#### 6.E.1 1of3 Solar System 28 questions

**1.** On Earth, most years are 365 days long. On Saturn, a year is 10,740 days long. Why is a year on Saturn so much longer than a year on Earth?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | Saturn rotates more slowly than Earth. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | It takes Saturn longer to revolve around the Sun. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | Saturn is a much larger planet than Earth. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | Saturn has more moons than Earth. |

**2.** Each of the eight planets in the solar system follows a different elliptical orbit around the Sun. An ellipse is a type of oval shape. Each planet's orbit is at a different distance from the Sun than the other planets' orbits.

Beginning nearest to the Sun, the order of the planets is: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune.

Based on this order, which of the following is true of Neptune?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | It must travel in the opposite direction around the Sun than Earth does. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | It travels a shorter distance than Earth does to complete one orbit around the Sun. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | It must travel farther than Earth does to complete one orbit around the Sun. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | It travels the same distance as Earth does to complete one orbit around the Sun. |

**3.** Modern technology has allowed scientists to view many features found on the planet Mars, including volcanoes, channels, valleys, and gullies.


*These images are courtesy of NASA.*

These features are

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | evidence of geologic activity on Mars. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | evidence that Mars was once one of Earth's moons. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | proof that life once existed on Mars. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | proof that Mars was formed by the Big Bang. |

**4.** The solar system is made up of eight planets, numerous comets, asteroids and moons, and the Sun. The force that holds all of these objects together is \_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | gravity |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | magnetism |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | electromagnetic attraction |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | tension |

**5.** The celestial body at the center of the solar system is a large ball of gases, mostly made up of helium and hydrogen. The hydrogen in this celestial body undergoes nuclear fusion, thus producing helium.

What is the name of this celestial body?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | Earth |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | Jupiter |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | the Moon |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | the Sun |

**6.**

|  |  |
| --- | --- |
| **Planet** | **Average Orbital Speed** |
| Mercury | 47.87 km/s |
| Venus | 35.02 km/s |
| Earth | ? km/s  |
| Mars | 24.077 km/s |
| Jupiter | 13.07 km/s |
| Saturn | 9.69 km/s |
| Uranus | 6.81 km/s |
| Neptune | 5.43 km/s |

The table above shows the average orbital speed of each planet. The planets are listed in order of increasing distance from the Sun, with Mercury being the nearest and Neptune the farthest.

How does the Earth probably compare in orbital speed to the other planets?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | The Earth moves faster than the planets that are closer to the Sun. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | The Earth moves at the same speed as all the other planets |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | The Earth moves faster than the planets that are farther from the Sun. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | The Earth moves at a slower speed than all the other planets. |

**7.** All the planets orbit the Sun

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | in nearly circular orbits. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | at the same speed. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | in perfect circles. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | in triangular orbits. |

**8.** Which of the following planets is the smallest?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | Uranus |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | Mars |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | Saturn |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | Neptune |

**9.** Which of the following is true about the solar system?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | None of the planets have moons. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | Most of the planets have moons. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | Earth is the only planet that has a moon. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | All of the planets have moons. |

**10.**


*NASA image courtesy of Jeff Schmaltz, MODIS Rapid Response Team, NASA-Goddard Space Flight Center*

The image shows part of the Aleutian Island Chain, which is part of Alaska. The image was captured by the *MODIS* satellite.

The Aleutian Islands are a chain of volcanoes that have built up above sea level. They are actively forming along a lithospheric plate boundary due to one plate plunging beneath another.

What makes this scenario unique to planet Earth?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | Earth is the only planet on which volcanic features have been observed. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | Earth is the only planet that has been photographed by a satellite or spacecraft. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | Earth is the only planet that has currently active lithospheric plate movement. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | all of these |

**11.** A solar system is composed of

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | a star and all the objects in orbit around it. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | several galaxies that are joined together. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | everything in existence. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | planets but not the star that they orbit. |

**12.** A celestial body is any natural (i.e., not man-made) object in the sky. Which celestial bodies orbit the Sun?

|  |  |
| --- | --- |
| I. | asteroids |
| II. | comets |
| III. | meteoroids |
| IV. | planets |

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | IV only |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | I, II, and III only |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | I, II, III, and IV |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | II, III, and IV only |

**13.** In the diagram below, the planets' relative distances from the Sun are shown. The sizes of the planets are not drawn to scale.



