PRACTICE EXAM 43: EARTH AND SPACE SCIENCES REGENTS SIMULATION (50 QUESTIONS)

1. A dam built across a river uses the force of water flowing downhill through turbines to generate electricity. What renewable energy source does this represent?

A. Geothermal energy, the energy that is drawn from the natural heat stored deep within the Earth's hot interior to make steam

B. Nuclear energy, the energy that is released when the nuclei of heavy atoms such as uranium are split apart inside a reactor

C. Hydroelectric energy, the energy generated by the force of flowing or falling water as it spins the turbines built into a dam

D. Wind energy, the energy captured by large turbines from moving air as the blades are pushed around by the blowing wind

2. Besides carbon dioxide, methane is a powerful greenhouse gas. Which of the following human-related activities is a significant source of methane released into the atmosphere?

A. Raising large numbers of livestock and operating landfills, both of which release methane as organic material is broken down

B. Operating solar panels and wind turbines, both of which release enormous quantities of methane gas while generating electricity

C. Planting trees and restoring wetlands, both of which are the single largest human sources of methane added to the atmosphere

D. Recycling aluminum and glass, both of which give off large amounts of methane during the process of being remelted and reused

3. As the oceans absorb more carbon dioxide from the atmosphere, the seawater gradually becomes more acidic. Why is this ocean acidification a concern for marine life?

A. The more acidic water makes fish swim much faster, which causes them to use up all of their energy and starve within a few days

B. The more acidic water instantly boils away, leaving large areas of the ocean completely dry and uninhabitable for marine animals

C. The more acidic water turns a deep red color that blocks sunlight, which prevents any photosynthesis from occurring in the ocean

D. The more acidic water makes it harder for corals, shellfish, and other organisms to build their shells and skeletons from calcium carbonate

4. On flat, open farmland in dry, windy regions, farmers sometimes plant rows of trees along the edges of their fields. How do these rows of trees, called windbreaks, help protect the land?

A. They attract strong winds toward the field, which dries out the soil faster and makes it easier for the farmer to plow the land

B. They slow down the wind blowing across the field, which reduces the wind erosion that would otherwise carry away the topsoil

C. They block all sunlight from reaching the crops, which forces the plants to grow taller as they stretch upward toward the light

D. They use up all of the water in the soil so that none is left for weeds, which is the only way that windbreaks benefit a farm

5. Scientists warn that human activities are causing many species to go extinct at an unusually rapid rate. Why is a loss of biodiversity considered harmful to ecosystems?

A. Diverse ecosystems tend to be more stable and resilient, so losing species can weaken an ecosystem's ability to recover from disturbances

B. A loss of biodiversity always makes ecosystems far stronger and healthier, so reducing the number of species is a clear benefit to nature

C. The number of species in an ecosystem has no connection at all to its health, so biodiversity loss has no real effect of any kind

D. Removing species speeds up the flow of energy so much that ecosystems become permanently and perfectly balanced forever afterward

6. Before water from a river or reservoir reaches people's homes, a treatment plant removes particles and kills harmful microorganisms. Which of the following describes part of how drinking water is typically made safe?

A. The water is heated until it completely evaporates, and people are then expected to breathe in the resulting steam instead of drinking liquid

B. The water is filtered to remove particles and then disinfected, often with chlorine, to kill harmful bacteria and other microorganisms

C. The water is mixed with large amounts of raw sewage, which is the standard method used to make river water safe enough to drink

D. The water is frozen into solid ice and shipped to homes, since freezing is the only process that can ever make natural water safe to drink

7. Fossil fuels currently supply much of the world's energy because they release a large amount of energy when burned. What is a major environmental drawback of relying on fossil fuels for energy?

A. Burning fossil fuels releases pure oxygen into the air, which has no effect on the environment and actually makes the air cleaner

B. Burning fossil fuels removes carbon dioxide from the atmosphere, which is cooling the planet far too quickly and too dangerously

C. Burning fossil fuels produces no emissions of any kind, so there are no environmental drawbacks to using them as an energy source

D. Burning fossil fuels releases carbon dioxide and other pollutants, contributing to climate change and air pollution problems

8. When a fish species is caught faster than it can reproduce, its population can collapse. What is this practice of catching fish faster than they can replace themselves called?

A. Overfishing, the harvesting of fish faster than the population can reproduce, which can cause the population to collapse over time

B. Aquaculture, the deliberate farming and raising of fish and other water organisms in controlled tanks, ponds, or ocean pens

C. Conservation, the careful protection and managed use of a natural resource so that it remains available for future generations

D. Migration, the regular seasonal movement of animals from one region to another in search of food, warmth, or breeding grounds

9. A government program encourages people to replace old incandescent light bulbs with LED bulbs that produce the same light using far less electricity. How does this program benefit the environment?

