**Chapter 24 Planetary Geology**

***Earth: An Introduction to Physical Geology***

24.1

Multiple-Choice Questions

1)

Which of the following statements concerning ring satellites of the planets is true?

A)

They are present around Saturn and Jupiter, but not around Uranus and Neptune.

B)

They have orbits that do not coincide with the equatorial planes of the parent planets.

C)

They are thin, solid disks revolving around the parent planets in polar orbits.

D)

They consist of concentrations of particles generally smaller than 10 meters in diameter.

Answer:

D

2)

A cluster of three, large, fresh looking, impact craters shown in radar images of the surface of Venus best supports the conclusion that \_\_\_\_\_\_\_\_.

A)

erosion and weathering are very slow processes on Venus

B)

volcanism was very active during the first billion or so years of the planet's history

C)

tectonism is still very active on Venus

D)

Venus was recently hit by a large, three-unit, cluster asteroid

Answer:

A

3)

Which pair of solar system bodies comes closest to approximating a "double planet", that is two bodies of roughly equal mass are close enough to revolve around each other as they orbit around the Sun?

A)

Uranus; Saturn

B)

Earth; Venus

C)

Venus; Mars

D)

Pluto; Charon

Answer:

B

4)

\_\_\_\_\_\_\_\_ occurs when an object in the outer reaches of the solar system passes between Earth and a far distant star, temporarily blocking light from the star.

A)

Elliptation

B)

Acculturation

C)

Decantation

D)

Occultation

Answer:

D

5)

Which one of the following statements is a logical explanation for why the Venusian atmosphere contains much more carbon dioxide than Earth's atmosphere?

A)

Limestone deposition is common on Earth but absent from Venus.

B)

Carbon dioxide-rich, icy asteroids in orbits near the Sun continue to bombard Venus but miss Earth.

C)

Volcanism on Venus has been inactive since early in the planet's geologic history.

D)

Venusian atmospheric and surface temperatures are much lower than Earth's.

Answer:

A

6)

The \_\_\_\_\_\_\_\_ explains how our solar system probably formed from a giant cloud of gases and dispersed solid particles.

A)

extrastellar solar hypothesis

B)

planetary compression theory

C)

protogalactic theory

D)

nebular hypothesis

Answer:

D

7)

\_\_\_\_\_\_\_\_ meteorites are thought to be analogous in composition to Earth's core.

A)

Iron

B)

Stony

C)

Ammonical

D)

Calcareous

Answer:

A

8)

Compared to Earth's atmosphere, the atmosphere of Mars has surface pressures that are \_\_\_\_\_\_\_\_.

A)

3 times those on Earth; major gases are water vapor and carbon dioxide

B)

1.5 times those on Earth; main gases are methane and nitrogen

C)

one-half those on Earth; main gases are methane and nitrogen

D)

0.1 times those on Earth; major gases are water vapor and carbon dioxide

Answer:

D

9)

As the solar system was forming, \_\_\_\_\_\_\_\_ came closest to undergoing nuclear fusion and becoming a second sun.

A)

Earth

B)

Jupiter

C)

Neptune

D)

Saturn

Answer:

B

10)

Which one of the following statements is believed to be true of comets?

A)

They may gain slightly in mass with each orbit around the Sun.

B)

Their bright, glowing appearance in the night sky is due to frictional heating in Earth's atmosphere.

C)

They are composed mostly of dense rock particles.

D)

They have highly elliptical orbits around the Sun.

Answer:

D

11)

\_\_\_\_\_\_\_\_ refers to the bright head of a comet.

A)

Toma

B)

Coma

C)

Lira

D)

Lima

Answer:

B

12)

A (an) \_\_\_\_\_\_\_\_ probably caused the Tunguska event of 1908.

