PRACTICE EXAM 38: EARTH AND SPACE SCIENCES REGENTS SIMULATION (50 QUESTIONS)

1. Which list places the four innermost planets of the solar system in correct order, starting from the planet nearest the Sun?

A. Venus, Mercury, Earth, and then Mars, beginning with the planet that is located closest to the Sun

B. Mercury, Venus, Earth, and then Mars, beginning with the planet that is located closest to the Sun

C. Earth, Mars, Mercury, and then Venus, beginning with the planet that is located closest to the Sun

D. Mars, Earth, Venus, and then Mercury, beginning with the planet that is located closest to the Sun

2. During a new moon, an observer on Earth cannot see the Moon at all in the night sky. What is the reason the Moon is not visible during this phase?

A. The Moon passes directly into the deep shadow of the Earth, which completely blocks all sunlight from reaching it

B. The Moon is located on the far side of its orbit, so it is simply too distant from the Earth to be seen at this time

C. The Moon stops reflecting any light during this phase because its entire surface temporarily becomes perfectly black

D. The Moon is between the Earth and the Sun, so its sunlit side faces away from Earth and its dark side faces us

3. Jupiter has a much stronger surface gravity than Earth. What property of Jupiter is most responsible for its stronger gravitational pull?

A. Jupiter's much faster rotation, which spins material outward and increases the planet's overall gravitational attraction

B. Jupiter's greater distance from the Sun, which allows the Sun's gravity to add to Jupiter's own gravity at its surface

C. Jupiter's far greater mass, since the gravitational pull an object produces increases as its total mass increases

D. Jupiter's many moons, whose combined gravity is added to Jupiter's own to produce its very strong surface gravity

4. The Sun appears far brighter to us than any other star, even though many stars are actually much larger and more luminous. Why does the Sun appear so much brighter than these other stars?

A. The Sun is extremely close to Earth compared with all other stars, so its light is far less spread out by the time it reaches us

B. The Sun is by far the largest and most luminous star that exists anywhere in the entire observable universe today

C. The Sun is the only star that produces any visible light at all, while every other star glows only in invisible wavelengths

D. The Sun is made of completely different and far brighter material than any of the other stars found in the galaxy

5. Earth is actually slightly closer to the Sun during the Northern Hemisphere's winter than during its summer. What does this fact demonstrate about the cause of the seasons?

A. It demonstrates that the seasons are caused entirely by the changing distance between the Earth and the Sun each year

B. It demonstrates that distance from the Sun is not the cause of the seasons, which instead result from the tilt of Earth's axis

C. It demonstrates that the Northern and Southern Hemispheres must experience all of their seasons at exactly the same time

D. It demonstrates that the Sun gives off more total energy during the winter than it does during the warmer summer months

6. Each year, Earth passes through the same patch of debris left behind by a comet, and observers see a meteor shower. What produces the streaks of light seen during a meteor shower?

A. Small bits of comet debris burn up brightly from friction as they enter and travel through Earth's atmosphere

B. Distant stars briefly flare up much brighter than usual whenever the Earth passes near the orbit of an old comet

C. Pieces of the Moon break off and fall toward Earth, glowing as they descend through the night sky in long streaks

D. Sunlight reflecting off of orbiting artificial satellites creates the streaks of light that observers see during a shower

7. Where is our solar system located within the Milky Way galaxy?

A. At the exact center of the galaxy, in the dense bright core around which all of the other stars slowly revolve

B. Completely outside the galaxy, drifting alone in the empty space far beyond the galaxy's outermost spiral arms

C. Within one of the galaxy's spiral arms, partway out from the center, far from the crowded central core of the galaxy

D. In a tight cluster at the very edge of the galaxy, where the Sun is the only star for many millions of light-years around

8. During a total solar eclipse, the Moon blocks the bright disk of the Sun, and a faint glowing halo becomes visible around it. This outermost layer of the Sun's atmosphere, visible only during a total eclipse, is called the:

A. Sunspot, a dark, cooler region that appears on the visible surface of the Sun in roughly eleven-year cycles

B. Photosphere, the bright visible surface of the Sun from which nearly all of its light is emitted into space

C. Solar core, the extremely hot and dense central region of the Sun where the energy-producing fusion takes place

D. Corona, the faint, extremely hot outer atmosphere of the Sun that becomes visible only during a total solar eclipse

9. Both the Sun and the Moon exert a gravitational pull on Earth's oceans, yet the Moon is the main cause of the tides. Why does the much smaller Moon have a greater effect on the tides than the enormous Sun?

A. The Moon is far more massive than the Sun, so its much greater mass produces a far stronger pull on Earth's oceans

B. The Moon is far closer to Earth than the Sun, and its nearness gives it a stronger effect on the tides despite its small size

C. The Moon is made of a special magnetic material that pulls strongly on ocean water, while the Sun has no such effect at all

D. The Sun's light pushes the ocean water away during the day, which cancels out nearly all of the Sun's gravitational pull

10. Astronomers study objects in space using not only visible-light telescopes but also radio, infrared, ultraviolet, and X-ray telescopes. Why do astronomers use telescopes that detect these different forms of radiation?