A. It greatly increases the total amount of electricity that each home uses, which in turn increases the demand for burning more fossil fuels

B. It has no effect on the environment whatsoever, since the type of light bulb a person uses cannot influence how much electricity is consumed

C. It reduces electricity demand, which lowers the amount of fossil fuel that must be burned and cuts the resulting greenhouse gas emissions

D. It forces power plants to produce far more electricity than before, since efficient bulbs somehow require additional power to operate

10. Earth both spins on its axis and travels around the Sun. Which statement correctly describes the difference between Earth's rotation and its revolution?

A. Rotation is Earth's yearly trip around the Sun, while revolution is Earth's daily spin on its axis, which produces day and night

B. Rotation is Earth's daily spin on its axis, which produces day and night, while revolution is Earth's yearly orbit around the Sun

C. Rotation and revolution both refer to Earth's daily spin, so the two words mean exactly the same motion and can be used interchangeably

D. Rotation is the motion of the Moon around Earth, while revolution is the motion of the Sun as it travels around the entire galaxy

11. The Sun contains more than 99 percent of all the mass in the solar system. How does the Sun's enormous mass affect the rest of the solar system?

A. The Sun's great mass has no effect on the planets, which would continue to orbit in exactly the same paths even if the Sun were removed

B. The Sun's great mass pushes the planets away, which is the force that keeps them from ever falling inward toward the center of the system

C. The Sun's great mass causes it to physically collide with each planet in turn, which is what keeps the planets moving along their orbits

D. The Sun's great mass produces a strong gravitational pull that holds the planets in their orbits around it at the center of the solar system

12. Two stars are identical in size and brightness, but one appears much dimmer in the night sky than the other. What is the most likely reason the one star appears dimmer than the other?

A. The dimmer-appearing star is much farther away from Earth, and a star's apparent brightness decreases as its distance from us increases

B. The dimmer-appearing star is much closer to Earth, since stars always appear dimmer the closer they happen to be to our planet

C. The dimmer-appearing star has stopped producing light entirely, even though it is described as being identical in brightness to the other

D. The dimmer-appearing star is made of a completely different material, which is the only thing that can ever affect how bright a star looks

13. Space agencies send robotic rovers and probes to explore other planets rather than sending humans to most of them. What is one major reason robotic missions are often used instead of human missions?

A. Robotic missions are far more dangerous to human life than crewed missions, so they are used only when the goal is to put people at risk

B. Robotic missions cannot collect any scientific data at all, so they are sent purely for entertainment rather than for any real exploration

C. Robotic missions avoid the great cost, danger, and life-support needs of keeping humans alive on long, hazardous journeys through space

D. Robotic missions travel much more slowly than crewed missions, which is the specific reason space agencies prefer to use them so often

14. All four of the outer gas giant planets have ring systems, and Saturn's rings are the most prominent. What are the rings of a planet like Saturn made of?

A. A single solid sheet of smooth, continuous rock that encircles the planet like a flat, unbroken disk spinning around its equator

B. Countless small pieces of ice and rock, ranging from tiny grains to large chunks, that orbit the planet together in a flat ring

C. Thick clouds of colorful gas that have leaked out of the planet's atmosphere and settled permanently into a flat ring around it

D. Beams of light reflected from the planet's surface, which form a glowing ring that contains no physical material of any kind

15. Astronomers have detected a faint glow of microwave radiation coming from every direction in space, left over from the early universe. What is this radiation considered to be evidence of?

A. Evidence that the universe is completely empty and cold, with no leftover heat or radiation remaining anywhere from its past history

B. Evidence that the Earth is located at the exact center of the universe, since the radiation appears to come equally from all directions

C. Evidence that the universe will soon collapse, since the microwave glow is a warning sign that space is rapidly shrinking inward

D. Evidence supporting the Big Bang, since this cosmic background radiation is the leftover heat from the early, hot, dense universe

16. Observers on Earth always see the same side of the Moon, never the far side. What causes the same side of the Moon to always face the Earth?

A. The Moon does not rotate at all as it orbits the Earth, which is the simple reason that the same face stays pointed toward us at all times

B. The Earth physically holds the Moon still with a beam of gravity, preventing the Moon from ever turning to show its other side to us

C. The Moon rotates exactly once for each orbit it makes around Earth, so the same side remains facing us throughout the entire orbit

D. The far side of the Moon is permanently hidden in Earth's shadow, so it is always too dark for observers on Earth to ever see it

17. If the Sun were shrunk to the size of a basketball, the Earth would be a tiny speck located about 25 meters away, and the nearest star would still be thousands of kilometers away. What does this comparison best illustrate?

