PRACTICE EXAM 36: EARTH AND SPACE SCIENCES REGENTS SIMULATION (50 QUESTIONS)

1. Which two sources of energy drive the processes of the rock cycle?

A. Energy from the Moon's gravity and energy from the chemical burning of fossil fuels deep underground

B. Energy from the Sun, which drives surface processes, and Earth's internal heat, which drives processes at depth

C. Energy from ocean tides and energy released by the radioactive decay of elements high in the upper atmosphere

D. Energy from lightning strikes and energy stored in the magnetic field generated by Earth's molten outer core

2. Two igneous rocks have the same chemical composition, but one has large visible crystals and the other has tiny crystals. What does this difference reveal?

A. The rock with large crystals is much older than the rock with tiny crystals, since crystals grow steadily with age

B. The two rocks must have formed from entirely different magmas, since identical magma always makes identical rocks

C. The large-crystal rock cooled slowly underground, while the tiny-crystal rock cooled quickly at or near the surface

D. The rock with tiny crystals cooled slowly deep underground, while the large-crystal rock cooled quickly in the open air

3. A solid block of rock is broken into many smaller pieces. How does breaking the rock into smaller pieces affect the rate of chemical weathering?

A. It increases the rate of chemical weathering, because breaking the rock exposes much more surface area to air and water

B. It decreases the rate of chemical weathering, because the smaller pieces are far too tiny for chemical reactions to occur

C. It has no effect on the rate of chemical weathering, since the total amount of rock present has not changed at all

D. It completely stops all chemical weathering, because only solid unbroken blocks of rock can ever be chemically weathered

4. Halite (table salt) consistently forms cube-shaped crystals. What is the reason a mineral such as halite grows in a characteristic geometric shape?

A. The cube shape forms randomly and would be completely different each time the same mineral happened to crystallize

B. The cube shape is caused by the color of the mineral, since each different color produces a different crystal shape in nature

C. The cube shape is carved into the mineral after it forms by the action of running water and blowing wind over time

D. The cube shape reflects the orderly, repeating arrangement of the mineral's atoms in its internal crystal structure

5. After a heavy rainstorm, a river's discharge and velocity both increase sharply. How does this change affect the river's ability to erode and transport sediment?

A. The river loses its ability to carry sediment, since fast-moving water can only deposit material and never pick it up

B. The river can transport only the smallest particles, because high velocity reduces the energy available for erosion

C. The river can erode its banks more strongly and carry larger particles, because faster-moving water has more energy

D. The river's erosion and transport remain completely unchanged, since these depend only on the width of the channel

6. In which environment would you most expect to find poorly sorted sediment containing a jumbled mix of boulders, sand, and clay all together?

A. At the bottom of a calm, deep lake, where only the very finest particles slowly settle out of the still water

B. In glacial till deposited directly by melting ice, which drops all of its particle sizes together without sorting them

C. On a beach where waves continuously wash the sand, sorting it into uniform, well-rounded grains all of one size

D. In a slow, gently flowing stream, where the steady current carefully separates the sediment particles by their size

7. P-waves can travel through both solids and liquids, but S-waves can travel only through solids. How have scientists used this fact?

A. They concluded that the entire interior of Earth must be completely solid all the way down to its very center

B. They concluded that Earth has no internal structure at all and is made of one single uniform material throughout

C. They concluded that the crust is liquid while the deep interior of the planet is entirely gaseous and extremely hot

D. They concluded that Earth's outer core is liquid, because S-waves fail to pass through it while P-waves slow and bend

8. Symmetrical stripes of alternating magnetic polarity are found in the rocks of the ocean floor, matching on both sides of a mid-ocean ridge. What do these magnetic stripes provide evidence for?

A. Seafloor spreading, since new crust records Earth's magnetic field as it forms and then spreads away from the ridge

B. That Earth's magnetic field has remained perfectly constant and has never once reversed at any point in the planet's history

C. That the ocean floor is completely uniform in age, having all formed at exactly one single moment in the distant past

D. That the continents have always been fixed in their present positions and have never moved across the planet at all

9. Rock immediately surrounding a hot magma intrusion is altered by the heat, even without any squeezing pressure. This type of metamorphism, caused mainly by heat from a nearby magma body, is called:

A. Regional metamorphism, which affects enormous areas of rock during the building of entire mountain ranges

B. Sedimentary lithification, in which loose sediment is compacted and cemented together into solid sedimentary rock

C. Contact metamorphism, in which rock is altered by the intense heat of a nearby igneous intrusion

D. Chemical weathering, in which minerals at Earth's surface react with water and air to form new substances

10. A rock can hold a large volume of water in its pore spaces yet still allow water to pass through it only very slowly. Which pair of properties does this rock have?