A. Visible light is the only form of radiation that actually exists in space, so the other telescopes detect nothing real at all

B. The different telescopes are used only because some are cheaper to build, and they all reveal exactly the same information

C. Different objects and processes in space give off different forms of radiation, so each type of telescope reveals different information

D. The non-visible telescopes are used only at night, while visible-light telescopes can be used only during the daytime hours

11. The Big Bang theory is the leading scientific explanation for the origin of the universe. What does this theory state?

A. The universe began about 13.8 billion years ago from an extremely hot, dense state and has been expanding ever since

B. The universe has always existed in exactly its present form and size and will remain completely unchanged forever

C. The universe was created instantly in its current state only about six thousand years ago and has not grown at all since

D. The universe is steadily shrinking, with all of the galaxies slowly moving closer together toward a single central point

12. Which sequence correctly describes the basic path of water through the water cycle?

A. Precipitation falls, then immediately freezes into ice, then sinks into the mantle, and finally erupts from volcanoes

B. Water vapor condenses into the ocean, then evaporates into rivers, then freezes into clouds, and finally falls as dust

C. Groundwater rises into space, then cools into stars, then falls back as meteors, and finally lands in the deep oceans

D. Water evaporates from the surface, condenses into clouds, falls as precipitation, and then runs off or soaks into the ground

13. Clouds commonly form when a parcel of air rises in the atmosphere. Why does rising air tend to form clouds?

A. As the air rises, it expands and cools, and if it cools to its dew point the water vapor condenses into cloud droplets

B. As the air rises, it is compressed and heated, which causes the water droplets already in it to evaporate into clear air

C. As the air rises, it gains water from outer space, which immediately freezes into the ice crystals that make up clouds

D. As the air rises, sunlight strikes it more directly and chemically combines the gases in the air into solid cloud particles

14. A region comes under the influence of a low-pressure system, in which air rises. What kind of weather is most commonly associated with rising air in a low-pressure system?

A. Clear, sunny skies and calm, dry conditions, since rising air prevents any clouds or precipitation from ever forming

B. Cloudy skies and an increased chance of precipitation, since rising air cools and its water vapor condenses into clouds

C. A sudden and lasting drop in humidity, since rising air always carries every bit of the moisture away from the region

D. Bitterly cold temperatures and clear skies, since rising air can occur only during the coldest part of the winter season

15. Warm air near the equator rises, moves toward the poles at high altitude, sinks, and returns toward the equator near the surface. This large-scale circular movement of air is an example of:

A. Convection, the transfer of heat by the movement of a fluid such as air, with warm fluid rising and cooler fluid sinking

B. Conduction, the transfer of heat by direct contact between particles without any movement of the material itself at all

C. Radiation, the transfer of heat by electromagnetic waves that travel outward through the empty vacuum of outer space

D. Precipitation, the falling of water from clouds down to the surface as rain, snow, sleet, or hail during a passing storm

16. How do tornadoes and hurricanes differ in size and duration?

A. Tornadoes are much larger and longer-lasting than hurricanes, often covering entire oceans for several weeks at a time

B. Tornadoes and hurricanes are exactly the same size and last for exactly the same amount of time as one another

C. Hurricanes are very small and brief, usually only a few meters wide and lasting only a few seconds before vanishing

D. Tornadoes are small and short-lived, while hurricanes are very large storms that can last for many days over the ocean

17. Ice core records show that over the past several hundred thousand years, atmospheric carbon dioxide levels and global temperatures have risen and fallen together. What does this close relationship suggest?

A. That carbon dioxide and temperature are completely unrelated and that the matching pattern is purely a coincidence

B. That rising temperatures cause carbon dioxide to vanish from the atmosphere, which is why the two move in opposite directions

C. That carbon dioxide levels and global temperature are closely linked, with higher carbon dioxide associated with warmer conditions

D. That the amount of carbon dioxide in the air has remained perfectly constant for hundreds of thousands of years

18. A weather station uses several instruments. Which instrument is correctly paired with the quantity that it measures?

A. A barometer is used to measure the speed of the wind as it blows past the station at any given moment in time

B. An anemometer is used to measure the speed of the wind as it blows past the station at any given moment in time

C. A thermometer is used to measure the total amount of rainfall that has collected at the station over the past day

D. A wind vane is used to measure the air pressure pressing down on the surface of the Earth at the weather station

19. Why does the Coriolis effect, which deflects moving air, have essentially no influence on winds blowing right at the equator?

