PRACTICE EXAM 40: EARTH AND SPACE SCIENCES REGENTS SIMULATION (50 QUESTIONS)

1. High-speed bands of wind that flow from west to east high in the atmosphere often steer weather systems across North America. What are these high-altitude, fast-moving air currents called?

A. Trade winds, the steady surface winds that blow from east to west across the tropical regions near the equator

B. Sea breezes, the local winds that blow from the cooler ocean toward the warmer land during the daytime hours

C. Jet streams, the narrow bands of very fast wind high in the atmosphere that flow from west to east and steer storms

D. Doldrums, the belt of calm, nearly windless air found near the equator where rising air produces very little surface wind

2. On a clear, calm evening the air cools steadily after sunset, and at a certain temperature water droplets begin to form on the grass. What is the name for the temperature at which air becomes saturated and water vapor begins to condense?

A. The boiling point, the temperature at which a liquid rapidly changes into a gas throughout the entire body of the liquid

B. The dew point, the temperature at which the air becomes saturated so that water vapor begins to condense into liquid water

C. The freezing point, the temperature at which liquid water changes into solid ice as heat is steadily removed from it

D. The melting point, the temperature at which a solid such as ice changes back into liquid water as it is gradually warmed

3. On a weather map, the lines that connect points of equal air pressure are drawn close together in one region and far apart in another. What does it mean when these pressure lines are spaced very close together?

A. The air pressure is exactly the same everywhere in that region, so there is no wind blowing across the area at all

B. The temperature in that region is extremely high, which is the only thing that the spacing of the lines can indicate

C. A warm front is passing through, since closely spaced pressure lines appear only along the leading edge of warm fronts

D. The pressure changes rapidly over a short distance, which produces a steep pressure gradient and stronger winds there

4. During the day, the land heats up faster than the nearby ocean, and a cool wind blows from the sea toward the land. What is the main reason a sea breeze blows from the ocean toward the land during the day?

A. The land heats faster than the water, so warm air rises over the land and cooler, denser air flows in from over the sea

B. The ocean heats far faster than the land, so the wind must always blow from the cooler land out toward the warmer sea

C. The Moon's gravity pulls the air directly from the ocean toward the land every afternoon regardless of the temperature

D. The land and the sea are always exactly the same temperature, so the breeze direction is purely random from day to day

5. A weather report states that the relative humidity is 100 percent. What does a relative humidity of 100 percent indicate about the air?

A. The air contains absolutely no water vapor at all, which is why the relative humidity has reached its highest possible value

B. The air is exactly half full of the water vapor it could hold, since 100 percent always refers to the halfway saturation point

C. The air is fully saturated, holding all the water vapor it can at that temperature, so condensation or precipitation is likely

D. The air temperature has reached exactly 100 degrees, since relative humidity is simply another way of stating the temperature

6. Certain gases in the atmosphere allow incoming sunlight to pass through but then trap some of the heat that the Earth radiates back toward space. What is this natural warming process called?

A. The ozone effect, in which a layer of gas high in the atmosphere blocks all incoming sunlight from reaching the ground

B. The albedo effect, in which bright surfaces such as snow and ice reflect incoming sunlight back into space without warming

C. The convection effect, in which warm air physically rises and carries heat upward away from the surface of the planet

D. The greenhouse effect, in which gases let sunlight in but trap outgoing heat, warming the lower atmosphere and surface

7. Thunderstorms form when warm, moist air rises rapidly in a strong updraft. What happens to the rising warm, moist air that leads to the towering clouds of a thunderstorm?

A. The rising air sinks back down immediately without cooling, which prevents any clouds from ever forming in the sky above

B. The rising air cools as it climbs, and its water vapor condenses into the tall cumulonimbus clouds that produce the storm

C. The rising air heats up further as it climbs higher, which causes all of its water vapor to evaporate and disappear entirely

D. The rising air turns directly into solid ice at the ground before it can rise, which is what builds the base of the storm cloud

8. Regions near the equator are generally much warmer than regions near the poles throughout the year. What is the main reason the equator receives more solar heating than the poles?

A. Near the equator sunlight strikes the surface at a high, direct angle, concentrating the energy over a smaller area

B. Near the equator the Earth is far closer to the Sun than it is at the poles, which is why the tropics receive more heat

C. The Sun only ever shines on the equator and never reaches the polar regions at any time during the entire year

D. The poles are heated entirely by moonlight rather than sunlight, which provides far less warmth than direct sunlight does

9. A meteorologist describes the day-to-day state of the atmosphere as "weather" and the long-term average conditions of a region as "climate." Which statement correctly distinguishes weather from climate?