A. The vast emptiness of space, in which planets and stars are separated by enormous distances compared with their own sizes

B. That the planets and stars are actually packed tightly together, with almost no empty space between any of them in the real universe

C. That the Sun is by far the smallest object in the solar system, since it can be shrunk down to the size of an ordinary basketball

D. That the distances in space are so tiny that a person could easily walk from the Earth to the nearest star in just a few minutes

18. The Sun appears far larger and brighter in our sky than any other star, yet it is actually an average star. Why does the Sun look so much bigger and brighter than the other stars?

A. The Sun is by far the largest and brightest star in the entire universe, which is the reason it dominates the sky both day and night

B. The Sun is extremely close to Earth compared with all other stars, and its nearness makes it appear far larger and brighter than they do

C. The Sun is the only true star, while all of the other points of light in the night sky are actually nearby planets reflecting its light

D. The Sun produces a special kind of light that no other star can produce, which is why it alone is able to light up the entire daytime sky

19. Earth is the only planet in our solar system known to support abundant life. Which combination of conditions makes Earth especially suitable for life?

A. Extremely high surface temperatures and an atmosphere of pure carbon dioxide, which together provide the ideal environment for all life

B. A complete lack of any atmosphere and a surface with no liquid water at all, which are the exact conditions that living things require

C. Constant exposure to deadly levels of radiation and a frozen surface with no liquid water, which most living organisms strongly prefer

D. Liquid water at the surface, a protective atmosphere, and moderate temperatures, all of which together allow living things to survive

20. On certain nights of the year, observers can see many meteors streaking across the sky in a meteor shower. What causes these predictable annual meteor showers?

A. The Moon breaks apart slightly each year, and the falling pieces of the Moon burn up in the atmosphere as the many visible meteors

B. Distant stars explode on a regular schedule, and the glowing fragments from those explosions rain down through Earth's atmosphere

C. Earth passes through a trail of dusty debris left behind by a comet, and the many particles burn up as they enter the atmosphere

D. The planets line up in a straight row, and their combined gravity pulls countless meteors out of deep space toward the Earth at once

21. Magma deep underground slowly cools and hardens into solid rock with large, interlocking crystals. What type of rock forms directly from the cooling and solidifying of molten material?

A. Igneous rock, which forms when molten magma or lava cools and solidifies, with slow underground cooling producing large crystals

B. Sedimentary rock, which forms when small particles of weathered rock are deposited in layers and then compacted and cemented together

C. Metamorphic rock, which forms when an existing rock is changed by intense heat and pressure deep underground without ever melting

D. A pure mineral vein, which forms only when hot water carrying dissolved minerals seeps into a crack and the minerals crystallize there

22. During an earthquake, the point underground where the rock first breaks and the earthquake originates is directly below a point on the surface. What is the point on Earth's surface directly above the earthquake's origin called?

A. The fault line, the long fracture or break in the rock along which the two blocks of rock slip past each other during the quake

B. The fault scarp, the small step or cliff that is left at the surface where one block of rock has shifted relative to the other one

C. The focus, the point underground where the rock actually breaks and where the earthquake's energy is first released into the ground

D. The epicenter, the point on Earth's surface located directly above the focus where the earthquake originates underground below it

23. Chemical weathering generally occurs faster in warm, wet climates than in cold, dry ones. Why does a warm, wet climate speed up chemical weathering of rock?

A. Cold, dry conditions actually provide the most water and heat for chemical reactions, so chemical weathering is fastest near the poles

B. Warmth speeds up chemical reactions and abundant water provides the moisture those reactions need, so weathering proceeds faster

C. Chemical weathering requires neither heat nor water, so the climate of a region has no influence at all on how fast it occurs

D. Warm, wet climates freeze the water inside rock cracks far more often, and this freezing is what drives chemical weathering forward

24. A geologist describes a mineral sample as having a shiny, reflective surface that looks like polished metal. This description refers to which physical property of the mineral?

A. Streak, the color of the powder that the mineral leaves behind when it is scraped firmly across a rough, unglazed porcelain tile

B. Hardness, the measure of how strongly the mineral resists being scratched, which is ranked on a scale running from talc to diamond

C. Luster, the way the surface of a mineral reflects light, described with terms such as metallic, glassy, pearly, dull, or earthy

D. Cleavage, the tendency of a mineral to break along smooth, flat planes that are determined by its internal atomic structure

25. At a divergent plate boundary, two tectonic plates move away from each other. What happens at this type of boundary as the plates separate?

A. Magma rises up into the gap between the separating plates and hardens, creating new crust as the plates continue to pull apart

B. One plate is forced down beneath the other plate, where it melts back into the mantle and is permanently destroyed over time

C. The two plates grind horizontally past each other without creating or destroying any crust, producing frequent powerful earthquakes

D. The two plates crash together and crumple upward, slowly pushing up tall mountain ranges along the boundary where they collide

26. Soils that form in grasslands and river valleys are often very fertile and good for farming, while soils on steep, rocky slopes are usually thin and poor. What largely determines how fertile a soil is?