Which of the following planets most likely has the warmest surface temperature?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | Earth |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | Neptune |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | Mercury |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | Jupiter |

**14.** The planet Jupiter is composed of

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | solid hydrogen and helium ice from the surface to the core. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | a liquid water core surrounded by a surface of heavy rock. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | liquid metals with a thin atmosphere of oxygen gas. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | a small rocky core surrounded by a thick atmosphere of dense gases. |

**15.** The planetary systems of Saturn, Uranus, and Neptune are shown below.



*These images are courtesy of NASA.*

What can be concluded by looking at these images?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | Some planets are orbited by moons and rings. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | Planets with rings cannot also be orbited by moons. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | All planets are the exact same size, shape, and color. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | Most planets can support life. |

**16.**

|  |  |
| --- | --- |
| **Planet** | **Temperature**  |
| Mercury | 100 - 700 K |
| Venus | 735 K |
| Earth | 287 K |
| Mars | 227 K |
| Jupiter | 112 - 165 K |
| Saturn | 84 - 134 K |
| Uranus | 53 - 76 K |
| Neptune | 55 - 72 K |

The chart above shows the average surface temperature or temperature range for each of the eight planets.

What conclusion can be drawn from this information?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | Earth and the other inner planets have lower average surface temperatures than the outer planets. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | Earth and the other inner planets have higher average surface temperatures than the outer planets. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | Earth has the highest average surface temperature, and Uranus has the lowest average surface temperature. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | Earth has the lowest average surface temperature, and Venus has the highest average surface temperature. |

**17.** Which of the following provides evidence that geologic activity occurred in the past on Earth's Moon?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | the axial tilt of the Moon |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | the revolution of the Moon around the Earth |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | the presence of solidified lava flows on the Moon |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | the phases of the Moon |

**18.**


*Image courtesy of NASA*

The image above was taken by the spacecraft *Messenger* as it flew by the planet Mercury. The terrain shown in this image is typical for the surface of Mercury. There are many circular depressions of various sizes in the scene (the largest one in the upper right part of the image is about 133 km across). These depressions are called \_\_\_\_\_\_\_ and formed when asteroids and comets struck the planet.

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | tectonic plates |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | impact craters |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | volcanoes |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | mountain ranges |

**19.** Suppose an astronomer discovers a large, spherical-shaped body orbiting the Sun. The body is composed mostly of rock, and there are no other bodies sharing its orbit.

What is the best way to categorize this body?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | asteroid |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | planet |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | moon |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | comet |

**20.** The \_\_\_\_\_\_\_ force between each planet and the Sun keeps the planets in orbit around the Sun.

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | magnetic |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | frictional |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | nuclear |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | gravitational |

**21.** Which of the following planets is farthest from the Sun?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | Mars |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | Earth |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | Neptune |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | Venus |

**22.** Which of the following is a discovery that supports the theory that there was once, or may still be, liquid water on planets other than Earth?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | There are large ponds and lakes present on the surface of Mars. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | There are river-like channels and rocks with an eroded appearance on Mars. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | Life is present on Saturn and Mars, so therefore water must exist on those planets. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | Jupiter experiences daily rainfall and has several small rivers. |

**23.** Which is closer to the Sun—Neptune or the Earth?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | The Earth is closer to the Sun than Neptune is. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | The distance from the Earth to the Sun cannot be determined. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | They are the same distance from the Sun. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | Neptune is closer to the Sun than the Earth is. |

**24.** Examine the picture below.



Except for the Sun, all of the bodies shown in this picture should be classified as \_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | moons |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | comets |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | planets |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | asteroids |

**25.**


*Image courtesy of NASA*

The image above is a photograph of an ancient region of Mars taken by one of the Viking Orbiter spacecraft. The scene shown is approximately 200 km across.