A. Weather and climate are exactly the same thing, so the two words can always be used interchangeably without any difference

B. Weather refers to conditions averaged over many decades, while climate refers to the conditions at one single moment in time

C. Weather is the short-term, day-to-day state of the atmosphere, while climate is the long-term average of weather over many years

D. Climate changes from hour to hour, while weather stays exactly the same in a region for centuries without ever changing at all

10. During an El Niño event, unusually warm water spreads across the eastern tropical Pacific Ocean and alters weather patterns far around the globe. What does this large-scale event best illustrate about Earth's systems?

A. That the oceans and the atmosphere are completely separate systems that never influence each other in any meaningful way

B. That changes in the ocean affect only the small area of water directly involved and can never influence the weather elsewhere

C. That the atmosphere controls the ocean entirely, while conditions in the ocean have no effect at all on the atmosphere above

D. That the ocean and atmosphere are linked, so a change in ocean temperatures can influence weather patterns across the world

11. An igneous rock at Earth's surface is broken down by weathering into small particles, which are then carried away, deposited, and cemented together. What type of rock forms as a result of this process?

A. A metamorphic rock, formed when the original rock is buried deep and changed by intense heat and pressure underground

B. A sedimentary rock, formed when weathered particles are eroded, deposited in layers, and then compacted and cemented together

C. A new igneous rock, formed only when the original rock is melted completely into magma and then cooled and solidified again

D. No rock at all, because once an igneous rock is weathered into particles it can never become part of any rock again

12. Mica is a mineral that splits easily into thin, flat, parallel sheets along smooth, even surfaces. This tendency of a mineral to break along smooth, flat planes is called:

A. Cleavage, the tendency of a mineral to break along one or more smooth, flat planes determined by its internal structure

B. Streak, the color of the powder a mineral leaves behind when it is rubbed firmly across an unglazed porcelain tile

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

D. Hardness, the measure of how strongly a mineral resists being scratched, ranked on a scale from talc up to diamond

13. Seismologists use the difference in arrival times between fast-moving P-waves and slower S-waves recorded at a station to determine one important quantity. What does the time gap between the P-wave and S-wave arrivals reveal?

A. The exact magnitude of the earthquake, which can be found from the time gap alone without any other measurements at all

B. The precise compass direction from the station to the earthquake, pointing straight toward where the epicenter is located

C. The total number of aftershocks that the earthquake will produce in the days and weeks following the initial main shock

D. The distance from the recording station to the earthquake's epicenter, since the wave gap grows larger with greater distance

14. Geologists explain that the slow movement of Earth's tectonic plates is driven by the circulation of heat in the mantle below. What process in the mantle is thought to drive the motion of the plates?

A. The freezing of the entire mantle into solid rock, which cracks the surface and shoves the plates apart from below

B. The pull of the Moon's gravity on the solid mantle, which drags the plates across the surface a little more each day

C. Convection currents, in which hot mantle material rises, cools, and sinks, slowly dragging the plates along above it

D. The spinning of the Earth's iron core, which throws the plates outward toward the equator by centrifugal force alone

15. As a massive glacier flows slowly downhill, it scrapes and carves the underlying bedrock, often leaving behind a wide valley with a distinctive cross-sectional shape. What shape of valley does glacial erosion typically produce?

A. A narrow, V-shaped valley with steep sides meeting at a sharp point, identical to the valleys carved by fast mountain rivers

B. A broad, U-shaped valley with a wide, flat floor and steep sides, carved as the thick ice grinds away the rock beneath it

C. A perfectly circular crater with raised rims, formed where the heavy weight of the glacier punched a round hole into the rock

D. A series of tiny ripple marks only a few centimeters across, which are the only features that flowing glacial ice can produce

16. When rain falls on bare, compacted soil, much of it flows across the surface rather than soaking in. What is the name for the water that flows over the land surface instead of soaking into the ground?

A. Runoff, the precipitation that flows across the land surface into streams and rivers rather than soaking into the ground

B. Infiltration, the process by which water soaks downward through the soil and into the spaces within the rock below it

C. Transpiration, the release of water vapor into the air from the leaves of plants as part of the natural water cycle

D. Condensation, the process by which water vapor in the cooling air changes back into tiny droplets of liquid water

17. Running along the floor of the Atlantic Ocean is a long undersea mountain chain where new ocean crust is continually being created as plates pull apart. What is this feature called?

A. A deep-sea trench, the deepest part of the ocean floor, formed where one plate bends and sinks beneath another plate

B. An abyssal plain, the wide, nearly flat region of the deep ocean floor covered by thick layers of fine, soft sediment

C. A continental shelf, the gently sloping, shallow underwater edge of a continent that extends out from the coastline

D. A mid-ocean ridge, the long undersea mountain chain where plates pull apart and new ocean crust is continually formed

18. A student is told that quartz is a mineral but that granite is a rock. What is the key difference between a mineral and a rock?

