight nebulae "dust."
 - e. Only the terrestrial planets formed from planetesimals.

Ans: d

Link To: [The Formation of the Solar System](#)

Difficulty Level: Easy

6. The birth of a solar system would look like
- a. a huge explosion of rocks and fire.
 - b. a meteor shower.
 - c. thick dust clouds circling a new star.
 - d. a thickening Jovian plane.
 - e. nothing we could ever see or imagine.

Ans: c

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Easy

7. The Earth's layered composition is a consequence of
- a. the great bombardment.
 - b. differentiation of materials.
 - c. isolation.
 - d. condensation currents.

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e. plate tectonics.

Ans: b

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Easy

8. The inner core at the center of the Earth

- a. contains the heaviest elements of the Earth's mass.
- b. is made from rocks similar to those on the Earth's surface.
- c. contains a mixture of solids, liquids, and gases.
- d. is under low pressure, but at a very high temperature.
- e. all of the above

Ans: a

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Easy

9. The mantle of the Earth can be described as

- a. the metallic core.
- b. containing hot, melted rock.
- c. the surface of the Earth.
- d. primarily gaseous.
- e. helium, oxygen, magnesium, silicon.

Ans: b

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Easy

10. In our solar system, we can say that moons

- a. were most likely formed by spinning planets throwing off big chunks of material.
- b. are all about the same size.
- c. have less gravitational pull than that found on any planet.
- d. usually have active volcanoes.
- e. have been found orbiting all planets except for Mercury and Venus.

Ans: e

Link To: [The Formation of the Solar System](#)

Difficulty Level: Easy

11. The composition of the Earth's Moon is most like

- a. Mars.
- b. the Earth's crustal material.
- c. an asteroid.
- d. the Earth's mantle.
- e. a comet.

Ans: d

Link To: The Formation of the Solar System

Difficulty Level: Easy

12. Scientists study meteorites

- a. because they contain the material from which the solar system was made.
- b. to find out more about how and when the Earth was created.
- c. to find out more about other parts of the solar system.
- d. for all the above reasons.
- e. Scientists cannot study meteorites because they burn up when they hit the Earth's atmosphere.

Ans: d

Link To: The Outer Solar System

Difficulty Level: Easy

13. After the Earth was formed

- a. it was bombarded by huge chunks of rock.
- b. outgassing ended.
- c. its atmosphere remained virtually unchanged.
- d. the densest materials collected as the Earth's crust.
- e. its temperature was too cold to support life.

Ans: a

Link To: The Outer Solar System

Difficulty Level: Easy

14. A comparison of asteroids and terrestrial planets would reveal that both are

- a. made primarily of gases.
- b. relatively rocky and small.
- c. composed of chunks of ice surrounded by solid material.
- d. located beyond the effect of solar heat and wind.
- e. large and dense, compared to the Jovian planets.

Ans: b

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Difficulty Level: Easy

15. The “big splash” theory of the Moon’s formation

- a. was disproven during the Apollo lunar mission.
- b. states that the Moon was formed elsewhere in the Solar System and was captured by Earth’s gravitational force.
- c. suggests that the Moon was thrown from a spinning Earth.
- d. states that the Earth was struck by a huge object, causing a large amount of mantle material to be blown into orbit.
- e. suggests that the Moon was formed by light, less dense materials that floated into the orbit around the Earth.

Ans: d

Link To: The Nebular Hypothesis

Difficulty Level: Easy

16. The early atmosphere on Earth included

- a. methane (CH₄).
- b. water vapor (H₂O).
- c. ammonia (NH₃).
- d. carbon dioxide (CO₂).
- e. all of the above

Ans: e

Link To: The Nebular Hypothesis

Difficulty Level: Easy

17. What are some health hazards of long space trips?

- a. Astronauts can develop skin cancer from direct UV-rays.
- b. Unidentified microbes create a possible danger of infection.
- c. Weight gain is common because of the high calorie foods.
- d. Bone mass is lost increasing the chance of breaks.
- e. All of the above can happen.

Ans: d

Link To: The Nebular Hypothesis

Difficulty Level: Easy

18. An astronaut standing on Mars and attempting to look at Jupiter might have her view partly blocked by the intervening

- a. Oort Cloud.
- b. rings of Saturn.
- c. asteroid belt.
- d. moon Triton.
- e. Sun.