A. High permeability and high porosity, which together allow water to be both stored and transmitted very rapidly

B. High porosity but low permeability, meaning it has much pore space to hold water but poorly connected passages for flow

C. Low porosity and low permeability, meaning it has little space to hold water and almost no ability to transmit it

D. Low porosity but high permeability, meaning it holds very little water yet transmits the small amount extremely fast

11. How does the typical landscape of an arid (dry) region usually differ from that of a humid (wet) region?

A. Arid regions have rounded hills and gentle slopes, while humid regions have sharp, angular, steep-walled features

B. Arid and humid regions develop landscapes that look exactly the same, since climate has no effect on landforms at all

C. Humid regions have angular, jagged cliffs everywhere, while arid regions have only smooth, flat, featureless plains

D. Arid regions tend to have steep, angular slopes and sharp features, while humid regions tend to have rounded, gentler slopes

12. Soil forms slowly over long periods of time. Which combination of factors most strongly controls how a soil develops in a given location?

A. The parent rock material, the climate, the organisms present, the slope of the land, and the amount of time available

B. Only the color of the local bedrock and the direction from which the prevailing winds happen to blow during each season

C. Only the distance of the location from the nearest large ocean and its elevation above the present-day sea level

D. Only the number of earthquakes the region experiences and the strength of the local magnetic field deep underground

13. Astronomers often measure distances within the solar system in astronomical units (AU). One astronomical unit is defined as:

A. The distance light travels through empty space in exactly one full year as measured from the surface of the Earth

B. The total diameter of the Sun measured straight across from one edge of its glowing surface to the opposite edge

C. The average distance from the Earth to the Sun, used as a convenient yardstick for distances within the solar system

D. The distance from the Sun to the very outermost planet, Neptune, at the farthest edge of the planetary system

14. Different constellations are visible in the night sky during different seasons of the year. What causes the visible constellations to change from season to season?

A. The constellations physically move to new positions in space, traveling completely around the Earth once each year

B. The stars within the constellations burn out in winter and are then replaced by entirely new stars again in the summer

C. The Earth's daily rotation on its axis brings a completely different set of constellations into view every single night

D. Earth's revolution around the Sun changes the nighttime side of the planet's view of space over the course of the year

15. Kepler's second law states that a planet sweeps out equal areas in equal times as it orbits the Sun. What does this law tell us about a planet's speed?

A. The planet moves at the very same constant speed at every single point along its entire orbit around the Sun

B. The planet moves faster when it is closer to the Sun and slower when it is farther from the Sun

C. The planet moves slower when it is closer to the Sun and faster when it is farther away from the Sun

D. The planet's speed depends only on its size and is completely unrelated to its distance from the Sun

16. Compared with the other stars in the universe, our Sun is best described as:

A. A fairly average, middle-sized main sequence star, neither the largest and brightest nor the smallest and dimmest

B. By far the largest and most luminous star known to exist anywhere in the entire observable universe today

C. One of the smallest and coolest stars in existence, far dimmer than nearly every other star in the whole galaxy

D. A dying star in the final stages of its life that will explode as a supernova within the next several years

17. Which statement best describes the scale of the observable universe?

A. The universe contains only the Sun, its planets, and a few thousand nearby stars, with empty space far beyond

B. The universe contains exactly one galaxy, the Milky Way, which holds every single star that exists anywhere

C. The universe contains billions of galaxies, each made of billions of stars, separated by vast distances of space

D. The universe contains only a few dozen stars arranged in a small fixed pattern that never changes over time

18. Mercury experiences extremely hot days and extremely cold nights, with one of the largest temperature ranges of any planet. Which factor best explains these extreme temperature swings?

A. Mercury is tilted so far on its axis that one side is always in summer while the other side is always in winter

B. Mercury has almost no atmosphere to trap heat or moderate temperatures, so the surface heats and cools drastically

C. Mercury is the farthest planet from the Sun, so it receives almost no warmth from sunlight during its long daytime

D. Mercury rotates so rapidly that friction with its thick clouds heats one side while the opposite side stays frozen

19. Comets typically follow long, stretched-out elliptical orbits that carry them from the far outer solar system to close around the Sun and back again. What happens to a comet as it approaches the Sun?