A. A mineral is always much larger than a rock, since rocks are simply very tiny pieces that have broken off from minerals

B. A rock is a single pure chemical substance, while a mineral is always a loose mixture of many different solid materials

C. A mineral is a naturally occurring solid with a definite chemical makeup, while a rock is usually a mixture of minerals

D. There is no real difference between a mineral and a rock, so the two terms can be used interchangeably in every situation

19. Soil scientists note that the type of soil that forms in a region depends heavily on the local climate and the kind of rock beneath it. The rock from which a soil's mineral particles are derived is known as the:

A. Parent material, the underlying rock or deposit from which the mineral particles of the soil are originally derived

B. Humus layer, the dark, uppermost portion of the soil that is made almost entirely of decayed plant and animal matter

C. Water table, the underground level below which all of the spaces in the soil and rock are completely filled with water

D. Topsoil crust, a hard surface layer that forms on top of the soil and prevents any new soil from ever forming below it

20. In a desert, the wind picks up loose sand and piles it into mounds that slowly migrate across the landscape over time. What are these wind-deposited mounds of sand called?

A. Moraines, the long ridges of mixed rock and soil that are bulldozed up and left behind by the slow movement of glaciers

B. Sand dunes, the mounds or ridges of wind-deposited sand that build up and migrate across the land as the wind blows

C. Deltas, the fan-shaped deposits of sediment that build up where a river slows down and empties into a lake or the ocean

D. Sinkholes, the surface depressions that form when the roof of an underground cavern collapses into the empty space below

21. Geologists use certain fossils of organisms that were widespread but existed only for a short period of geologic time to match up rock layers in different locations. What are such fossils called?

A. Trace fossils, which are preserved records of an organism's activity, such as footprints, burrows, or feeding marks

B. Living fossils, which are present-day organisms that closely resemble species known only from very ancient rock layers

C. Petrified fossils, in which the original material of an organism has been slowly replaced, particle by particle, with minerals

D. Index fossils, which come from organisms that were widespread but short-lived, making them useful for correlating rock layers

22. In a rock sequence, a geologist finds a surface where older rock was eroded away before younger rock was deposited on top, leaving a gap in the geologic record. This buried surface representing missing time is called:

A. A fault, a fracture in the rock along which blocks of rock have slipped and moved past one another over geologic time

B. An intrusion, a body of igneous rock that pushed its way into and hardened within the surrounding pre-existing rock layers

C. An unconformity, a buried surface of erosion or non-deposition that represents a gap of missing time in the rock record

D. A fold, a bend in rock layers produced when the layers are slowly squeezed and deformed by compressional forces

23. Earth's early atmosphere contained almost no free oxygen. Scientists believe the oxygen that later filled the atmosphere was produced mainly by which process?

A. Photosynthesis carried out by early organisms such as cyanobacteria, which released oxygen as a byproduct over time

B. The steady cooling of molten rock at the surface, which slowly released pure oxygen gas trapped within the cooling lava

C. The breakup of water molecules by the Moon's gravity, which split them apart and freed their oxygen into the atmosphere

D. The arrival of oxygen carried in on comets, which delivered nearly all of the planet's oxygen from distant outer space

24. A vertical crack filled with hardened magma cuts straight across several horizontal sedimentary layers. According to the principle of cross-cutting relationships, what can be said about the age of this igneous intrusion?

A. The intrusion is exactly the same age as the oldest layer it cuts across, since cutting and forming happen simultaneously

B. The intrusion is younger than the layers it cuts across, because the layers had to already exist before the magma could cut through them

C. The intrusion is the oldest feature present, since any igneous rock is always older than any sedimentary rock around it

D. The age of the intrusion cannot be compared to the layers at all, since igneous and sedimentary rocks cannot be dated together

25. Near the start of the Paleozoic Era, the fossil record shows a sudden, dramatic increase in the number and variety of complex animals with hard parts. This rapid diversification of life is often called the:

A. Great Dying, the largest mass extinction in Earth's history, during which the majority of marine species were wiped out

B. Ice Age, a long period during which thick sheets of ice advanced and covered large portions of the continents repeatedly

C. Cambrian explosion, the relatively rapid appearance and diversification of many complex animal groups early in the Paleozoic

D. Industrial Revolution, the period of rapid technological change during which humans began burning large amounts of fossil fuels

26. To determine the age of extremely old rocks that are billions of years old, geologists choose a radioactive isotope with a very long half-life rather than a short one. Why is a long half-life better suited for dating very old rocks?