Ans: c

Link To: [The Formation of the Solar System](#)

Difficulty Level: Easy

19. The Earth's atmosphere has probably been affected by all of the following except for
- a. volcanoes.
 - b. strong solar winds.
 - c. Amazon jungles.
 - d. the number of living things on Earth.
 - e. increased amounts of hydrogen and helium.

Ans: e

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Easy

20. The process that formed the structure of the Earth and other terrestrial planets is
- a. convection.
 - b. gravity.
 - c. differentiation
 - d. acceleration.
 - e. tectonics.

Ans: c

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Easy

21. Transfer of material from space to Earth
- a. stopped after the great bombardment.
 - b. started after the great bombardment.
 - c. has been measured at 20 metric tons daily.
 - d. will double the mass of the Earth in 4 billion years.
 - e. continues at an estimated rate of 20 metric tons annually.

Ans: c

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Link To: The Nebular Hypothesis

Difficulty Level: Easy

22. What new astronomical information resulted from the impact of the comet Shoemaker-Levy on Jupiter in 1994?

- a. effect of hydrogen bombs on Jupiter's atmosphere
- b. composition of atmosphere beneath the planet's surface
- c. the number of volcanoes located within 100 km of the impact
- d. amount of water in Jupiter's atmosphere
- e. mineral analysis of Jupiter's core

Ans: b

Link To: The Outer Solar System

Difficulty Level: Easy

23. The diamond anvil can attain pressures that exceed pressures at the center of the Earth.

Ans: True

Link To: The Nebular Hypothesis

Difficulty Level: Easy

24. The largest moon in our solar system is about the same size as the smallest planet.

Ans: True

Link To: The Formation of the Solar System

Difficulty Level: Easy

25.. Pluto's moon Charon was captured during the great bombardment.

Ans: False

Link To: The Outer Solar System

Difficulty Level: Easy

26. Comets can originate in two regions outside our solar system.

Ans: True

Link To: [The Outer Solar System](#)
Difficulty Level: Easy

27. Extrasolar planets have been discovered by an adaptation of the Doppler effect.

Ans: True
Link To: [The Outer Solar System](#)
Difficulty Level: Easy

28. The mantle is the one of two layers of the solid Earth with which human beings have had direct contact.

Ans: False
Link To: [The Nebular Hypothesis](#)
Difficulty Level: Easy

29. More diamonds can now be manufactured in a year than the total amount of diamonds mined in recorded history.

Ans: True
Link To: [The Nebular Hypothesis](#)
Difficulty Level: Easy

30. NASA scientists are collaborating with the Center for Disease Control on a mission to collect and bring back surface samples from Mars.

Ans: True
Link To: [Exploring the Solar System](#)
Difficulty Level: Easy

31. "Hot Jupiters" are large gaseous planets located close to their respective suns in other solar systems.

Ans: True
Link To: [The Outer Solar System](#)
Difficulty Level: Easy

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32. The nebulae hypothesis states that only 10% of the original mass became concentrated as the Sun.

Ans: False

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Easy

33. A comet is a piece of space debris burning up in the Earth's atmosphere.

Ans: False

Link To: [The Outer Solar System](#)

Difficulty Level: Easy

34. Pluto's orbital path sometimes crosses Neptune's orbital path.

Ans: True

Link To: [The Outer Solar System](#)

Difficulty Level: Easy

35. What was accomplished by Voyager 1 and Voyager 2?

- a. remote sensing of the atmosphere of Venus
- b. collected samples from the asteroid belt
- c. paved the way for the Moon landings
- d. clocked winds on Mercury
- e. assessment of the outer Solar System environment

Ans: e

Link To: [The Outer Solar System](#)

Difficulty Level: Medium

36. How can meteor showers be predicted?

- a. Meteors follow the jet stream in the upper atmosphere.
- b. Meteors are in known orbits around the sun after comets.
- c. Meteors rise in the east and set in the west.

- d. Telescopes on satellites detect meteors months in advance of their entry into the Earth's atmosphere.
- e. Calculations made by the Divine Calculator have been used to produce meteor shower schedules.

Ans: b

Link To: [The Outer Solar System](#)

Difficulty Level: Medium

37. Which of the following characteristics does the Earth share with all other bodies in the solar system?

- a. formed from matter ejected by the Sun
- b. move in circular orbits
- c. similar chemical composition
- d. equally dense
- e. gravitationally bound to the Sun

Ans: e

Link To: [The Formation of the Solar System](#)

Difficulty Level: Medium

38. The density of our Moon is less than the average density of Earth.

Ans: True

Link To: [The Formation of the Solar System](#)

Difficulty Level: Medium

39. The density of the material on the Moon is less than the density of the Earth.

Ans: True

Link To: [The Formation of the Solar System](#)

Difficulty Level: Medium

40. The weight of an object on Jupiter's surface is less than it would be on Earth.

Ans: False

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Difficulty Level: Medium

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41. How are asteroids different from comets?