A)

supersonic impact of an asteroidal-size body in central Siberia, Russia

B)

explosive disintegration of a meteorite or small comet high in the atmosphere over central Siberia, Russia

C)

impact of a small, low-velocity, iron meteorite in northern Arizona

D)

explosive disintegration of a meteorite or small comet in the atmosphere over northern Arizona

Answer:

B

13)

Which one of the following is most likely to be associated both with impact craters and with volcanic calderas that originate by collapse?

A)

outwardly radiating, fragmental, bright, surface streaks

B)

sharp rims that rise well above the surrounding area far away from the edge of the depression

C)

landslides and other mass wasting movements along the walls of the depression

D)

sharp, central peaks that rise above the floor of the depression

Answer:

C

14)

\_\_\_\_\_\_\_\_ was struck by a string of small asteroids and cometary fragments in the highly publicized Shoemaker-Levy event in 1994.

A)

Saturn

B)

Uranus

C)

Venus

D)

Jupiter

Answer:

D

15)

\_\_\_\_\_\_\_\_ has the great, dark spot on its surface.

A)

Venus

B)

Neptune

C)

Mars

D)

Uranus

Answer:

B

16)

How did the lunar maria most likely originate?

A)

the solar wind eroded very wide, shallow basins that filled with lunar dust

B)

massive, basaltic comets melted when they hit the lunar surface

C)

huge impact basins that were nearly filled with basaltic lava flows

D)

huge impact craters filled with frozen carbon dioxide and dark-colored silt and dust

Answer:

C

17)

Which one of the following is not found on Mars?

A)

sand dunes

B)

polar ice caps

C)

extinct volcanoes

D)

H2O-rich atmosphere

Answer:

D

18)

\_\_\_\_\_\_\_\_ are both found on Mars and Earth.

A)

Active volcanoes

B)

Heavily cratered landscapes preserved from early in the planets' histories

C)

Erosional features related to flowing water

D)

Oceans

Answer:

C

19)

The surface features of \_\_\_\_\_\_\_\_ are known only through satellite radar mapping.

A)

Jupiter

B)

Mars

C)

Venus

D)

Mercury

Answer:

C

20)

\_\_\_\_\_\_\_\_ is a moon of Mars.

A)

Ajo

B)

Phobos

C)

Callisto

D)

Miranda

Answer:

B

21)

Which one of the following is not true of Jupiter?

A)

a rotational speed slower than Mercury

B)

a very dense atmosphere

C)

largest and most massive planet

D)

dominantly composed of hydrogen

Answer:

A

22)

\_\_\_\_\_\_\_\_ has atmospheric pressures at its surface that are roughly comparable to those at Earth's surface.

A)

Neptune's moon Cassii

B)

Saturn's moon Titan

C)

Uranus's moon Miranda

D)

Jupiter's moon Io

Answer:

B

23)

\_\_\_\_\_\_\_\_, a moon orbiting Jupiter, has an unusually smooth, uncratered, ice-covered surface.

A)

Miranda

B)

Titan

C)

Phobos

D)

Europa

Answer:

D

24)

Compared to the density of liquid water (1 gram/cc), the appropriate range in average densities of the terrestrial planets is \_\_\_\_\_\_\_\_.

A)

2 to 3 grams/cc

B)

l to 2 grams/cc

C)

4 to 6 grams/cc

D)

0.4 to 0.7 grams/cc

Answer:

C

25)

\_\_\_\_\_\_\_\_ has a hot, turbulent atmosphere dominated by carbon dioxide.

A)

Earth

B)

Jupiter

C)

Venus

D)

Mercury

Answer:

C

26)

Which one of the following lunar features is the youngest?

A)

rugged highlands

B)

brightly rayed craters

C)

plagioclase-rich, crustal rocks

D)

maria

Answer:

B

27)

\_\_\_\_\_\_\_\_ is the principal gas in the Venusian atmosphere and also a minor component of the atmospheres of Earth and Mars.

A)

Nitrogen

B)

Ozone

C)

Carbon dioxide

D)

Methane

Answer:

C

28)

The largest known volcano in the solar system is \_\_\_\_\_\_\_\_.