A. Only the color of the soil matters, since the darkest soils are always completely infertile and the lightest soils are always the richest

B. The amount of organic matter and minerals the soil contains, since soils rich in nutrients and humus support much more plant growth

C. The exact day of the year on which the soil first formed, since soils that form in winter are always far more fertile than summer soils

D. Only the depth underground at which the soil is found, since all soils become equally fertile the moment they are brought to the surface

27. A fast-moving river can carry large, heavy particles, but when the same river slows down, it drops the heaviest particles first. What is the relationship between a stream's speed and the size of the particles it can carry?

A. A slower stream can carry much larger and heavier particles than a fast one, since slow water always has far more energy than fast water

B. The speed of a stream has no connection to the size of the particles it carries, since water carries every particle size equally at all speeds

C. A stream carries only the very smallest particles when it is moving fast and only the very largest particles when it is moving slowly

D. The faster a stream flows, the larger and heavier the particles it can carry, so as it slows it drops the heaviest particles first

28. A metamorphic rock shows distinct bands or layers of minerals that have been flattened and lined up in parallel sheets by intense pressure. What is this banded or layered texture in a metamorphic rock called?

A. Vesicular texture, the holey, sponge-like texture of a volcanic rock that is full of small cavities left behind by escaping gas bubbles

B. Clastic texture, the texture of a sedimentary rock that is made up of separate fragments and grains cemented together into solid rock

C. Foliated texture, the banded, layered texture of a metamorphic rock whose minerals have been flattened and aligned by directed pressure

D. Glassy texture, the smooth, shiny, crystal-free texture of a volcanic rock that cooled so quickly that no mineral crystals could form

29. In some places, groundwater naturally flows out onto the surface of the ground, often at the base of a hill, without any pump or well. What is this natural flow of groundwater onto the surface called?

A. A geyser, a vent from which boiling water and steam are violently and periodically blasted high into the air from deep underground

B. A spring, a place where groundwater naturally flows out onto the surface, often where the water table meets the side of a hill

C. A reservoir, a large artificial lake created by building a dam across a river in order to store water for human use over time

D. A glacier, a thick mass of slowly moving ice that forms on land where more snow falls each winter than melts during the summer

30. Earth is surrounded by a magnetic field that causes a compass needle to point north and helps shield the planet from harmful solar particles. What is the source of Earth's magnetic field?

A. The churning motion of the liquid iron in Earth's outer core, which generates the planet's magnetic field as the molten metal flows

B. The slow, steady spinning of the solid rocky crust at the surface, which produces the magnetic field through friction with the air

C. Large deposits of magnetic rock scattered randomly across the continents, which together happen to add up to one global magnetic field

D. The pull of the Moon's own magnetic field, which reaches across space and magnetizes the entire Earth from far away each day

31. The Sun's energy drives the water cycle. Which process, powered by the Sun, changes liquid water from oceans and lakes into water vapor that rises into the atmosphere?

A. Condensation, the process by which water vapor high in the cooling atmosphere changes back into the tiny droplets that form clouds

B. Precipitation, the process by which water returns from the clouds to the surface of the Earth as rain, snow, sleet, or hail

C. Runoff, the process by which water from rain or melting snow flows across the surface of the land and into streams and rivers

D. Evaporation, the process by which the Sun's energy changes liquid water at the surface into water vapor that rises into the air

32. Clouds form when warm, moist air rises and cools to the point where its water vapor condenses around tiny particles in the air. What is the main reason rising air cools as it climbs higher into the atmosphere?

A. The rising air moves much closer to the Sun as it climbs, but somehow this closer position to the Sun causes the air to grow colder

B. The rising air collides with falling rain, and the cold rain chills the air, which is the only way that rising air is ever able to cool

C. As air rises into regions of lower pressure it expands, and this expansion causes the air to cool until its water vapor condenses

D. The rising air is chilled by the light of the Moon, which grows steadily stronger at the higher altitudes the rising air reaches

33. An air mass forms over a warm tropical ocean, where it sits for a long time before moving over land. What temperature and moisture characteristics would this air mass most likely have?

A. Cold and dry, taking on the frigid, low-moisture conditions of a snow-covered polar region despite forming over warm tropical seas

B. Warm and humid, taking on the high temperature and abundant moisture of the warm tropical ocean over which it formed

C. Cold and humid, taking on freezing temperatures combined with high moisture even though it sat over a warm tropical ocean

D. Hot and bone-dry, taking on the conditions of a scorching, waterless desert despite forming directly over a warm tropical ocean

34. Hurricanes form over tropical oceans and can weaken quickly once they move over land. What is the main source of energy that powers a hurricane?