A. Heat from the Sun vaporizes its ices, releasing gas and dust that form a glowing coma and a long tail

B. The Sun's gravity captures the comet permanently, locking it into a tight circular orbit close to the Sun forever

C. The comet freezes solid and becomes completely invisible, since approaching the Sun rapidly cools the comet down

D. The comet breaks apart into a belt of rocky asteroids that then spread out evenly across the entire inner solar system

20. Which two observations are considered the strongest evidence supporting the Big Bang theory of the universe's origin?

A. The phases of the Moon and the changing of the seasons, both repeating in regular and predictable cycles each year

B. The expansion of the universe shown by galactic redshifts and the cosmic microwave background radiation

C. The presence of craters on the Moon and the existence of a rocky asteroid belt between Mars and Jupiter

D. The daily rising and setting of the Sun and the slow apparent drift of the constellations across the night sky

21. Stars begin their lives within vast clouds of gas and dust in space. What causes a new star to begin forming within such a cloud?

A. A passing comet collides with the cloud and ignites the gas, instantly setting the brand-new star ablaze in space

B. Sunlight from nearby existing stars chemically burns the gas of the cloud, slowly cooking it into a solid star over time

C. Gravity causes a region of the cloud to contract and heat up until it becomes hot and dense enough for fusion to begin

D. The magnetic field of the galaxy freezes a portion of the cloud solid, and this frozen ball then becomes a new star

22. How does the strength of the gravitational attraction between two objects change as the distance between them increases?

A. The gravitational attraction grows stronger as the distance increases, since more space allows more pull to build up

B. The gravitational attraction stays exactly the same no matter how far apart the two objects are moved from each other

C. The gravitational attraction first increases and then suddenly disappears entirely once a certain distance is reached

D. The gravitational attraction grows weaker as the distance increases, decreasing rapidly the farther apart the objects are

23. A list of stars is arranged in order of increasing surface temperature. Which sequence of star colors correctly matches this order, from coolest to hottest?

A. Red, then orange, then yellow, then white, and finally blue, moving from the coolest stars to the hottest stars

B. Blue, then white, then yellow, then orange, and finally red, moving from the coolest stars to the hottest stars

C. Green, then purple, then red, then yellow, and finally black, moving from the coolest stars to the hottest stars

D. White, then red, then blue, then orange, and finally yellow, moving from the coolest stars to the hottest stars

24. Methane is a greenhouse gas many times more effective at trapping heat than carbon dioxide. Which of the following is a major human-related source of methane emissions?

A. The generation of electricity using large solar panels and wind turbines spread across open fields and rooftops

B. Livestock digestion, rice paddies, and landfills, all of which release methane through the breakdown of organic matter

C. The planting of new forests, which release enormous quantities of methane gas as the young trees grow each year

D. The natural weathering of exposed granite bedrock, which releases trapped methane gas as the rock slowly breaks down

25. A farmer in a dry region wants to use water more efficiently for irrigation. Which method would best conserve water by delivering it directly to plant roots with little waste?

A. Flooding the entire field with water repeatedly, allowing the excess to run off into the surrounding ditches and fields

B. Spraying water high into the air over the whole field during the hottest and sunniest part of the afternoon each day

C. Leaving the irrigation channels open continuously day and night so that water is always available to every single plant

D. Using drip irrigation, which delivers small amounts of water slowly and directly to the base of each individual plant

26. Which list contains only nonrenewable resources?

A. Sunlight, wind, flowing water, and geothermal heat, all of which are continuously replenished by natural processes

B. Wind, coal, solar energy, and timber, a mixture of resources that can be replaced naturally on a short human timescale

C. Coal, oil, natural gas, and uranium, all of which exist in fixed amounts and form far more slowly than they are used

D. Hydroelectric power, biomass, wind, and tidal energy, all of which are constantly being renewed by natural cycles

27. A predator is completely removed from an ecosystem. What is a likely consequence of removing this predator?

A. The population of its prey may grow rapidly and overgraze or deplete the resources that other species also depend on

B. The ecosystem will immediately become more stable and balanced, since removing any species always improves an ecosystem

C. Every other species in the ecosystem will go extinct within just a few days because of the loss of the single predator

D. Nothing at all will change, because the removal of one species can never affect any of the other species that are present

28. On steep hillsides, farmers sometimes cut the slope into a series of flat, step-like levels to grow their crops. How does this practice of terracing help the land?