Ans: Asteroids are small rocky bodies that are similar in composition to the terrestrial planets and move in orbits around the Sun, primarily in the asteroid belt. Comets have the consistency of a “dirty snowball” of water and methane ice imbedded with some rock. Most comets are located outside the orbit of Pluto in the Oort Cloud or the Kuiper Belt.

Link To: [The Outer Solar System](#)

Difficulty Level: Medium

42. Describe the Galileo mission to Jupiter.

Ans: Galileo began study of Jupiter after 1989 launch and six years in space. From an orbit around Jupiter, Galileo probed the atmosphere with a projectile. Galileo continues to orbit Jupiter and send back data about the planet and its moons.

Link To: [The Outer Solar System](#)

Difficulty Level: Medium

43. What is the current hypothesis that explains why planets differ in their axis of rotation and direction of spin?

Ans: Early bombardment.

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Medium

44. How was the layered structure of the Earth first differentiated?

Ans: Lighter elements rise to the surface; heavy elements sink.

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Medium

45. From the density calculation of the Moon (page 328) why would you anticipate that a directional compass would not work on the Moon?

Ans: It suggests that the Moon is basically devoid of metals so one would not expect a large amount of metals in the core to produce a magnetic field—indeed, the Moon’s magnetic field is virtually nonexistent.

Link To: The Nebular Hypothesis

Difficulty Level: Medium

46. Explain how the early Earth’s atmosphere must have been very different from the atmosphere we are breathing now?

Ans: The atmosphere had to change from a carbon dioxide dominated one with a trace of oxygen to a nitrogen-oxygen dominated one with a trace of carbon dioxide. This reversal is the product of plants and oceans absorbing carbon dioxide and photosynthesis releasing oxygen into the atmosphere, decaying plants releasing nitrogen.

Link To: The Nebular Hypothesis

Difficulty Level: Medium

47. Discuss the apparent conflict between the nebulae hypothesis and the rotations of planets.

Ans: Planets revolve around the Sun in the same plane and in the same direction, according to the nebulae hypothesis; however, each planet rotates around its own axis at differing angles and directions. Scientists now believe that a planet’s rotation was affected by random collisions with very large objects at some point in its history.

Link To: The Nebular Hypothesis

Difficulty Level: Hard

48. Why do scientists believe there may have been life on Mars?

Ans: Evidence of water locked beneath the surface of Mars comes from several space missions, including Pathfinder (1990s) and Odyssey (2002). A Martian atmosphere was also possible in the past. These are the two prerequisites for formation of life.

Link To: Exploring the Solar System

Difficulty Level: Hard

49. Compare several of the moons of our solar system and what a study of these has taught us about Earth's processes.

Ans: The craters on Earth's moon show evidence of a great bombardment in the past. Jupiter's moon Io has active volcanoes; Europa, has a frozen ocean; Saturn’s moon, Titan, may have

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organic materials. Each of these moons provides an example of processes that may be similar to those processes forming life on prehistoric Earth.

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Hard

50. Draw a simple diagram to show how it is possible for an asteroid to collide with Earth, even though both are in orbit around the Sun.

Ans: Answers will vary, but the diagram should reflect that, at some point, the asteroid's orbit crosses that of the Earth.

Link To: [The Outer Solar System](#)

Difficulty Level: Hard

51. Explain the processes in the evolution of the Earth's atmosphere beginning with Earth as an airless, molten ball.

Ans: Answers will vary but should include: Volcanoes belched water vapor and carbon dioxide. Atmospheric temperatures dropped. Torrential rains filled ocean basins. Light atmospheric elements escaped to space. Photosynthetic organisms evolved. Free oxygen increases to about 20% of the atmosphere.

Link To: [The Nebular Hypothesis](#)

Difficulty Level: Hard

52. Do you think that space exploration should be carried out with manned or unmanned spacecraft? Explain your answer.

Ans: Answers will vary. Unmanned space craft are safer for humans, however humans can make on-the-spot judgments.