A. The warm, moist air rising from warm ocean water, which releases heat as its water vapor condenses and fuels the storm's powerful winds

B. The cold, dry air found over large landmasses, which is why hurricanes always grow much stronger after they move ashore over land

C. The light reflected off the surface of the Moon at night, which is the only source of the enormous energy that a hurricane requires

D. The friction of the storm's winds rubbing against the mountains, which is what builds a hurricane up to its greatest strength over land

35. Earth's climates are often grouped into broad zones based mainly on latitude. Which list correctly names three of these major climate zones, ordered from the equator toward the pole?

A. Polar near the equator, then temperate in the middle, then tropical at the poles, moving from the hottest region to the coldest one

B. Temperate at the equator, then polar in the middle latitudes, then tropical at the poles, ordered from warmest to coldest by latitude

C. Tropical near the equator, then temperate in the middle latitudes, then polar near the poles, moving from warmest toward coldest

D. Tropical at the poles, then polar in the middle latitudes, then temperate at the equator, ordered from the coldest region to the warmest

36. Cities located near a large ocean often have smaller differences between their summer and winter temperatures than cities far inland at the same latitude. What property of water best explains this moderating effect on coastal climates?

A. Water reflects nearly all sunlight away, so coastal areas receive almost no solar heating at all during any season of the entire year

B. Water freezes solid across the whole ocean every winter, which releases a burst of heat that keeps the nearby coastal cities warm

C. Water evaporates so quickly that it removes all of the heat from coastal air, keeping those cities cold throughout the entire year

D. Water heats up and cools down much more slowly than land, so the nearby ocean moderates the temperature of the coastal cities

37. A meteorologist wants to measure the exact amount of rainfall that has fallen during a storm. Which instrument is designed for this purpose?

A. An anemometer, the instrument that is used to measure how fast the wind is blowing as it spins the small cups mounted on the device

B. A rain gauge, the instrument that collects falling rain in an open container and measures the depth of water that has accumulated

C. A barometer, the instrument that is used to measure the pressure of the atmosphere, whose changes often signal a shift in the weather

D. A thermometer, the instrument that is used to measure the temperature of the air, the water, or another substance being studied

38. Large-scale winds do not blow in perfectly straight lines from high to low pressure but instead curve as they travel across the globe. What causes these large-scale winds to curve rather than move in straight paths?

A. The rotation of the Earth deflects the path of moving air, an effect known as the Coriolis effect, which makes large-scale winds curve

B. The winds bounce off invisible walls in the atmosphere, which are spaced evenly around the globe and force the winds to curve sharply

C. The gravity of the Moon reaches down and bends every wind on Earth, which is the sole reason that winds never travel in straight lines

D. The winds are pulled off course by large mountain ranges alone, and over the flat oceans the same winds always travel perfectly straight

39. On a weather map, regions of high pressure and low pressure are often marked. High-pressure systems are generally associated with which type of weather?

A. Heavy rain, strong storms, and thick cloud cover, since rising air in a high-pressure system cools and forms abundant clouds and rain

B. Constant, violent thunderstorms and tornadoes, since high-pressure systems are the specific source of nearly all severe weather on Earth

C. Clear skies and fair, calm weather, since the sinking air in a high-pressure system discourages cloud formation and precipitation

D. Heavy snowfall in every season, since high-pressure systems always produce freezing temperatures and steady snow no matter the location

40. Besides rising average temperatures, scientists point to several other observed changes as evidence of a warming climate. Which of the following is one such observed piece of evidence?

A. A worldwide thickening and rapid growth of glaciers and polar ice sheets, which have been steadily expanding over the past century

B. The widespread shrinking of glaciers and the earlier arrival of spring conditions, both of which are consistent with a warming climate

C. A steady and dramatic drop in global sea levels, which have been falling rapidly as the oceans cool and contract year after year

D. A complete halt in all changes to the natural world, since a warming climate is known to leave every part of the environment unchanged

41. A geologist studies an outcrop where a fault cuts through several sedimentary layers, and an igneous intrusion in turn cuts across that same fault. According to cross-cutting relationships, which event happened most recently?

A. The deposition of the sedimentary layers, since the layers are always the youngest features in any outcrop a geologist might study

B. The fault, since a fault that cuts through sedimentary layers is always the most recent event regardless of what else is present nearby

C. It is impossible to determine the order of any of these events, since cross-cutting relationships reveal nothing about their relative ages

D. The igneous intrusion, since it cuts across the fault, meaning the intrusion must have formed after both the layers and the fault

42. Most fossils are of organisms that had hard parts such as bones, shells, or teeth, while soft-bodied organisms like worms and jellyfish are rarely fossilized. Why are hard parts so much more likely to become fossils than soft tissues?