A. It increases the speed at which rainwater rushes down the slope, quickly draining the fields after every heavy storm

B. It permanently prevents any plants or crops from ever growing on the hillside, leaving the soil there completely bare

C. It raises the temperature of the soil so dramatically that crops can be grown even during the coldest winter months

D. It slows the downhill flow of water and reduces soil erosion by creating level surfaces that hold soil and water in place

29. In many large cities, sunlight reacts with pollutants from vehicle exhaust to create a brownish haze that can harm human health. This type of air pollution is known as:

A. Acid rain, precipitation that has become acidic from dissolved sulfur and nitrogen compounds in the atmosphere

B. Photochemical smog, a haze formed when sunlight reacts with pollutants such as those released by vehicle exhaust

C. The greenhouse effect, the natural trapping of heat near Earth's surface by certain gases in the atmosphere

D. Ozone depletion, the thinning of the protective ozone layer high in the stratosphere caused by certain chemicals

30. Recycling metals such as steel and aluminum instead of mining new ore from the ground provides which major benefit?

A. It produces metal that is far weaker and much lower in quality than metal made from freshly mined natural ore

B. It requires far more energy than mining new ore, which is the main reason recycling is rarely worth the effort involved

C. It conserves natural resources and uses much less energy than extracting and refining brand-new metal from raw ore

D. It permanently destroys the metal so that it can never be used again, which simply frees up space in crowded landfills

31. Which of the following actions would most directly reduce the amount of carbon dioxide released into the atmosphere?

A. Replacing coal-burning power plants with solar, wind, and other energy sources that do not burn fossil fuels

B. Cutting down large areas of forest in order to clear additional land for new parking lots and shopping centers

C. Increasing the number of gasoline-powered vehicles on the road and encouraging longer daily commutes by car

D. Burning much larger quantities of coal and oil each year to keep up with the rising global demand for electricity

32. Fertile topsoil forms very slowly but can be lost quickly through erosion. Why is the loss of topsoil a serious concern for human society?

A. Topsoil is needed only for building roads and bridges, so its loss affects construction but never affects food supplies

B. Topsoil loss is actually beneficial overall, because removing the topsoil exposes valuable mineral ores that can be mined

C. Topsoil has no real value to humans, so its loss through erosion makes no meaningful difference to anyone at all

D. Topsoil supports the growth of crops that feed people, and because it forms so slowly, lost topsoil is not easily replaced

33. In a sequence of undisturbed sedimentary rock layers, the principle of superposition states that:

A. The youngest layers are always found at the very bottom, since the oldest sediment settles last and rises to the top

B. All of the layers in the sequence were deposited at exactly the same time and are therefore all the same age

C. The oldest layers are at the bottom and each successive layer above is younger, since lower layers were deposited first

D. The age of the layers cannot be determined from their order, since sediment is deposited in a completely random sequence

34. A buried shell slowly dissolves away, leaving an empty cavity in the rock shaped exactly like the shell. Later, minerals fill that cavity. What has formed when the minerals fill the cavity?

A. A trace fossil, which is a preserved record of an organism's behavior rather than any actual part of the organism itself

B. A cast fossil, formed when minerals fill the mold left behind by a dissolved organism, taking on its original shape

C. A petrified fossil, formed when the original living tissues of the organism are gradually replaced by hard minerals

D. An index fossil, the preserved remains of a short-lived, widespread organism used to determine the age of rock layers

35. The Phanerozoic Eon, the time of abundant visible life, is divided into three eras. Which sequence lists these eras in order from oldest to youngest?

A. The Paleozoic Era, then the Mesozoic Era, then the Cenozoic Era, moving from the oldest era to the most recent one

B. The Cenozoic Era, then the Mesozoic Era, then the Paleozoic Era, moving from the oldest era to the most recent one

C. The Mesozoic Era, then the Paleozoic Era, then the Cenozoic Era, moving from the oldest era to the most recent one

D. The Cenozoic Era, then the Paleozoic Era, then the Mesozoic Era, moving from the oldest era to the most recent one

36. To determine the age of a rock that is roughly two billion years old, which kind of radioactive isotope should a geologist use?

