**Chapter 22 Earth's Evolution Through Geologic Time**

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

22.1

Multiple-Choice Questions

1)

Which of the following gases was NOT part of Earth's original atmosphere?

A)

water vapor

B)

carbon dioxide

C)

nitrogen

D)

oxygen

E)

both A and C

Answer:

D

2)

The most common Precambrian fossils are \_\_\_\_\_\_\_\_, layered mounds of calcium carbonate.

A)

prokaryotes

B)

chert

C)

trilobites

D)

stromatolites

E)

none of the above

Answer:

D

3)

The \_\_\_\_\_\_\_\_ era is known as the "age of flowering plants."

A)

Precambrian

B)

Paleozoic

C)

Cenozoic

D)

Devonian

E)

Silurian

Answer:

C

4)

\_\_\_\_\_\_\_\_ are among the most widespread Paleozoic fossils.

A)

Stromatolites

B)

Birds

C)

Dinosaurs

D)

Salamanders

E)

Brachiopods

Answer:

E

5)

As the solar system began forming, the first materials to condense into small particles were \_\_\_\_\_\_\_\_ and nickel.

A)

oxygen

B)

silicon

C)

nitrogen

D)

carbon

E)

none of the above

Answer:

E

6)

Which one of the following represents the greatest expanse of geological time?

A)

Mesozoic

B)

Cenozoic

C)

Precambrian

D)

Paleozoic

Answer:

C

7)

During the early Paleozoic era, the current continents of South America, Africa, Australia, Antarctica, India, and perhaps China comprised the vast southern continent of \_\_\_\_\_\_\_\_.

A)

Europe

B)

Laurasia

C)

Gondwanaland

D)

Antindia

E)

Pangaea

Answer:

C

8)

Which type of bacteria thrives in environments that lack free oxygen?

A)

aerobic

B)

placental

C)

anaerobic

D)

foraminifera

E)

photosynthetic

Answer:

C

9)

Which era of geologic time spans about 88% of Earth's history?

A)

Precambrian

B)

Paleozoic

C)

Mesozoic

D)

Cenozoic

E)

none of the above

Answer:

A

10)

The \_\_\_\_\_\_\_\_ means "the sun in the making."

A)

solar disk

B)

presun

C)

nebular sun

D)

sol

E)

protosun

Answer:

E

11)

Mammals became the dominant land animals during the \_\_\_\_\_\_\_\_ era.

A)

Pleistocene

B)

Cenozoic

C)

Cretaceous

D)

Mesozoic

E)

Paleozoic

Answer:

B

12)

The \_\_\_\_\_\_\_\_ period was a time of major extinctions, including 75 percent of amphibian families.

A)

Jurassic

B)

Mississippian

C)

Permian

D)

Pennsylvanian

E)

Devonian

Answer:

C

13)

The beginning of the Cambrian Period marks an important event in animal evolution — the appearance of organisms with \_\_\_\_\_\_\_\_.

A)

wings

B)

cells

C)

hard parts

D)

vertebrae

E)

none of the above

Answer:

C

14)

The era of "ancient life" is the \_\_\_\_\_\_\_\_ era.

A)

Cenozoic

B)

Precambrian

C)

Neolithic

D)

Mesozoic

E)

none of the above

Answer:

E

15)

Due to a virtual absence of land plants and certain animals, fossil fuels are notably absent in \_\_\_\_\_\_\_\_ rocks.

A)

Precambrian

B)

Paleozoic

C)

Mesozoic

D)

Cenozoic

E)

Paleozoic and Mesozoic

Answer:

A

16)

The major source of free oxygen in the atmosphere is from \_\_\_\_\_\_\_\_.

A)

molten rock

B)

water

C)

green plants

D)

silicate minerals

E)

glaciers

Answer:

C

17)

The age of Earth is about \_\_\_\_\_\_\_\_.

A)

2 billion years

B)

4.5 million years

C)

16 million years

D)

4.5 billion years

E)

195 million years

Answer:

D

18)

The Precambrian rock record indicates that much of Earth's first free oxygen combined with \_\_\_\_\_\_\_\_ dissolved in water.