Link To: [Exploring the Solar System](#)

Difficulty Level: Hard

53. Describe how the scientific process led to the discovery of Pluto.

Ans: Development of the telescope and pictures of a shifting point of light; observations and interpretations of these observations.

Link To: [The Outer Solar System](#)

Difficulty Level: Hard

54. Compare what you would experience during explorations of Jupiter and Venus.

Ans: Answers will vary but should include ideas about changes in weight, in the visibility due to atmospheric variations, plus differences in atmospheric pressure.

Link To: [Exploring the Solar System](#)

Difficulty Level: Hard

55. In 1994 the Shoemaker-Levy Comet collided with Jupiter. The impact was predicted, observed, and recorded by astronomers on Earth. What information did the scientists use to predict the time and location of the comet impact?

Ans: Velocity, time and gravitational relationships between the planet and the comet plus the orbits of the comet and Jupiter..

Link To: [The Outer Solar System](#)

Difficulty Level: Hard

56. What is the long-range impact of space debris and rock falling to Earth each day? What is the impact of this same material in outer space to the space program?

Ans: Answers will vary but should include information about foreign biological materials which could be found within meteorites, small impact craters to wide-scale destruction, as well as the ability to study materials from space. Answers should also include danger to astronauts, ability to study materials while still in orbit and so forth.

Link To: [The Outer Solar System](#)

Difficulty Level: Hard

57. The “Death Star” hypothesis has been used to explain the extinction of the dinosaurs during the Cretaceous period. How could this impact kill animals on all parts of the Earth? What are the chances of this happening again?

Answers will vary; one theory is that it decreased the temperature of the atmosphere thereby killing all animals/plants that could not adapt to the relatively immediate change. Chances range from very high to very low depending on the data reported.

Link To: [The Outer Solar System](#)

Difficulty Level: Hard

58. Describe two fictional life forms that have internal skeletons: one adapted to life on Pluto and one adapted to life on Saturn. Why would they be different?

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Ans: Answers will vary but should include adaptation to different gravitation and to different temperatures and light.

Link To: The Nebular Hypothesis

Difficulty Level: Hard

59. How important are volcanoes to the creation of an atmosphere? Use several examples from our solar system in your answer.

Ans: Outgassing released new atmosphere. Volcanoes on Earth, Mars, Jupiter's moons, all of which have or had atmospheres as can be shown by the surface of the planet.

Link To: The Nebular Hypothesis

Difficulty Level: Hard

60. If the Nebular hypothesis is correct, then what physical and chemical aspects of the solar system does it account for? Are there any outlier phenomena?

Ans: It accounts for the mechanical motions, rotation and revolution of the Sun and all planets and respective moons. Aberrant motions can be accounted for by subsequent impacts and, in the case of moons, captured by larger bodies. Chemically it accounts for the chemical and density segregation of the planets.

Link To: The Nebular Hypothesis

Difficulty Level: Hard

61. Explain the relationship between meteor showers and comets.

Ans: Meteor showers are the result of the earth running into the dusty orbits of previous comet's journey around the Sun.

Link To: The Outer Solar System

Difficulty Level: Hard

62. Explain how the 'seasons' would be represented on Uranus.

Ans: With the northern hemisphere always pointed toward the Sun, only the northern hemisphere would receive any daylight, therefore any 'seasonal' change would be the result of changing one's latitude.

Link To: The Nebular Hypothesis

Difficulty Level: Hard

63. Even though Saturn's size is about eight Earth diameters, your weight (earth standard) would be about the same if you stand on Saturn's 'surface'. What does this suggest about the composition of the ringed planet?

Ans: Although bigger in volume, Saturn must be much less dense than Earth, so one's body weight on Earth should be very similar on Saturn (100 pounds on earth \approx 106 pounds on Saturn).

Link To: The Formation of the Solar System

Difficulty Level: Hard

64. Both the Earth and moon have craters but the smaller moon has millions more than the Earth. If they both formed at the same time and under similar conditions, how can you account for this discrepancy?

Ans: The Earth being the larger target probably had several times the impacts of the moon, but the process of weathering and plate tectonics have erased much of the Earth's surface features.

Link To: The Nebular Hypothesis

Difficulty Level: Hard

65. What physical and chemical characteristics does the 'big splash' hypothesis (earth-moon formation) account for?

Ans: It accounts for the motions of the earth and moon operating as a mechanical system: further it accounts for the density difference between the two bodies (Earth being more dense) and the lack of gases and metals in moon rocks.

Link To: The Nebular Hypothesis

Difficulty Level: Hard