A. An isotope with a very short half-life of only a few years, so that it decays rapidly enough to be measured quickly

B. Any isotope at all, since the half-life of the isotope has no effect on which materials it can accurately date

C. An isotope that does not decay at all, since only completely stable isotopes are useful for dating very old rocks

D. An isotope with a very long half-life of hundreds of millions or billions of years, suited to measuring such great ages

37. When Alfred Wegener first proposed continental drift, most scientists rejected the idea for many years. Why was his hypothesis not widely accepted at the time?

A. Wegener offered no evidence whatsoever to support his idea, simply guessing for no reason that the continents had moved

B. The continents were already known to be completely fixed in place, and no fossil or rock evidence had ever been found

C. Wegener could not explain a mechanism powerful enough to move the continents, which was later supplied by plate tectonics

D. His idea was immediately proven false by laboratory experiments, since continents had been shown never to move even slightly

38. The fossil record shows that the vast majority of species that have ever lived on Earth are now extinct. What does this pattern indicate about extinction?

A. Extinction is a normal and ongoing part of the history of life, with species continually arising and dying out over time

B. Extinction has occurred only once in Earth's history, during a single catastrophic event that ended all of the early life

C. Extinction is an extremely rare event that has affected only a tiny handful of unusual species across all of geologic time

D. Extinction never truly occurs at all, since the fossil record shows that all ancient species are in fact still alive somewhere today

39. Scientists describe the very early Earth, shortly after it formed about 4.6 billion years ago, as a place that was:

A. Cool and covered in deep oceans of liquid water teeming with complex multicellular plants and animals from the very start

B. Extremely hot, with widespread volcanic activity and frequent impacts, and lacking the oxygen-rich atmosphere of today

C. Almost exactly like the Earth of today, with the same atmosphere, the same continents, and the same forms of life present

D. A frozen, lifeless ball of solid ice with no internal heat, no volcanic activity, and no liquid water anywhere upon it

40. Geologists find the same distinctive index fossil in rock layers on two different continents separated by a wide ocean. What can they reasonably conclude?

A. That the two continents have always been separated by the ocean and the fossil organism swam across between them

B. That the rock layer on one continent must be billions of years older than the matching layer on the other continent

C. That the index fossil is still a living species found today in the open ocean between the two widely separated continents

D. That the two rock layers formed during the same period of geologic time and can be correlated despite the great distance

41. When a parcel of air near the surface is heated, what typically happens to that air?

A. The warmed air expands, becomes less dense than the surrounding air, and rises upward in the atmosphere

B. The warmed air contracts, becomes much denser than the air around it, and sinks rapidly toward the ground

C. The warmed air instantly freezes into tiny ice crystals, which then fall back down to the surface as light snow

D. The warmed air remains completely motionless, since heating a parcel of air has no effect on its density or behavior

42. On a winter day, raindrops fall from a warm cloud layer but then pass through a deep layer of below-freezing air near the ground, freezing into small ice pellets before they land. This type of precipitation is called:

A. Hail, which forms when strong updrafts in thunderstorms repeatedly lift water droplets high up into freezing air

B. Snow, which forms when water vapor in a cloud changes directly into ice crystals without ever becoming liquid first

C. Sleet, which forms when raindrops fall through a layer of below-freezing air and freeze into small ice pellets

D. Dew, which forms when water vapor in the air condenses directly onto cool surfaces near the ground overnight

43. Two cities are located at the same latitude, but one sits high in the mountains while the other is at sea level. How will their average temperatures most likely compare?

A. The mountain city will be much warmer than the sea-level city, since higher elevations are always closer to the Sun

B. The mountain city will be cooler than the sea-level city, since air temperature generally decreases with increasing elevation

C. The two cities will have exactly the same average temperature, since elevation has no effect on temperature at all

D. The sea-level city will be far colder than the mountain city, since lower elevations receive far less sunlight overall

44. A cold ocean current flows along a coastline. How does this cold current most likely affect the climate of the nearby coast?