A. A short half-life isotope produces no measurable decay at all, so it cannot be used to date rocks of any age whatsoever

B. A long half-life isotope decays so fast that it is gone within only a few years, which is ideal for dating ancient rocks

C. The half-life of an isotope has no connection to the age of the rock, so any isotope works equally well for any rock age

D. With a long half-life, enough of the original isotope still remains in a billions-of-years-old rock to be measured accurately

27. About 300 million years ago, nearly all of Earth's landmasses were joined together into a single giant supercontinent that later broke apart into today's continents. What is the name of this ancient supercontinent?

A. Pangaea, the single giant supercontinent that contained nearly all of Earth's land before breaking into today's continents

B. Antarctica, the present-day continent that is centered on the South Pole and is almost entirely covered by thick ice sheets

C. Gondwana, a name geologists use only for the northern landmasses and never for any southern continents at all

D. Eurasia, the present-day combined landmass of Europe and Asia, which has always existed in its current fixed position

28. A geologist finds sedimentary rock layers that are now steeply tilted at a sharp angle. Based on the principle of original horizontality, what can the geologist conclude about these layers?

A. The layers were originally deposited at this same steep angle, since sediment naturally piles up on sharply sloping surfaces

B. The layers were originally deposited in horizontal sheets and were later tilted by forces acting on them after deposition

C. The layers could never have been horizontal at any time, since tilted layers prove that the rock was never flat to begin with

D. The tilt reveals nothing about the layers' history, since the angle of rock layers is completely random and carries no meaning

29. The Northern Hemisphere experiences summer when it is tilted toward the Sun and winter when it is tilted away. What is the primary cause of Earth's seasons?

A. The changing distance between the Earth and the Sun, which brings the planet much closer in summer and farther in winter

B. The Sun growing hotter during the summer months and then cooling down significantly throughout the winter months each year

C. The Moon blocking part of the Sun's heat during winter and then moving aside to let more heat through during the summer

D. The tilt of Earth's axis, which changes the angle and duration of sunlight a hemisphere receives as Earth orbits the Sun

30. A planet that orbits far from the Sun takes much longer to complete one orbit than a planet that orbits close to the Sun. What is the relationship between a planet's distance from the Sun and the length of its year?

A. Planets that are farther from the Sun complete their orbits much faster, giving the outer planets the shortest years of all

B. All planets take exactly the same amount of time to orbit the Sun once, regardless of how far they are from the Sun

C. Planets that are farther from the Sun travel longer paths at slower speeds, so they take much longer to complete one orbit

D. A planet's distance from the Sun has no effect on the length of its year, which depends only on the size of the planet itself

31. Our Sun is an average-sized star currently in the stable, hydrogen-burning stage of its life. Once the Sun exhausts the hydrogen fuel in its core, what is its expected next stage?

A. It will immediately explode in a violent supernova, since every star of every size ends its life in such an explosion

B. It will expand into a much larger, cooler red giant as changes in its core cause its outer layers to swell outward

C. It will collapse directly into a black hole, since the gravity of an average star like the Sun is always strong enough for that

D. It will remain exactly the same forever, since average stars like the Sun never change or run out of fuel at any point

32. Astronomers learn about the temperature and composition of distant stars without ever traveling to them. What is the main source of information that allows astronomers to study distant stars?

A. The light and other electromagnetic radiation the stars emit, which can be analyzed to reveal temperature and composition

B. Direct physical samples of star material collected by spacecraft that routinely fly to distant stars and return to Earth

C. The sound waves that travel from the stars through the vacuum of space and are recorded by microphones here on Earth

D. The gravitational pull of each star tugging directly on instruments in laboratories on the surface of the Earth each night

33. A small rocky object from space enters Earth's atmosphere, burns brightly as a streak of light, and a surviving piece lands on the ground. What is the correct term for the piece of rock after it has landed on Earth's surface?

A. A meteoroid, which is the correct term for the object only while it is still drifting through space before entering the atmosphere

B. A comet, a large icy body that develops a glowing tail as it approaches the Sun and never actually reaches the ground

C. A meteor, which is the correct term for the bright streak of light produced as the object burns up high in the atmosphere

D. A meteorite, which is the correct term for the surviving piece of rock once it has reached and landed on Earth's surface

34. Charged particles streaming outward from the Sun sometimes interact with gases in Earth's upper atmosphere near the poles, producing glowing curtains of colored light. What is this glowing light display called?