A)

potassium

B)

silicon

C)

iron

D)

carbon

E)

none of the above

Answer:

C

19)

Which one of the following does NOT characterize the early development and specialization of the primitive mammals?

A)

increase in size

B)

increase in stomach capacity

C)

increase in brain capacity

D)

specialization of limbs

E)

specialization of teeth

Answer:

B

20)

As they formed, due to their high temperatures and comparatively weak gravitational fields, which planets were unable to retain appreciable amounts of hydrogen, helium, and ammonia?

A)

Jupiter and Neptune

B)

Mercury and Earth

C)

Uranus and Pluto

D)

Jupiter and Uranus

E)

Neptune and Uranus

Answer:

B

21)

Abundant fossil evidence did not appear in the geologic record until about \_\_\_\_\_\_\_\_.

A)

5 billion years ago

B)

6 million years ago

C)

550 million years ago

D)

300 million years ago

E)

3 billion years ago

Answer:

C

22)

During the late Paleozoic, the present-day North America, Europe, western Asia, Siberia, and perhaps China formed the northern continent of \_\_\_\_\_\_\_\_.

A)

Gondwanaland

B)

Laurasia

C)

Greenland

D)

Africa

E)

none of the above

Answer:

B

23)

Most \_\_\_\_\_\_\_\_ rocks are devoid of fossils, which hinders correlation of rocks.

A)

Precambrian

B)

Paleozoic

C)

Mesozoic

D)

Cenozoic

E)

Mesozoic and Cenozoic

Answer:

A

24)

The \_\_\_\_\_\_\_\_ period is sometimes called the "golden age of trilobites."

A)

Cambrian

B)

Silurian

C)

Pennsylvanian

D)

Devonian

E)

Triassic

Answer:

A

25)

\_\_\_\_\_\_\_\_ means "planets in the making."

A)

Jovian

B)

Asteroids

C)

Terrestrial

D)

Protoplanets

E)

none of the above

Answer:

D

26)

The process in which plants use light energy to synthesize food sugars from carbon dioxide is called \_\_\_\_\_\_\_\_.

A)

photosynthesis

B)

hydration

C)

oxidation

D)

fusion

E)

none of the above

Answer:

A

27)

The beginning of the \_\_\_\_\_\_\_\_ era is marked by the appearance of the first life forms with hard parts.

A)

Precambrian

B)

Paleozoic

C)

Mesozoic

D)

Cenozoic

Answer:

B

28)

Each continent contains large "core areas" of Precambrian rocks referred to as \_\_\_\_\_\_\_\_.

A)

rifts

B)

plates

C)

plateaus

D)

shields

E)

none of the above

Answer:

D

29)

By the close of the Paleozoic, all the continents had fused into the single super continent of \_\_\_\_\_\_\_\_.

A)

Laurasia

B)

Pangaea

C)

Appalachia

D)

Gondwanaland

E)

Europa

Answer:

B

30)

Earth's primitive atmosphere evolved from gases \_\_\_\_\_\_\_\_.

A)

produced by radioactive decay

B)

collected from the nebula

C)

escaping from water

D)

from the sun

E)

expelled from within

Answer:

E

31)

The most economically important resource in Cenozoic strata of the Gulf Coast is \_\_\_\_\_\_\_\_.

A)

petroleum

B)

carbon

C)

coal

D)

fresh water

E)

iron

Answer:

A

32)

The waste gas released by plants as they synthesize food sugars from carbon dioxide and water is \_\_\_\_\_\_\_\_.

A)

oxygen

B)

methane

C)

nitrogen

D)

carbon dioxide

E)

none of the above

Answer:

A

33)

Most of Earth's iron ore occurs in middle \_\_\_\_\_\_\_\_ rocks.

A)

Precambrian

B)

Paleozoic

C)

Mesozoic

D)

Cenozoic

Answer:

A

34)

The first true terrestrial animals were the \_\_\_\_\_\_\_\_.

A)

mammals

B)

reptiles

C)

lobe-finned fish

D)

trilobites

E)

marsupials

Answer:

B

35)

This least understood era of Earth's history has not been subdivided into briefer time units.