A. It greatly increases rainfall and warms the coast, producing a hot and extremely humid tropical climate there year-round

B. It causes the coast to experience violent daily hurricanes throughout every season of the entire year without any pause

C. It raises the average temperature of the coast far above that of the inland areas located at the very same latitude

D. It tends to cool the nearby coast and can reduce rainfall, since the cold water cools the air passing over it

45. An occluded front forms when:

A. A faster-moving cold front catches up to and overtakes a slower warm front, lifting the warm air completely off the ground

B. Two warm air masses of identical temperature collide head-on and merge together without any lifting or precipitation at all

C. A warm front and a cold front move in exactly the same direction at the same speed and therefore never actually meet

D. A single air mass remains in one place for many days without moving, producing clear skies and calm, dry weather

46. At the very center of a hurricane is a region of calm, clear skies and light winds. What is this central region called, and what are conditions like there?

A. The eyewall, where the strongest winds and the heaviest rain of the entire hurricane are concentrated in a tight ring

B. The storm surge, a dome of seawater that is pushed up onto the coast by the powerful winds at the storm's center

C. The eye, a region of calm, sinking air at the center of the hurricane where skies are often clear and winds are light

D. The spiral band, one of the long curving arms of clouds and thunderstorms that wrap around the outside of the storm

47. Scientists study the width of the annual growth rings in very old trees to learn about past climate. How do tree rings record information about past climate conditions?

A. The color of each ring reveals the exact amount of carbon dioxide that was present in the atmosphere during that year

B. The total number of rings in a tree reveals the precise average global temperature during the tree's entire lifetime

C. The chemical makeup of the bark on the outside of the tree records the strength of Earth's magnetic field each year

D. Wider rings generally indicate favorable growing years with ample warmth and moisture, while narrow rings indicate harsher years

48. What is the main source of energy that drives the entire water cycle, powering evaporation and the movement of water around the planet?

A. The heat released by earthquakes and volcanic eruptions occurring along the boundaries of Earth's tectonic plates

B. Energy from the Sun, whose heat drives the evaporation of surface water and powers the circulation of the atmosphere

C. The gravitational pull of the Moon, which lifts water from the surface of the oceans into the sky to form the clouds

D. The magnetic field generated deep within Earth's core, which pushes water upward through the rocks and into the air

49. A team is designing a bridge and is told it must cost no more than a set budget and must be completed within one year. In the language of the engineering design process, the budget limit and the time limit are examples of:

A. Constraints, the limitations and restrictions within which an acceptable design solution must be developed

B. Criteria, the desirable goals and qualities that the design should achieve in order to be considered a success

C. Prototypes, the early working models that engineers build in order to test how well a proposed design actually performs

D. Variables, the factors in a controlled scientific experiment that are deliberately changed in order to observe their effects

50. Before a scientific finding about climate is widely accepted, other scientists repeat the measurements and review the work. Why is this process of independent checking important?

A. It is unimportant, because the very first scientist to report a result is always guaranteed to be completely correct

B. It allows scientists to freely change the results to whatever conclusion they personally prefer before publishing the work

C. It only slows down science for no good reason, since no scientific claim ever needs to be tested more than a single time

D. It helps catch errors and confirm results, so that conclusions are supported by repeated, independently checked evidence

ANSWERS KEY WITH EXPLANATIONS

1. B — The rock cycle is driven by two energy sources: the Sun powers surface processes such as weathering and erosion, while Earth's internal heat drives melting, metamorphism, and plate motion at depth. These two engines together move material through every stage of the cycle.
2. C — Crystal size in igneous rock reflects cooling rate, so large crystals indicate slow cooling deep underground while tiny crystals indicate rapid cooling at or near the surface. Identical magmas can thus form different-looking rocks depending solely on how quickly they cooled.
3. A — Breaking rock into smaller pieces increases the total surface area exposed to air and water, which speeds up chemical weathering. More exposed surface means more sites for chemical reactions, accelerating the breakdown of the rock.
4. D — A mineral's characteristic crystal shape results from the orderly, repeating internal arrangement of its atoms, so halite consistently forms cubes. This atomic structure, not color or external forces, determines the geometric form a mineral takes.
5. C — When discharge and velocity rise, the water carries more energy, so the river can erode its banks more strongly and transport larger particles. This is why floods move sediment that ordinary flows leave in place.
6. B — Glacial till is deposited directly by melting ice, which drops all particle sizes together without sorting, producing a jumbled mix of boulders, sand, and clay. The absence of sorting distinguishes glacial deposits from water- or wind-laid sediments.
7. D — Because S-waves cannot pass through liquid while P-waves can but slow and bend, the failure of S-waves to cross a region shows that Earth's outer core is liquid. Seismic wave behavior is the key evidence for the liquid state of the outer core.
8. A — Symmetrical magnetic stripes on both sides of a mid-ocean ridge record reversals of Earth's magnetic field in new crust that forms and spreads outward, providing direct evidence of seafloor spreading. The matching pattern shows crust is created at the ridge and moves away.
9. C — Contact metamorphism alters rock through the intense heat of a nearby igneous intrusion, even without directed pressure. Recognizing heat alone as the agent distinguishes contact metamorphism from the heat-and-pressure regional type.
10. B — A rock that holds much water but transmits it slowly has high porosity but low permeability, meaning ample but poorly connected pore space. This combination explains why some water-rich materials, like clay, still drain very slowly.
11. D — Arid regions typically develop steep, angular slopes and sharp features because limited water and sparse vegetation allow rugged forms to persist, while humid regions weather into rounded, gentler slopes. Climate strongly shapes the overall character of a landscape.