Notice the branched networks of long, linear valleys. These features resemble similar networked features on Earth. These martian valley networks

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | confirm that large surface lakes must currently exist near this location. |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | suggest that flowing liquid water was once present on the surface of Mars. |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | were probably created by sediment deposited by the wind. |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | confirm that intelligent life currently exists on Mars. |

**26.** While observing a planet through a telescope, a scientist observes a natural satellite orbiting the planet. What is the best classification for this satellite?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | planet |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | comet |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | asteroid |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | moon |

**27.**


*Image couresty of JPL/NASA*

The image above was created from radar data collected by the spacecraft *Magellan* during a mission to Venus. The circular features near the center of the image average about 25 km across.

The brighter parts of this image represent rough surfaces, and the darker parts of the image represent smooth surfaces. Based on this information, which of the following locations is most likely a broad, smooth plain?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | X |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | Z |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | Y |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | W |

**28.** In the diagram below, the planets' relative distances from the Sun are shown. The sizes of the planets are not drawn to scale.



Which of the following planets most likely has the coldest surface temperature?

|  |  |  |
| --- | --- | --- |
| Bubble | **A.** | Mercury |

|  |  |  |
| --- | --- | --- |
| Bubble | **B.** | Venus |

|  |  |  |
| --- | --- | --- |
| Bubble | **C.** | Saturn |

|  |  |  |
| --- | --- | --- |
| Bubble | **D.** | Mars |

# Answers

1. B
2. C
3. A
4. A
5. D
6. C
7. A
8. B
9. B
10. C
11. A
12. C
13. C
14. D
15. A
16. B
17. C
18. B
19. B
20. D
21. C
22. B
23. A
24. C
25. B
26. D
27. B
28. C

# Explanations

1. A year is defined as the amount of time it takes for a planet to make one complete revolution or orbit around the Sun.

Since Saturn is much farther away from the Sun than Earth, Saturn's orbit is much larger and Saturn moves more slowly than Earth. Thus, **it takes Saturn longer to revolve around the Sun**.

2. Each planet orbits around the Sun along an elliptical path. The farther away from the Sun a planet is, the larger the ellipse. The larger the ellipse, the longer the distance around it. Because the orbit of Neptune is **larger** than the orbit of Earth, **Neptune must travel farther than Earth does to complete one orbit around the Sun.**

3. The presence of volcanoes, channels, valleys, and gullies on Mars is **evidence** that **geologic activity** once occurred on Mars.

Similar evidence can be found on other planets, as well. For example, Venus also has volcanoes, and cliffs can be found on Mercury.

4. **Gravity** is the force that holds the solar system together.

The vast majority of gravity in the solar system is supplied by the Sun, since it is so massive compared to the planets and other objects that revolve around it. It is primarily the Sun's gravity that keeps the solar system in its current form.

5. The **Sun** is at the center of the solar system. Planets, comets, and asteroids in the solar system orbit the Sun.

6. Based on the data in the table, orbital speed decreases as distance from the Sun increases. Each planet, including Earth, moves slower than the planets that are closer to the Sun but **faster than the planets that are farther from the Sun.** Earth's average orbital speed (29.78 km/s) fits this pattern.

7. As a result of the Sun's gravity, planets orbit the Sun **in nearly circular orbits.**

The shape of each planet's orbit is a special kind of oval called an *ellipse*. The shape of an ellipse can vary from long and narrow to circular. The planets' elliptical orbits are nearly circular in shape.

8. Here is the order of planets, from smallest to largest:

Mercury, Mars, Venus, Earth, Neptune, Uranus, Saturn, Jupiter

9. **Most of the planets have moons.**

Earth has one moon, Mars has two moons, and each of the outer planets has several moons. Mercury and Venus are the only two planets that do not have moons.

10. This scenario is unique to planet Earth because **Earth is the only planet that has currently active lithospheric plate movement**, or *plate tectonics*. Evidence suggests that the planet Venus may have had processes somewhat similar to lithospheric plate movement in the past, but nothing quite like Earth's unique lithospheric plate system has been observed anywhere in the solar system.

Regarding the other answer choices, all of the other planets in our solar system have been photographed by satellites or spacecraft. And all of the terrestrial planets, as well as some moons, have evidence for past or present volcanic activity.