A)

Precambrian

B)

Paleozoic

C)

Mesozoic

D)

Cenozoic

Answer:

A

36)

During the \_\_\_\_\_\_\_\_ Period, large evaporite deposits of rock salt and gypsum formed in North America.

A)

Cambrian

B)

Silurian

C)

Pennsylvanian

D)

Jurassic

E)

Tertiary

Answer:

B

37)

The supercontinent of Pangaea began to breakup during the \_\_\_\_\_\_\_\_ Era.

A)

Precambrian

B)

Paleozoic

C)

Mesozoic

D)

Cenozoic

Answer:

C

38)

Which era is sometimes called the "age of dinosaurs"?

A)

Pleistocene

B)

Cenozoic

C)

Cretaceous

D)

Mesozoic

E)

none of the above

Answer:

D

39)

During the \_\_\_\_\_\_\_\_ Era, the westward-moving North American plate began to override the Pacific plate, eventually causing the tectonic activity that ultimately formed the mountains of western North America.

A)

Precambrian

B)

Paleozoic

C)

Mesozoic

D)

Cenozoic

E)

none of the above

Answer:

C

40)

By the \_\_\_\_\_\_\_\_ period, large tropical swamps extended across North America, eventually becoming the vast coal deposits of today.

A)

Cambrian

B)

Silurian

C)

Pennsylvanian

D)

Devonian

E)

Triassic

Answer:

C

41)

One group of reptiles, exemplified by the fossil *Archaeopteryx*, led to the evolution of \_\_\_\_\_\_\_\_.

A)

dinosaurs

B)

mammals

C)

cephalopods

D)

birds

E)

horses

Answer:

D

42)

Which period is known as the "age of fishes"?

A)

Jurassic

B)

Mississippian

C)

Permian

D)

Pennsylvanian

E)

Devonian

Answer:

E

43)

During the Cenozoic, plate interactions gave rise to many events of mountain building, volcanism, and earthquakes in \_\_\_\_\_\_\_\_ North America.

A)

western

B)

central

C)

eastern

D)

southern

E)

northern

Answer:

A

44)

The cells of these primitive organisms lack organized nuclei and they reproduce asexually.

A)

trilobites

B)

eukaryotes

C)

prokaryotes

D)

brachiopods

E)

none of the above

Answer:

C

45)

Following the reptilian extinctions at the close of the Mesozoic, two groups of mammals, the marsupials and \_\_\_\_\_\_\_\_, evolved.

A)

eukaryotes

B)

cephalopods

C)

trilobites

D)

placentals

E)

stromatolites

Answer:

D

46)

The theory for the origin of the solar system is known as the \_\_\_\_\_\_\_\_ hypothesis.

A)

Big Bang

B)

nebular

C)

terrestrial

D)

solar

E)

none of the above

Answer:

B

22.2

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) Paleozoic B) Precambrian C) Mesozoic D) Cenozoic

Answer:

Precambrian

2)

A) protoplanet B) planetesimal C) supercontinent D) protosun

Answer:

supercontinent

3)

A) Pangaea B) North America C) Rodinia D) Gondwana

Answer:

North America

4)

A) oxygen B) outgasssing C) water vapor D) carbon dioxide

Answer:

oxygen

5)

A) mammals B) reptiles C) gymnosperms D) dinosaurs

Answer:

mammals

22.3

True/False Questions

1)

The decay of radioactive atoms, coupled with heat released by colliding particles, produced at least some melting of Earth's early interior.

Answer:

TRUE

2)

We are now living in the Mesozoic era.

Answer:

FALSE

3)

Most Mesozoic rocks are devoid of fossils, consequently this is the least understood span of Earth's history.

Answer:

FALSE

4)

Probably the single most characteristic feature of the Precambrian is its great abundance of fossil evidence.

Answer:

FALSE

5)

Due to differentiation, the lighter, gaseous materials escaped Earth's interior and became the primitive atmosphere.

Answer:

TRUE

6)

During the early Paleozoic Era, the continent of Gondwanaland included North and South America.

Answer:

FALSE

7)

The bodies of our solar system began forming about 5 billion years ago from an enormous cloud of minute rocky fragments and gases.