12. A — Soil development is controlled by parent material, climate, organisms, slope, and time acting together over long periods. These interacting factors determine a soil's depth, texture, and fertility at any given location.
13. C — One astronomical unit is the average distance from Earth to the Sun, a convenient yardstick for measuring distances within the solar system. Using the AU keeps planetary distances in manageable numbers rather than enormous figures.
14. D — Different constellations appear in different seasons because Earth's revolution around the Sun changes the direction the night side faces out into space over the year. As Earth orbits, the nighttime view shifts to different parts of the sky.
15. B — Kepler's second law of equal areas means a planet moves faster when closer to the Sun and slower when farther away, so its speed varies along the orbit. The stronger pull near the Sun corresponds to the greater orbital speed there.
16. A — The Sun is a fairly average, middle-sized main sequence star, neither the largest and brightest nor the smallest and dimmest. Recognizing the Sun as typical places it in context among the vast range of stars.
17. C — The observable universe contains billions of galaxies, each holding billions of stars, separated by vast distances. Grasping this immense scale is fundamental to understanding our place within the cosmos.
18. B — Mercury's extreme temperature swings result from its almost complete lack of atmosphere, which leaves nothing to trap heat or moderate temperatures, so the surface heats and cools drastically. An atmosphere is what buffers temperature, and Mercury has essentially none.
19. A — As a comet nears the Sun, solar heat vaporizes its ices, releasing gas and dust that form a glowing coma and a long tail. This sublimation of ices is what gives an approaching comet its characteristic appearance.
20. B — The two strongest pieces of evidence for the Big Bang are the expansion of the universe shown by galactic redshifts and the cosmic microwave background radiation. Together they point to a universe that began hot and dense and has expanded ever since.
21. C — A new star begins when gravity causes a region of a gas-and-dust cloud to contract and heat until it is dense and hot enough for nuclear fusion to ignite. Gravitational collapse, not collision or external burning, triggers star formation.
22. D — Gravitational attraction weakens as distance increases, dropping off rapidly with greater separation between two objects. This inverse relationship with distance governs how strongly any two masses pull on each other.
23. A — Star color tracks surface temperature from coolest to hottest as red, orange, yellow, white, and finally blue. This color sequence lets astronomers estimate a star's temperature directly from its observed color.
24. B — Major human-related methane sources include livestock digestion, rice paddies, and landfills, all of which release methane as organic matter breaks down. Targeting these sources is important because methane is a potent greenhouse gas.
25. D — Drip irrigation conserves water by delivering small amounts slowly and directly to the base of each plant, minimizing evaporation and runoff. This targeted delivery makes it far more water-efficient than flooding or spraying.
26. C — Coal, oil, natural gas, and uranium are all nonrenewable, existing in fixed amounts and forming far more slowly than they are consumed. Their slow formation relative to use is what places them in the nonrenewable category.