A. A rainbow, which forms when sunlight is bent and separated into its different colors by countless tiny raindrops in the air

B. A solar eclipse, which occurs when the Moon passes directly between the Earth and the Sun and blocks the Sun from view

C. An aurora, the glowing display of light produced when charged particles from the Sun strike gases in the upper atmosphere

D. A meteor shower, the many bright streaks of light seen when Earth passes through a trail of dusty debris left by a comet

35. Many powerful telescopes, such as space-based observatories, are launched into orbit above Earth's atmosphere. What is one major advantage of placing a telescope in space rather than on the ground?

A. Above the atmosphere a telescope avoids the blurring and absorption of light caused by Earth's air, giving much clearer views

B. A telescope in space is much closer to the distant stars and galaxies, which makes those objects appear far larger and nearer

C. A telescope in space no longer needs any power source at all, since there is no air to slow down its moving parts in orbit

D. A telescope in space can collect sound from the stars, which is impossible to do from the surface of the Earth below it

36. Between the orbits of Mars and Jupiter lies a region containing many thousands of rocky objects orbiting the Sun. What is this region called?

A. The Oort cloud, a distant spherical shell of icy objects thought to surround the solar system at its very outer edge

B. The asteroid belt, the region between the orbits of Mars and Jupiter that contains many thousands of rocky objects

C. The Kuiper belt, a ring of icy bodies that lies far beyond the orbit of Neptune at the cold outer reaches of the solar system

D. The corona, the outermost layer of the Sun's atmosphere, which glows faintly and extends millions of kilometers into space

37. An astronaut weighs less standing on the Moon than standing on Earth, even though the astronaut's body has not changed. Why does the astronaut weigh less on the Moon?

A. The astronaut's mass becomes much smaller on the Moon, since traveling through space permanently reduces the amount of matter

B. There is no gravity at all on the Moon, so the astronaut is completely weightless and simply floats freely above the surface

C. The Moon has less mass than Earth, so its gravitational pull is weaker, and weaker gravity means the astronaut weighs less

D. The Moon actually pushes objects away from its surface, which reduces the astronaut's weight to a fraction of its Earth value

38. Our solar system, including the Sun and all of its planets, is located within one particular galaxy. What is the name of the galaxy that contains our solar system?

A. The Andromeda Galaxy, the large spiral galaxy that is the nearest major galaxy to our own and lies far beyond it

B. The Whirlpool Galaxy, a well-known spiral galaxy that astronomers often photograph but which does not contain our Sun

C. The Sombrero Galaxy, a galaxy named for its distinctive shape, which lies far outside the region of our own solar system

D. The Milky Way, the spiral galaxy that contains our Sun, its planets, and hundreds of billions of other stars

39. Astronomers measure the vast distances within our solar system in astronomical units and the far greater distances between stars in light-years. Why do astronomers use light-years rather than astronomical units to measure distances between stars?

A. The distances between stars are so enormous that light-years express them in manageable numbers, while AU would be unwieldy

B. Light-years measure time rather than distance, so they are used only to describe how old the various distant stars actually are

C. Astronomical units are far larger than light-years, so light-years are reserved only for the very smallest distances in space

D. There is no real difference between the two units, so astronomers simply choose between them at random for each measurement

40. Coal, oil, and natural gas are classified as nonrenewable resources. Why are fossil fuels considered nonrenewable on a human timescale?

A. Fossil fuels are constantly being created in vast amounts every single day, far faster than humans could ever use them up

B. Fossil fuels form from buried organic material over millions of years, so they cannot be replaced as quickly as they are used

C. Fossil fuels are made instantly in factories whenever they are needed, but factories choose to produce only small amounts

D. Fossil fuels never run out no matter how much is burned, which is exactly why they are classified as nonrenewable resources

41. Burning fossil fuels releases sulfur and nitrogen compounds into the air, where they combine with water to form acids that fall back to the surface. What environmental problem does this process cause?

A. The depletion of the ozone layer, which allows far more of the Sun's ultraviolet radiation to reach the planet's surface

B. The formation of the seasonal hole in the ozone layer that appears over the continent of Antarctica each spring season

C. An increase in the total amount of oxygen in the atmosphere, which makes the air far cleaner and healthier to breathe

D. Acid rain, which damages forests, harms aquatic life in lakes and streams, and erodes buildings and stone monuments

42. In some agricultural regions, water is pumped out of underground aquifers far faster than rainfall can refill them. What is the most likely long-term consequence of this practice?