Answer:

TRUE

8)

The first true terrestrial land animals were the mammals.

Answer:

FALSE

9)

Earth's original atmosphere, several billion years ago, was similar to the present atmosphere.

Answer:

FALSE

10)

The Cenozoic Era is the age of mammals.

Answer:

TRUE

11)

The major source of oxygen in Earth's atmosphere is from the decay of plants.

Answer:

FALSE

12)

The supercontinent of Pangaea formed during the late Mesozoic Era.

Answer:

FALSE

13)

Much of the original free oxygen in the atmosphere combined with iron dissolved in water to become iron oxide.

Answer:

TRUE

14)

With the perfection of the shelled egg, reptiles quickly became the dominant land animals of the Mesozoic Era.

Answer:

TRUE

15)

Because of their high surface temperatures and comparatively weak gravitational fields, during their formation, the inner planets retained appreciable amounts of hydrogen, helium, and ammonia as part of their composition.

Answer:

FALSE

16)

During the Cenozoic Era, the eastern and western margins of North America experienced similar geologic events.

Answer:

FALSE

17)

Altered climatic conditions at the end of the Paleozoic Era caused one of the most dramatic biological declines in all Earth history.

Answer:

TRUE

18)

Evidence indicates that some dinosaurs were warm blooded.

Answer:

TRUE

19)

The large outer planets (Jupiter, Saturn, Uranus, and Neptune) contain huge amounts of hydrogen and other light materials as part of their composition.

Answer:

TRUE

20)

Fossil fuels are abundant in Precambrian rocks.

Answer:

FALSE

21)

A major event of the Mesozoic Era was the breakup of the supercontinent called Pangaea.

Answer:

TRUE

22)

The fault-block mountains of Nevada and Mexico formed during the Cenozoic Era.

Answer:

TRUE

23)

When Earth's primitive surface cooled below water's boiling point, torrential rains slowly filled low areas, forming oceans.

Answer:

TRUE

24)

Volcanic activity was common in the West during much of Cenozoic time.

Answer:

TRUE

25)

The earliest land plants had large, broad leafs to efficiently intercept sunlight.

Answer:

FALSE

26)

Mammals replaced reptiles as the dominant land animals in the Cenozoic Era.

Answer:

TRUE

27)

Well preserved remains of many tiny organisms extend the record of life back beyond 5 billion years.

Answer:

FALSE

28)

A wave of late Pleistocene extinctions rapidly eliminated many large mammals.

Answer:

TRUE

29)

The fossil record supports the hypothesis that the hard parts of organisms evolved for survival.

Answer:

FALSE

30)

The evolution of both birds and mammals was strongly influenced by the development of flowering plants.

Answer:

TRUE

31)

The beginning of the Precambrian Era is marked by the appearance of the first life forms with hard parts.

Answer:

FALSE

32)

Many reptile groups became extinct at the close of the Cenozoic Era.

Answer:

FALSE

33)

During the Cenozoic Era, a great wedge of sediments from the eroding Rockies created the Great Plains.

Answer:

TRUE

34)

Evidence of an extensive glaciation places western Africa near the South Pole during the early Paleozoic Era.

Answer:

TRUE

22.4

Short Answer Questions

1)

Bacteria that thrive in oxygen free environments are called \_\_\_\_\_\_\_\_ bacteria.

Answer:

anaerobic

2)

The theory for the formation of the solar system is known as the \_\_\_\_\_\_\_\_.

Answer:

nebular hypothesis

3)

During the early Paleozoic Era, the \_\_\_\_\_\_\_\_ orogeny affected eastern North America from the present-day central Appalachians to Newfoundland.

Answer:

Taconic

4)

What were the three gases that made up Earth's original atmosphere? \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_

Answer:

water vapor, carbon dioxide, nitrogen

5)

The rock formations of the \_\_\_\_\_\_\_\_ Era are more widespread and less disturbed than those of any other time.

Answer:

Cenozoic

6)

During the process of \_\_\_\_\_\_\_\_, plants release the gas \_\_\_\_\_\_\_\_.