27. A — Removing a predator can let its prey population grow rapidly and overgraze or deplete resources that other species also depend on, destabilizing the ecosystem. This shows how the loss of one species can ripple through an entire community.
28. D — Terracing slows the downhill flow of water and reduces erosion by turning a steep slope into level, soil- and water-holding steps. Holding soil and moisture in place keeps the hillside productive and protects it from washing away.
29. B — Photochemical smog forms when sunlight reacts with pollutants such as those in vehicle exhaust, creating a brownish, health-harming haze. Identifying its sunlight-plus-exhaust origin distinguishes it from acid rain or ozone depletion.
30. C — Recycling metals conserves natural resources and uses far less energy than extracting and refining new metal from ore. These energy and resource savings are the main reasons metal recycling is environmentally beneficial.
31. A — Replacing coal-burning power plants with solar, wind, and other non-combustion sources most directly cuts carbon dioxide emissions by eliminating the burning of fossil fuels for that electricity. Removing the combustion step removes the carbon dioxide it would have produced.
32. D — Topsoil supports the crops that feed people, and because it forms so slowly, soil lost to erosion cannot be quickly replaced. This slow renewal is why protecting topsoil is essential for long-term food security.
33. C — The principle of superposition states that in undisturbed layers the oldest is at the bottom and each higher layer is younger, since lower layers were deposited first. This ordering is the foundation for reading the relative ages of sedimentary rocks.
34. B — When minerals fill the mold left by a dissolved organism and take on its shape, the result is a cast fossil. The cast reproduces the organism's external form even though the original material is gone.
35. A — The three Phanerozoic eras in order from oldest to youngest are the Paleozoic, the Mesozoic, and the Cenozoic. Knowing this sequence is essential for placing major developments in the history of complex life.
36. D — Dating a two-billion-year-old rock requires an isotope with a very long half-life of hundreds of millions or billions of years, so that measurable amounts of both parent and daughter remain. Short-lived isotopes would have decayed away long ago, making them useless for such ancient rocks.
37. C — Wegener's continental drift was resisted mainly because he could not explain a mechanism strong enough to move continents, a gap later filled by plate tectonics. Lacking a driving force, his well-evidenced idea was not accepted for decades.
38. A — That most species ever to live are now extinct shows extinction is a normal, ongoing part of life's history, with species continually arising and dying out. Extinction is the rule over geologic time, not a rare exception.
39. B — The early Earth was extremely hot, with widespread volcanism and frequent impacts, and lacked today's oxygen-rich atmosphere. This violent, oxygen-poor beginning contrasts sharply with the planet's present conditions.
40. D — The same index fossil in layers on two separated continents indicates the layers formed during the same geologic time and can be correlated despite the distance. Index fossils are valuable precisely because they mark a narrow time interval across wide areas.
41. A — Heated surface air expands, becomes less dense than its surroundings, and rises, which is the basis of convection in the atmosphere. This rising of warm, less dense air drives cloud formation and many weather patterns.

42. C — Sleet forms when raindrops fall through a deep layer of below-freezing air and freeze into small ice pellets before reaching the ground. The freezing of already-liquid drops on the way down distinguishes sleet from snow and hail.
43. B — At the same latitude, the mountain city will be cooler because air temperature generally decreases with increasing elevation. This drop in temperature with altitude is why high-elevation places are colder than nearby lowlands.
44. D — A cold ocean current tends to cool the nearby coast and can reduce rainfall, since the cold water cools the air passing over it. Ocean currents thus strongly influence the temperature and moisture of the coasts they bathe.
45. A — An occluded front forms when a faster cold front overtakes a slower warm front, lifting the warm air completely off the ground. Recognizing this overtaking process explains the complex weather found along occluded fronts.
46. C — The calm center of a hurricane is the eye, a region of sinking air where skies are often clear and winds are light, surrounded by the violent eyewall. The contrast between the quiet eye and the destructive eyewall is a defining feature of hurricanes.
47. D — Tree-ring widths record past climate because wider rings generally mark favorable years with ample warmth and moisture, while narrow rings mark harsher years. This makes tree rings a valuable proxy for reconstructing past growing conditions.
48. B — Energy from the Sun drives the entire water cycle, powering evaporation of surface water and the circulation of the atmosphere that moves moisture around the planet. Solar heating is the engine behind evaporation, precipitation, and weather.
49. A — A required budget and a deadline are constraints, the limitations within which an acceptable engineering solution must be developed. Distinguishing constraints from criteria clarifies which factors are firm limits rather than desirable goals.
50. D — Independent repetition and review help catch errors and confirm results, so that accepted conclusions rest on repeated, independently checked evidence. This scrutiny is central to the reliability and self-correcting nature of science.