A. The aquifer will refill itself instantly each night, so there is no real limit to how much water can be pumped from it

B. The pumping will permanently increase the total amount of rainfall the region receives, ending any concern about water supply

C. The water table will drop and the aquifer may eventually be depleted, threatening the region's long-term water supply

D. The removed water will have no effect at all on the aquifer, since underground water supplies are effectively unlimited

43. A fishing community decides to limit how many fish can be caught each season so that enough fish remain to reproduce and replenish the population. This practice is an example of:

A. Resource depletion, the complete and permanent using up of a natural resource until none of it remains for future use

B. Sustainable management, using a renewable resource at a rate that allows it to replenish so it remains available in the future

C. Pollution control, the reduction of harmful substances released into the air, water, or soil by human industrial activities

D. Habitat destruction, the removal or degradation of the natural environment that the organisms of an area depend on to survive

44. When a natural landscape is paved over with roads, parking lots, and buildings, rainwater can no longer soak into the ground as easily. What is one common result of covering the land with these hard, impervious surfaces?

A. Increased surface runoff and a greater risk of flooding, since rainwater flows quickly across the pavement instead of soaking in

B. A large increase in the amount of water soaking into the ground, since pavement absorbs rain far better than natural soil does

C. The complete elimination of all rainfall in the area, since paved surfaces prevent rain clouds from forming over the city

D. A permanent drop in local temperatures, since paved surfaces always stay much cooler than the surrounding natural ground

45. A community is considering building a wind farm to generate electricity. Which of the following is a genuine advantage of wind energy compared with burning coal?

A. Wind energy releases large amounts of carbon dioxide and other pollutants, making the local air much dirtier than before

B. Wind energy can be generated at exactly the same steady rate at every hour of every day regardless of the weather conditions

C. Wind energy produces electricity without burning fuel or releasing carbon dioxide, so it does not add greenhouse gases to the air

D. Wind energy uses up a limited underground fuel supply that will run out within only a few short years of operating the turbines

46. When large areas of tropical rainforest are cleared and the trees are removed, several harmful effects often follow. Which of the following is a likely consequence of widespread deforestation?

A. A large increase in the number of plant and animal species living in the area, since clearing the forest creates new habitats

B. A permanent increase in the amount of carbon dioxide that is removed from the atmosphere, which helps to cool the planet

C. A complete stop to all soil erosion in the region, since removing the trees firmly anchors the soil more strongly in place

D. Increased soil erosion and loss of habitat, along with more carbon dioxide remaining in the air as fewer trees absorb it

47. Recycling aluminum cans uses only a small fraction of the energy needed to produce new aluminum from raw ore. Based on this, what is one clear benefit of recycling aluminum?

A. Recycling aluminum uses far more energy and raw ore than making new aluminum, which wastes resources on a large scale

B. Recycling aluminum conserves energy and raw materials, since making cans from recycled metal requires much less of both

C. Recycling aluminum has no effect on energy use at all, since the two methods of producing aluminum require identical energy

D. Recycling aluminum permanently destroys the metal so it can never be used again, which steadily reduces the total supply

48. Scientists around the world continuously measure atmospheric carbon dioxide levels, global temperatures, and sea levels over many years. Why is this long-term monitoring of environmental data important?

A. It allows scientists to detect trends and changes over time, helping them understand and respond to environmental problems

B. It serves no real scientific purpose, since a single measurement taken on one day reveals everything there is to know

C. It is useful only for predicting tomorrow's weather and has no value for understanding any long-term changes in the climate

D. It permanently prevents any further environmental change from occurring simply by the act of recording the measurements

49. An engineering team builds a prototype of a new water filter, tests it, and finds that it clogs too quickly. According to the engineering design process, what should the team do next?

A. Abandon the entire project permanently, since any prototype that fails its first test can never be successfully improved at all

B. Sell the clogging filter to customers without any changes, since the first prototype is always the best possible final design

C. Analyze why it clogged and use that information to redesign and improve the prototype, then test the improved version again

D. Ignore the test results entirely and build an identical copy of the same filter, expecting it to perform differently next time

50. Scientists build computer models of Earth's climate to predict how rising greenhouse gas levels may affect future temperatures. What is the main value of using such models?

A. The models allow scientists to permanently stop the climate from changing simply by running the simulations on a computer

B. The models let scientists explore how the climate may respond to different conditions, helping to inform decisions and planning

C. The models are valuable only as colorful images and provide no actual information about how the real climate might behave

D. The models prove with absolute, perfect certainty exactly what the weather will be on every single day far into the future