11. A solar system is composed of **a star and all the objects in orbit around it**.

12. The Sun is an average-sized star located about halfway out from the center of a disc-shaped galaxy of stars. These stars can be seen as a bright band across the sky when the night sky is clear.

The Sun is the largest body in the solar system, and it is orbited by many celestial bodies, including **asteroids, comets, meteoroids, and planets**. The force of gravity keeps objects in the solar system in orbital motion around the Sun.

13. **Mercury** is the closest planet to the Sun. As a result, Mercury receives a large amount of warming energy from the Sun and has a relatively hot surface temperature.

The only planet with a warmer surface temperature than Mercury is Venus, which is the second planet from the Sun. In addition to being very close to the Sun, Venus is blanketed by a thick atmosphere with a very powerful greenhouse effect.

14. Jupiter is composed of **a small rocky core surrounded by a thick atmosphere of dense gases**. Hydrogen and helium are Jupiter's most abundant elements.

Jupiter is also the solar system's largest planet. Its radius is 11.2 times larger than Earth's, and the planet is five times further away from the Sun.

15. **Some planets are orbited by a variety of moons and/or flat rings of rock and ice particles.**

Saturn, for example, is the second largest planet in the solar system. It is orbited by at least sixty-two moons and nine rings, made mostly of ice particles with some rocky debris and dust.

Uranus has at least thirteen rings and at least twenty-seven moons. Neptune has at least three rings and at least thirteen moons.

Other planets, like the Earth, do not possess any rings. The Earth does have one moon, however, and Earth is the only planet that can support life.

16. The chart shows that the temperatures of the inner planets (Mercury, Venus, Earth, and Mars) range from 100 K to 735 K. The temperatures of the outer planets range from 55 K to 165 K.

Thus, a good conclusion for the data would be that **Earth and the other inner planets have higher average surface temperatures than the outer planets**.

17. Over time, a significant amount of geological activity, such as plate tectonics, the rock cycle, and erosion, has occurred on the Earth and continues to occur today. There is evidence, however, that some geological activity once occurred on other planets or moons as well.

**The presence of solidified lava flows on Earth's Moon**, for example, provides evidence that geologic activity in the form of volcanic eruptions occurred in the past on the Moon.

18. These circular depressions are called **impact craters** and formed when asteroids and comets struck the planet. Most large asteroid and comet impacts occurred early in our solar system's history. Surfaces like Mecury's that preserve large impact craters are very ancient terrain.

19. The International Astronomical Union defines a **planet** as a spherical object that orbits a star. Planets clear the neighborhood around their orbits (i.e., no other bodies share their orbits).

20. The **gravitational** force between each planet and the Sun keeps the planets in orbit around the Sun. Any object with mass exerts a gravitational force on any other object with mass. Planets orbit stars due to this attractive force.

21. Neptune orbits an average of 2.8 billion miles from the Sun. Earth orbits an average of 93 million miles from the Sun. Neptune is the eighth planet from the Sun.

22. Finding **river-like channels and rocks with an eroded appearance on Mars** was one of the first discoveries that led scientists to believe that there had once been liquid water on Mars. Scientists now know that large volumes of water exist as buried ice in Mars' polar regions. Evidence suggests that shallow ground ice is likely buried in many other regions of the planet as well. It is possible that liquid water may be found at greater depths below the ice, although none has yet been detected.

23. The order of the planets in increasing distance from the Sun is: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune.

**The Earth is closer to the Sun than Neptune is.**

24. The International Astronomical Union defines a **planet** as a spherical object that orbits a star and has cleared the neighborhood around its orbit.

25. These martian valley networks resemble networks of rivers on Earth, and they **suggest that flowing liquid water was once present on the surface of Mars.**

26. **Moons** are natural satellites that orbit a planet.

27. Of the four labeled locations, location **Z** is most likely to be a broad, smooth plain. This is because location Z appears darker than the other locations in radar data.

The other locations appear brighter because their rougher surfaces scatter the radar signal instead of reflecting it uniformly. Location X, for example, is the rough surface of a circular lava dome. The bright areas on top of the dome likely represent cracks in the dome.

28. Of the planets listed, **Saturn** is the greatest distance from the Sun. As a result, Saturn receives little of the Sun's warming energy and has a relatively cold surface temperature.