A)

Vulcan on Venus

B)

Mauna Loa, Hawaii, on Earth

C)

Mons Olympus on Mars

D)

Solfatara on Jupiter

Answer:

C

29)

Which one of the terrestrial planets has a surface landscape similar to that of the older areas of the Moon?

A)

Neptune

B)

Venus

C)

Mercury

D)

Uranus

Answer:

C

30)

\_\_\_\_\_\_\_\_ are small, extraterrestrial particles that glow brightly and burn up as they travel through Earth's atmosphere.

A)

Microcomets

B)

Meteoroids

C)

Asteroids

D)

Mesocoronas

Answer:

B

31)

Which one of the following statements is not true?

A)

Pluto is the smallest and most distant planet from the Sun.

B)

Tectonic movements and erosion have obliterated most evidence for impacts of large objects early in Earth's geologic history.

C)

Jupiter is the largest, densest, and most massive planet.

D)

Mercury rotates faster than Earth and Jupiter; it is the closest planet to the Sun.

Answer:

C

32)

Vast, circular to elliptical dark-colored, smooth areas of the Moon are known as \_\_\_\_\_\_\_\_.

A)

lunar lava flats

B)

Copernican steppes

C)

Olympian fields

D)

lunar maria

Answer:

D

33)

The belt (orbit) of the asteroids is located between \_\_\_\_\_\_\_\_.

A)

Earth and Mars

B)

Jupiter and Mars

C)

Venus and Mercury

D)

Saturn and Uranus

Answer:

B

24.2

Word Analysis Questions

Examine the words and/or phrases for each question below and determine the relationship among the majority of words/phrases. Choose the option which does not fit the pattern.

1)

A) Mercury B) Saturn C) Uranus D) Jupiter

Answer:

Mercury

2)

A) Phobos B) Pluto C) Titan D) Callisto

Answer:

Pluto

3)

A) Earth B) Venus C) Mars D) Jupiter

Answer:

Jupiter

4)

A) comet B) asteroid C) meteorite D) planet

Answer:

meteorite

24.3

True/False Questions

1)

The dark tail of a comet is called a coma.

Answer:

FALSE

2)

Carbon dioxide is the major gas in the atmosphere of Venus.

Answer:

TRUE

3)

The very large, lava-covered areas of the Moon are called maria.

Answer:

TRUE

4)

Rayed craters on the Moon, such as Copernicus, formed during an intense, early period of bombardment prior to the formation of the lunar maria.

Answer:

FALSE

5)

The formation of the solar system from a huge cloud of gases and dispersed particles is known as the solar galactic hypothesis.

Answer:

FALSE

6)

The lunar maria are thought to be huge, dust-filled, impact craters.

Answer:

FALSE

7)

Jupiter is the largest and most massive planet in the solar system.

Answer:

TRUE

8)

The four, largest moons of Jupiter are known as the Galilean moons.

Answer:

TRUE

9)

The Cassini gap refers to the planetless belt of asteroids between Mars and Earth.

Answer:

FALSE

10)

Of the terrestrial planets, Mercury exhibits the greatest lateral variations in surface temperatures.

Answer:

TRUE

11)

Rays in the rings of Saturn are bright, radial streaks that converge inward toward the planet's surface.

Answer:

TRUE

12)

Lunar regolith breccia contains crystalline rock fragments and glassy fragments.

Answer:

TRUE

13)

Meteorites disintegrate and burn up as shooting stars; meteoroids survive an impact event and a trip through Earth's atmosphere.

Answer:

FALSE

14)

Comets are thought to be composed of dust and tiny, icy particles encased in small, solidified, metallic fragments.

Answer:

FALSE

15)

An extreme example of the greenhouse effect is thought to be associated with an abundance of carbon dioxide in the Martian atmosphere.