Practice Exam 40: Answer Key with Explanations

1. C — Jet streams are narrow bands of very fast wind high in the atmosphere that flow generally from west to east. Because weather systems are carried along by these high-altitude currents, the position of the jet stream strongly influences the path storms take across North America.
2. B — The dew point is the temperature at which air becomes saturated and water vapor begins to condense into liquid. When the surface cools to the dew point on a calm evening, condensation forms as dew, making it a useful indicator of humidity and fog potential.
3. D — Closely spaced isobars indicate that pressure changes rapidly over a short distance, which is a steep pressure gradient. A steeper gradient drives stronger winds, so the spacing of pressure lines on a map directly signals wind strength.
4. A — Land heats faster than water, so air over the land warms, rises, and is replaced by cooler, denser air flowing in from the sea. This temperature difference between land and water is what creates the daytime sea breeze.
5. C — A relative humidity of 100 percent means the air is fully saturated, holding all the water vapor it can at that temperature. At saturation any further cooling forces condensation, so fog, dew, or precipitation becomes likely.
6. D — The greenhouse effect occurs when atmospheric gases allow incoming sunlight through but absorb and re-emit the heat the Earth radiates back. This trapping of outgoing heat warms the lower atmosphere and surface, making the planet habitable.
7. B — As warm, moist air rises in an updraft it cools, and its water vapor condenses to build the towering cumulonimbus clouds of a thunderstorm. This rising and condensing of moist air is the engine that powers the storm.
8. A — Near the equator sunlight strikes the surface at a high, direct angle, concentrating solar energy over a smaller area. At the poles the same sunlight hits at a low angle and spreads over a larger area, so the tropics receive more heating.
9. C — Weather is the short-term, day-to-day state of the atmosphere, while climate is the long-term average of that weather over many years. Distinguishing the two clarifies that a single cold day does not contradict a long-term warming climate.
10. D — El Niño shows that the ocean and atmosphere are linked, so a change in Pacific ocean temperatures can shift weather patterns worldwide. This coupling demonstrates how Earth's systems interact rather than operating in isolation.
11. B — Weathered particles that are eroded, deposited in layers, and then compacted and cemented form a sedimentary rock. This pathway shows how surface processes recycle an igneous rock into a new rock type within the rock cycle.
12. A — Cleavage is the tendency of a mineral to break along smooth, flat planes determined by its internal atomic structure. Mica's splitting into thin parallel sheets is a classic example, distinguishing cleavage from irregular fracture.
13. D — The time gap between fast P-waves and slower S-waves grows larger with distance, so it reveals how far the station is from the epicenter. Combining distance readings from three stations allows seismologists to pinpoint the epicenter's location.
14. C — Convection currents in the mantle—hot material rising, cooling, and sinking—slowly drag the overlying plates along. This circulation driven by Earth's internal heat is the accepted mechanism behind plate motion.

15. B — Glacial erosion carves broad, U-shaped valleys with wide, flat floors and steep sides as the thick ice grinds away the bedrock. This contrasts with the narrow V-shaped valleys cut by rivers, making valley shape a clue to past glaciation.
16. A — Runoff is precipitation that flows across the land surface into streams and rivers instead of soaking in. On compacted or paved ground, reduced infiltration increases runoff, which raises flooding risk and surface erosion.
17. D — A mid-ocean ridge is the long undersea mountain chain where plates pull apart and new ocean crust is continually formed. The Mid-Atlantic Ridge is the prime example, marking a divergent boundary on the seafloor.
18. C — A mineral is a naturally occurring solid with a definite chemical composition, while a rock is usually a mixture of one or more minerals. Granite being made of quartz, feldspar, and mica illustrates how rocks are assemblages of minerals.
19. A — Parent material is the underlying rock or deposit from which a soil's mineral particles are derived. Along with climate, it strongly controls the type of soil that develops, since different rocks weather into different soils.
20. B — Sand dunes are mounds or ridges of wind-deposited sand that build up and slowly migrate as the wind blows. They are a classic feature of wind deposition in deserts and along sandy coastlines.
21. D — Index fossils come from organisms that were geographically widespread but existed only briefly in geologic time. These traits make them ideal for correlating and matching rock layers of the same age in different locations.
22. C — An unconformity is a buried surface of erosion or non-deposition that represents a gap of missing time in the rock record. Recognizing it tells geologists that part of the geologic history at that site is absent.
23. A — Most of Earth's atmospheric oxygen was produced by photosynthesis in early organisms such as cyanobacteria, which released oxygen as a byproduct. This gradual oxygenation transformed the atmosphere and made complex aerobic life possible.
24. B — By the principle of cross-cutting relationships, a feature that cuts across rock layers must be younger than the layers it cuts. The magma-filled crack could only form after the sedimentary layers already existed, so the intrusion is younger.
25. C — The Cambrian explosion was the relatively rapid appearance and diversification of many complex animal groups early in the Paleozoic. The sudden rise of animals with hard parts greatly enriched the fossil record at that time.
26. D — A long half-life means enough of the original isotope still remains in a billions-of-years-old rock to be measured accurately. A short half-life isotope would have decayed almost completely, leaving too little to date such ancient rocks.
27. A — Pangaea was the single giant supercontinent that joined nearly all of Earth's landmasses about 300 million years ago before breaking apart. Its later fragmentation produced the arrangement of continents seen today.
28. B — By the principle of original horizontality, sediments are deposited in nearly horizontal layers, so tilted layers must have been moved after deposition. The steep tilt therefore records later deformation by tectonic forces.
29. D — Earth's seasons are caused by the tilt of its axis, which changes the angle and duration of sunlight a hemisphere receives as Earth orbits the Sun. The hemisphere tilted toward the Sun gets more direct, longer-lasting sunlight and warmer weather.