A. Hard parts resist decay and physical breakdown long enough to be buried and preserved, while soft tissues usually decay quickly after death

B. Soft tissues are far more durable than bones and shells, so they are actually the parts most commonly found preserved in the fossil record

C. Hard parts dissolve instantly the moment an organism dies, which is the specific reason they are so frequently preserved as fossils

D. Only organisms that lived in deserts were ever fossilized, and those organisms happened to have hard parts rather than soft tissues

43. The Precambrian makes up the vast majority of Earth's history, yet its fossil record is sparse. What kind of life dominated Earth during most of the Precambrian?

A. Large dinosaurs and other giant reptiles, which roamed the land throughout nearly all of the long Precambrian span of time

B. Flowering plants and large mammals, which covered the continents during the Precambrian long before any simpler life appeared

C. Simple single-celled organisms such as bacteria, which were the dominant form of life for most of the long Precambrian span

D. Modern humans and other advanced primates, who lived throughout the Precambrian before gradually being replaced by simpler life

44. A distinctive layer of volcanic ash from a single eruption is found in rock outcrops hundreds of kilometers apart. How can such an ash layer be useful to geologists?

A. The ash layer is useless for comparing distant outcrops, since ash from a single eruption can never spread across more than a few meters

B. Because it was deposited everywhere at nearly the same time, the ash layer serves as a time marker that lets geologists correlate distant rock layers

C. The ash layer proves that each outcrop formed in a completely different time period, since identical ash can never be the same age in two places

D. The ash layer shows only the local weather on the day it fell and provides no information that could ever help in dating or correlating rocks

45. A radioactive isotope has a half-life of 5,000 years. A sample originally contained a certain amount of this isotope. After 15,000 years, what fraction of the original isotope remains?

A. One-half of the original isotope remains, since 15,000 years is equal to exactly one half-life of the radioactive isotope

B. One-quarter of the original isotope remains, since 15,000 years is equal to exactly two half-lives of the radioactive isotope

C. One-third of the original isotope remains, found by simply dividing the original amount by the three half-lives that have passed

D. One-eighth of the original isotope remains, since 15,000 years equals three half-lives, and halving three times leaves one-eighth

46. Some sequences of sedimentary rock are many kilometers thick and made of layers that each took a long time to form. How does the existence of such thick rock sequences support the idea that Earth is very old?

A. Thick rock sequences form in just a few days during a single large storm, which actually shows that the Earth must be extremely young

B. The thickness of rock sequences has no connection to time at all, so these layers reveal nothing about how old the Earth might be

C. Building up many kilometers of layered sediment, one slow layer at a time, would require vast amounts of time, pointing to a very old Earth

D. Thick rock sequences were created all at once in their finished form, so they formed instantly and say nothing about the age of the Earth

47. After a major mass extinction wipes out many species, the fossil record shows that surviving groups often diversify into many new species over the following millions of years. What does this pattern reveal about life on Earth?

A. Life can recover and diversify after a mass extinction, with surviving groups evolving to fill the ecological roles left empty by extinct species

B. Once a mass extinction occurs, life on Earth never recovers in any way and the planet remains permanently empty of new species forever

C. Mass extinctions have no effect on the variety of life, since exactly the same species always reappear unchanged after every extinction event

D. Surviving species immediately go extinct as well right after every mass extinction, so no new species are ever able to evolve afterward

48. A particular fossil species is found in rocks all over the world but only in layers from one narrow slice of geologic time. Why do these two characteristics make it an excellent index fossil?

A. Because it is found in only one tiny location and existed for billions of years, which makes it perfect for pinpointing a precise age

B. Because it is extremely rare and almost never found, which is exactly what geologists most want in a fossil used to date rock layers

C. Because it lived for an enormously long span of time, which allows it to match rock layers of every possible age all at once

D. Because it is geographically widespread yet existed only briefly, so finding it pinpoints a specific, narrow age across distant locations

49. An engineering team is asked to design a device to bring clean water to a remote village. What should the team do first, before sketching any possible designs?

A. Begin building the final version of the very first idea anyone suggests, since the first idea is always guaranteed to be the best solution

B. Clearly define the problem and identify the criteria and constraints, such as the village's needs, available materials, and budget limits

C. Immediately mass-produce thousands of untested devices and ship them to the village, since testing a design only wastes valuable time

D. Choose the most expensive possible materials without any planning, since higher cost by itself always guarantees a better final result

50. A student designs an experiment to test how the amount of sunlight affects plant growth. To get valid results, the student gives all the plants the same amount of water, soil, and warmth, changing only the sunlight. Why is it important to keep these other factors the same?