Answer:

photosynthesis, oxygen

7)

By the late \_\_\_\_\_\_\_\_ Period, true air-breathing amphibians with fish-like heads and tails had evolved.

Answer:

Devonian

8)

The \_\_\_\_\_\_\_\_ Era spans about 88% of Earth's history.

Answer:

Precambrian

9)

The most economically important resource in Cenozoic strata of the Gulf Coast is \_\_\_\_\_\_\_\_.

Answer:

petroleum (natural gas)

10)

Planets in the making are referred to as \_\_\_\_\_\_\_\_.

Answer:

protoplanets

11)

The most common Precambrian rock type is \_\_\_\_\_\_\_\_ rock.

Answer:

metamorphic

12)

The Cenozoic Era is often called the "age of \_\_\_\_\_\_\_\_."

Answer:

mammals

13)

On continents, large "core areas" of Precambrian rocks, called \_\_\_\_\_\_\_\_, dominate the surface.

Answer:

shields

14)

The \_\_\_\_\_\_\_\_ Period was the "golden age of trilobites."

Answer:

Cambrian

15)

The time of the great extinction that took place at the end of the Mesozoic Era is called the \_\_\_\_\_\_\_\_ or KT boundary.

Answer:

Cretaceous-Tertiary

16)

The sun in the making is known as the \_\_\_\_\_\_\_\_.

Answer:

protosun

17)

Western North America is the leading edge of the \_\_\_\_\_\_\_\_ plate.

Answer:

North American

18)

Extensive deposits of \_\_\_\_\_\_\_\_ ore are found worldwide in Precambrian rocks.

Answer:

iron

19)

In North America (including Greenland), the vast exposure of Precambrian rocks, called the \_\_\_\_\_\_\_\_ Shield, encompasses 2.8 million square miles.

Answer:

Canadian

20)

The development of \_\_\_\_\_\_\_\_, organisms that reproduce sexually and have cells that contain nuclei, may have increased dramatically the rate of evolutionary change.

Answer:

eukaryotes

21)

Human evolution takes place during the \_\_\_\_\_\_\_\_ Period of the \_\_\_\_\_\_\_\_ Era.

Answer:

Quaternary; Cenozoic

22)

Fossils that are not of the animals themselves, but of their activities, such as trails and wormholes, are referred to as \_\_\_\_\_\_\_\_ fossils.

Answer:

trace

23)

The \_\_\_\_\_\_\_\_ were the dominant trees of the Mesozoic Era.

Answer:

gymnosperms

24)

Following the reptilian extinctions at the close of the Mesozoic Era, two groups of mammals, the marsupials and \_\_\_\_\_\_\_\_, evolved and expanded.

Answer:

placentals

25)

Many of the most ancient fossils are found in a hard, dense, chemical rock called \_\_\_\_\_\_\_\_.

Answer:

chert

26)

The late \_\_\_\_\_\_\_\_ Era extinction was the greatest of at least five mass extinctions to occur over the past 600 million years.

Answer:

Paleozoic

27)

\_\_\_\_\_\_\_\_ are the dominant land plants of the Cenozoic Era.

Answer:

Angiosperms

28)

Primitive organisms, called \_\_\_\_\_\_\_\_, reproduce asexually and contain cells that lack organized nuclei.

Answer:

prokaryotes

29)

Toward the end of the Mesozoic Era, the \_\_\_\_\_\_\_\_ orogeny formed the southern ranges of the Rocky Mountains.

Answer:

Laramide

30)

One hypothesis for the extinction that took place at the end of the Mesozoic is that a large \_\_\_\_\_\_\_\_ collided with Earth.

Answer:

asteroid

22.5

Critical Thinking Questions

Use complete sentences, correct spelling, and the information presented in Chapter 22 to answer the questions below.

1)

Briefly discuss the development of life in the Paleozoic as compared to the Mesozoic.

2)

How does the supercontinent cycle fit into the entire scheme of plate tectonics? Also, how does the cycle help explain the origin of cratons?

3)

Discuss how Earth's early atmosphere is thought to have formed. What role did bacteria play in the development of our modern atmosphere?