30. C — Planets farther from the Sun travel longer orbital paths at slower speeds, so they take much longer to complete one orbit. This is why distant planets like Neptune have years lasting many Earth years.
31. B — After exhausting its core hydrogen, an average star like the Sun expands into a larger, cooler red giant as its outer layers swell. This red giant stage is the expected next phase before the Sun eventually sheds its layers and becomes a white dwarf.
32. A — Astronomers study distant stars by analyzing the light and other electromagnetic radiation those stars emit. The spectrum of that light reveals a star's temperature and chemical composition without any need to travel there.
33. D — A meteorite is the term for the surviving piece of rock once it has reached and landed on Earth's surface. The object is a meteoroid in space and a meteor as the glowing streak, so the landed fragment is specifically a meteorite.
34. C — An aurora is the glowing light display produced when charged particles from the Sun strike gases in Earth's upper atmosphere near the poles. The colors come from the energized atmospheric gases, demonstrating the Sun-Earth connection.
35. A — Placing a telescope above the atmosphere avoids the blurring and absorption of light caused by Earth's air, yielding much sharper, clearer images. This is the main reason space observatories outperform ground-based ones for fine detail.
36. B — The asteroid belt is the region between the orbits of Mars and Jupiter containing many thousands of rocky objects. These objects are leftover debris from the early solar system that never formed into a planet.
37. C — The Moon has less mass than Earth, so its gravitational pull is weaker, and weaker gravity means an object weighs less. The astronaut's mass stays the same; only the weight, which depends on local gravity, changes.
38. D — The Milky Way is the spiral galaxy that contains our Sun, its planets, and hundreds of billions of other stars. Recognizing our location within it places the solar system as one small part of a vast galactic system.
39. A — Distances between stars are so enormous that light-years express them in manageable numbers, while astronomical units would produce unwieldy figures. Choosing a larger unit for larger distances keeps the values practical to work with.
40. B — Fossil fuels form from buried organic material over millions of years, far slower than humans consume them, so they cannot be replaced on a human timescale. This mismatch between formation and use defines them as nonrenewable.
41. D — Sulfur and nitrogen compounds from burning fossil fuels combine with water in the air to form acids that fall as acid rain. Acid rain damages forests, harms aquatic life, and erodes buildings and stone monuments.
42. C — Pumping groundwater faster than rainfall can recharge it lowers the water table and may eventually deplete the aquifer. This overdraft threatens the long-term water supply of regions that depend on the aquifer.
43. B — Limiting the catch so enough fish remain to reproduce is sustainable management—using a renewable resource at a rate that allows it to replenish. This approach keeps the fishery productive and available for the future.
44. A — Paving land with impervious surfaces prevents rain from soaking in, so water flows quickly across the surface as runoff. The increased runoff raises the risk of flooding compared with natural ground that absorbs rainfall.

45. C — Wind energy produces electricity without burning fuel or releasing carbon dioxide, so it adds no greenhouse gases during generation. This makes it a cleaner alternative to coal, which emits large amounts of carbon dioxide and pollutants.
46. D — Widespread deforestation increases soil erosion and habitat loss and leaves more carbon dioxide in the air as fewer trees remain to absorb it. These combined effects make large-scale clearing of forests environmentally damaging.
47. B — Recycling aluminum conserves energy and raw materials because making cans from recycled metal uses far less of both than refining new aluminum from ore. This large energy saving is a key environmental benefit of aluminum recycling.
48. A — Long-term monitoring lets scientists detect trends and changes over time, such as rising carbon dioxide, temperatures, and sea levels. Tracking these trends is essential for understanding and responding to environmental problems.
49. C — The engineering design process is iterative, so after a prototype fails the team should analyze the cause, redesign to improve it, and test again. Using test results to refine the design is how engineering reaches a workable solution.
50. B — Climate models let scientists explore how the climate may respond to different conditions, providing projections that inform decisions and planning. Their value lies in testing possible futures, not in claiming perfect day-by-day certainty.