A. Keeping the other factors the same guarantees that the plants will all grow at exactly the same rate, which is the goal of every experiment

B. Keeping the other factors the same makes the experiment take much longer, which is the main reason scientists choose to control variables

C. Keeping the other factors the same ensures that any difference in growth can be attributed to sunlight rather than to some other variable

D. Keeping the other factors the same has no real effect on the results, since experiments give valid answers no matter how they are set up

Practice Exam 43: Answer Key with Explanations

1. C — Generating electricity from the force of flowing or falling water through a dam's turbines is hydroelectric energy. Because the water cycle continually refills the river, this is a renewable source rather than a fuel that is burned and used up.
2. A — Raising livestock and operating landfills are major methane sources, as microbes release methane while breaking down organic material in animal digestion and buried waste. This makes methane an important human-caused greenhouse gas alongside carbon dioxide.
3. D — More acidic seawater makes it harder for corals, shellfish, and similar organisms to build shells and skeletons from calcium carbonate. Because these organisms form the base of many marine food webs, ocean acidification threatens whole ecosystems.

4. B — Rows of trees act as windbreaks that slow the wind crossing a field, reducing the wind erosion that would otherwise strip away topsoil. Protecting the topsoil preserves the field's fertility in dry, windy regions.
5. A — Diverse ecosystems tend to be more stable and resilient, so losing species weakens an ecosystem's ability to recover from disturbances. This loss of resilience is why declining biodiversity is harmful even when individual species seem minor.
6. B — Drinking water is typically made safe by filtering out particles and then disinfecting, often with chlorine, to kill harmful microorganisms. These two steps remove both physical contaminants and disease-causing pathogens.
7. D — Burning fossil fuels releases carbon dioxide and other pollutants, contributing to climate change and air pollution. These emissions are the central environmental drawback of depending on fossil fuels for energy.
8. A — Catching fish faster than the population can reproduce is overfishing, which can drive a population to collapse. Sustainable limits are needed because once a stock is depleted it may take many years, if ever, to recover.
9. C — Switching to efficient LED bulbs reduces electricity demand, which lowers how much fossil fuel must be burned and cuts the resulting greenhouse gas emissions. Using less energy for the same task is a direct way to shrink environmental impact.
10. B — Rotation is Earth's daily spin on its axis, which produces day and night, while revolution is its yearly orbit around the Sun. Distinguishing the two clarifies which motion causes daily versus yearly cycles.
11. D — The Sun's enormous mass produces a strong gravitational pull that holds the planets in their orbits around it. This central gravity is what keeps the entire solar system bound together.
12. A — A star that appears dimmer despite being identical in true brightness must be farther away, since apparent brightness decreases with distance. This is why distance must be known before a star's true luminosity can be judged.
13. C — Robotic missions avoid the great cost, danger, and life-support requirements of keeping humans alive on long, hazardous journeys. This makes them a practical choice for exploring distant or harsh planetary environments.
14. B — Saturn's rings are made of countless pieces of ice and rock, from tiny grains to large chunks, all orbiting the planet in a flat ring. They are not a solid sheet but a swarm of separate particles held by gravity.
15. D — The faint microwave glow coming from all directions is the cosmic background radiation, the leftover heat of the early hot, dense universe. Its detection is strong evidence supporting the Big Bang theory.
16. C — The Moon rotates exactly once for each orbit around Earth, so the same side always faces us. This synchronous rotation, not a lack of spinning, keeps the far side hidden from Earth.
17. A — The basketball comparison illustrates the vast emptiness of space, where planets and stars are separated by enormous distances relative to their sizes. It conveys how sparse matter is across the solar system and beyond.
18. B — The Sun looks far larger and brighter only because it is extremely close to Earth compared with all other stars. Its nearness, not any special size or light, makes an average star dominate our sky.
19. D — Liquid surface water, a protective atmosphere, and moderate temperatures together make Earth suitable for abundant life. This particular combination of conditions supports the chemistry and stability that living things require.