Answer:

FALSE

16)

The Martian polar caps are thought to be mainly frozen methane and ammonia.

Answer:

FALSE

17)

Large impact craters and large, domal features (probably representing viscous lava flows) have been imaged on the surface of Venus.

Answer:

TRUE

18)

Under similar conditions of temperature and pressure, solid carbon dioxide (dry ice) evaporates at a much faster rate than water ice.

Answer:

TRUE

19)

Eruptive plumes and lava flows rich in sulfur have been photographed on Jupiter's moon, Io.

Answer:

TRUE

20)

The Jovian planets are more massive but less dense than the terrestrial planets.

Answer:

TRUE

21)

The lunar highlands exhibit rugged, topographic relief and a high density of impact craters.

Answer:

TRUE

22)

Saturn's rings are clusters of relatively small, individual particles; the rings observed on Jupiter are violent storm clouds swirling above the polar regions of the planet.

Answer:

FALSE

23)

Assuming equally long periods of magma generation deep below the surface, a planet with plate tectonic movements would have smaller shield volcanoes than one with no such plate movements.

Answer:

TRUE

24)

The atmosphere of Mars is less dense than Earth's, but dust storms and sand dunes indicate wind action occurs on Mars.

Answer:

TRUE

24.4

Short Answer Questions

1)

\_\_\_\_\_\_\_\_ refers to the glowing head of a comet.

Answer:

Coma

2)

\_\_\_\_\_\_\_\_ is the major gas in the atmosphere of Venus.

Answer:

Carbon dioxide

3)

The relatively smooth, large, circular to elliptical areas on the lunar surface are known as \_\_\_\_\_\_\_\_.

Answer:

maria

4)

The \_\_\_\_\_\_\_\_ hypothesis describes how the solar system formed from a huge cloud of gases and small particles produced by an exploding, high-density star.

Answer:

Nebular

5)

The two most abundant gases in Earth's atmosphere are \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_.

Answer:

nitrogen, oxygen

6)

The Cassini gap is associated with the planet \_\_\_\_\_\_\_\_.

Answer:

Saturn

7)

The only planet in the solar system whose axis of rotation lies close to its equatorial plane is \_\_\_\_\_\_\_\_.

Answer:

Uranus

8)

The largest shield volcano yet observed in the solar system is located on \_\_\_\_\_\_\_\_.

Answer:

Mars

9)

\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_ are terrestrial planets with permanent or seasonal polar ice caps.

Answer:

Earth, Venus

24.5

Critical Thinking Questions

Use complete sentences, correct spelling, and the information presented in Chapter 24 to answer the questions below.

1)

Why are meteorites a possible source of information regarding the origin and composition of Earth? Also, what other "clues" might be present in meteorites?

2)

What is the general relationship between the number of natural satellites or moons that orbit a given planet and the mass of that planet? Also, how is our own Moon different from the natural satellites of other terrestrial planets?

3)

How is Earth unique as compared to other planets in our solar system? How is it similar? And finally, what geologic information might we obtain by visiting Mars or Venus that would further link Earth to these planets?

24.6

Visualization Questions

1)

Label the planets on the diagram below.



Answer:

See figure 24.1 in chapter 24 of Earth, 9e

2)

Carefully examine the telescopic view of the lunar surface (near side) below and the features labeled A, B, and C.



Give a brief description that characterizes the bright area around C. a) \_\_\_\_\_\_\_\_

Notice the features like those labeled A. What are such features called? b) \_\_\_\_\_\_\_\_

How are craters like the one labeled B different from the craters of the area labeled C? c) \_\_\_\_\_\_\_\_

In what order (from first to latest) did the features form that are labeled A, B, and C? d) \_\_\_\_\_\_\_\_

Answer:

a) Area C is heavily cratered lunar highland.

b) maria (each one is a mare)

c) C-craters are less well-defined and do not have rays, unlike the B-craters, which are well-defined rayed craters

d) C (first), A (second), B (last)