20. C — Annual meteor showers occur when Earth passes through a trail of dusty debris left by a comet, and the particles burn up entering the atmosphere. Because Earth crosses these trails on a regular orbital schedule, the showers recur each year.
21. A — Rock that forms directly from cooling and solidifying molten material is igneous rock, with slow underground cooling producing large crystals. The crystal size reflects how much time the magma had to cool.
22. D — The point on Earth's surface directly above the underground focus is the epicenter. It is where earthquake shaking is typically strongest and is the location reported for the quake.
23. B — Warmth speeds up chemical reactions and abundant water supplies the moisture those reactions need, so chemical weathering is faster in warm, wet climates. This is why tropical regions weather rock more rapidly than cold, dry ones.
24. C — A shiny, metallic-looking reflective surface describes a mineral's luster, the way its surface reflects light. Luster is described with terms such as metallic, glassy, or dull and helps identify minerals.
25. A — At a divergent boundary, magma rises into the gap between separating plates and hardens, forming new crust. This continual creation of crust is the process that builds mid-ocean ridges.
26. B — Soil fertility is largely determined by the amount of organic matter and minerals it contains, since nutrient- and humus-rich soils support more plant growth. This is why valley and grassland soils outperform thin, rocky slope soils.
27. D — The faster a stream flows, the larger and heavier the particles it can carry, so as it slows it drops the heaviest particles first. This relationship between speed and carrying capacity explains how streams sort their sediment.
28. C — The banded, layered texture of a metamorphic rock whose minerals have been flattened and aligned by directed pressure is foliation. This alignment records the directed pressure the rock experienced during metamorphism.
29. B — Groundwater that flows naturally onto the surface, often where the water table meets a hillside, is a spring. It emerges without any pump because the water table intersects the ground surface there.
30. A — Earth's magnetic field is generated by the churning motion of liquid iron in the outer core. This flow of molten metal acts like a dynamo, producing the field that turns compass needles and shields the planet.
31. D — The Sun-powered process that changes liquid surface water into vapor that rises into the air is evaporation. It is the step of the water cycle that lifts water from oceans and lakes into the atmosphere.
32. C — Rising air moves into lower-pressure regions and expands, and that expansion cools the air until its water vapor condenses. This expansion-driven cooling is what allows clouds to form as air ascends.
33. B — An air mass forming over a warm tropical ocean becomes warm and humid, taking on the heat and abundant moisture of its source. Air masses acquire the temperature and moisture of the surface beneath them.
34. A — A hurricane is powered by warm, moist air rising from warm ocean water, which releases heat as its vapor condenses and drives the storm's winds. Losing that warm-water energy source is why hurricanes weaken over land.
35. C — Ordered from the equator toward the pole, the major climate zones are tropical, then temperate, then polar. This progression follows the decrease in direct solar heating with increasing latitude.

36. D — Water heats and cools much more slowly than land, so a nearby ocean moderates coastal temperatures. This high heat capacity is why coastal cities have smaller seasonal temperature swings than inland cities.
37. B — A rain gauge collects falling rain in an open container and measures the accumulated depth, giving the rainfall amount. It is the instrument specifically designed to quantify precipitation.
38. A — Earth's rotation deflects the path of moving air, an effect called the Coriolis effect, which makes large-scale winds curve. This deflection is why global winds follow curved rather than straight paths.
39. C — High-pressure systems bring clear skies and fair, calm weather because their sinking air discourages cloud formation and precipitation. This is why fair weather often accompanies high pressure on a weather map.
40. B — The widespread shrinking of glaciers and the earlier arrival of spring are observed changes consistent with a warming climate. These trends provide evidence beyond temperature readings alone.
41. D — By cross-cutting relationships, the igneous intrusion is the most recent event because it cuts across the fault, which itself cuts the layers. A feature that cuts another must be younger than what it cuts.
42. A — Hard parts resist decay and physical breakdown long enough to be buried and preserved, while soft tissues usually decay quickly. This durability is why bones, shells, and teeth dominate the fossil record.
43. C — For most of the Precambrian, life was dominated by simple single-celled organisms such as bacteria. Complex multicellular life appeared only late in Earth's history, leaving the long Precambrian record sparse.
44. B — Because a single ash fall is deposited everywhere at nearly the same time, the ash layer is a time marker that lets geologists correlate distant rock layers. Matching the same instantaneous layer ties separated outcrops to the same moment.
45. D — In 15,000 years the isotope passes through three half-lives (15,000 ÷ 5,000), and halving three times leaves 1/8 of the original. Counting half-lives and halving repeatedly gives the fraction remaining.
46. C — Building up many kilometers of layered sediment one slow layer at a time would require vast spans of time, pointing to a very old Earth. The sheer thickness of such sequences is evidence against a young Earth.
47. A — The post-extinction diversification of survivors shows that life can recover, with surviving groups evolving to fill the ecological roles left vacant. This pattern demonstrates the resilience and adaptability of life over geologic time.
48. D — A fossil that is geographically widespread yet existed only briefly makes an excellent index fossil, because finding it pinpoints a specific, narrow age across distant locations. Wide distribution allows correlation, while a short time range gives precision.
49. B — Before sketching designs, the team should clearly define the problem and identify the criteria and constraints, such as needs, materials, and budget. Defining the problem first ensures the eventual designs target the right goals and limits.
50. C — Keeping water, soil, and warmth the same ensures that any difference in growth can be attributed to sunlight rather than another variable. Controlling these factors is what makes the experiment a fair, valid test of the one variable being studied.