A. The air at the equator is far too warm for the Coriolis effect to be able to push it in any direction whatsoever

B. The equator experiences no wind whatsoever, so there is simply no moving air for the Coriolis effect to deflect there

C. The Sun shines directly down on the equator, and this direct sunlight completely cancels out the Coriolis effect there

D. The Coriolis deflection weakens toward the equator and drops to zero there because of the geometry of Earth's rotation

20. Climate scientists project that a warming climate will increase the frequency and intensity of certain extreme weather events. Which projection has strong scientific support?

A. More frequent and more intense heat waves and longer, more severe droughts in many regions of the world

B. A complete and permanent end to all hurricanes and tropical storms within the next ten years across every ocean

C. A steady worldwide drop in average temperatures that will soon plunge the entire planet into a new deep ice age

D. The complete disappearance of all rainfall everywhere on Earth, leaving every continent as a single lifeless dry desert

21. The dew point temperature of a parcel of air is best described as:

A. The temperature at which the air becomes so hot that all of the liquid water within it instantly boils away into vapor

B. The highest temperature that the air is able to reach during the warmest part of a clear and sunny afternoon

C. The temperature to which the air must be cooled, at constant pressure, for it to become saturated and begin to condense

D. The temperature at which the air pressure suddenly doubles, forcing the water vapor out of the air as liquid droplets

22. Which type of rock forms when molten rock material cools and solidifies, either beneath the surface or after erupting onto it?

A. Sedimentary rock, which forms from the compaction and cementing together of loose particles of sediment over time

B. Clastic rock, which forms only from the broken fragments of older rocks that have been transported and then deposited

C. Metamorphic rock, which forms when an existing rock is changed by intense heat and pressure deep within the crust

D. Igneous rock, which forms when molten rock material such as magma or lava cools and solidifies into a solid

23. A geologist compares two mineral samples of exactly the same size, but one feels noticeably heavier than the other. The heavier sample has a greater value of which physical property?

A. Hardness, which describes a mineral's resistance to being scratched by another, harder material on the Mohs scale

B. Density, which describes how much mass a mineral has packed into a given volume, so a denser mineral feels heavier

C. Luster, which describes the manner in which the surface of a mineral reflects the light that happens to strike it

D. Streak, which describes the color of the fine powder that a mineral leaves behind when it is rubbed across a tile

24. A world map showing the locations of major earthquakes reveals that they are concentrated in narrow belts rather than spread evenly across the globe. What do these belts of earthquakes most closely correspond to?

A. The boundaries between Earth's tectonic plates, where the plates grind against, pull away from, or collide with one another

B. The exact centers of the continents, far away from any coastlines, where the crust is thickest and most stable

C. The locations of the deepest parts of the oceans only, with no earthquakes ever occurring anywhere on dry land at all

D. A completely random scattering of points with no relationship to any underlying feature of the planet whatsoever

25. Tree roots grow into a crack in a rock, and as the roots thicken over the years, they gradually widen the crack and break the rock apart. This is an example of:

A. Chemical weathering, in which the rock's minerals react with substances in the environment to form entirely new minerals

B. Erosion, in which the broken fragments of the rock are picked up and transported to a new location by water or wind

C. Biological weathering, in which living organisms such as plant roots physically break apart rock as they grow over time

D. Deposition, in which sediment that has been carried by a river or the wind is dropped and accumulates in a new place

26. When a river overflows its banks during a flood, it spreads out across the flat land on either side and deposits a layer of fine sediment there. Over many floods, this builds up the fertile, flat land bordering the river. This land is called the river's:

A. Watershed, the entire area of land that drains all of its rainfall and snowmelt into one particular river system

B. Delta, the fan-shaped deposit of sediment that builds up where a river flows into a calm lake or the open ocean

C. Headwaters, the place high in the mountains or hills where a river first begins its journey toward the distant sea

D. Floodplain, the flat, fertile land bordering a river that is built up by sediment deposited during repeated floods

27. Earth generates a magnetic field that extends far out into space and causes a compass needle to point north. What part of Earth's interior is responsible for generating this magnetic field?

A. The rigid, brittle crust, the thin outermost rocky layer on which all of the continents and the oceans are located

B. The liquid outer core, where the churning, circulating motion of molten iron and nickel generates Earth's magnetic field

C. The solid inner core, which is completely frozen and motionless and therefore produces a steady, unchanging field

D. The thin layer of soil and loose sediment that covers much of the land surface at the very top of the solid crust

28. The most abundant group of minerals in Earth's crust is built around a basic structural unit of silicon and oxygen atoms. This largest and most common group of rock-forming minerals is called the:

A. The carbonates, a group of minerals such as calcite that are built around a unit of carbon and oxygen atoms

B. The native elements, a group consisting of minerals such as gold and copper that occur as a single pure element

C. The silicates, the largest group of rock-forming minerals, built around a basic unit of silicon and oxygen atoms

D. The sulfides, a group of minerals such as pyrite that are built around the combination of a metal with sulfur atoms

29. As a massive glacier slowly flows over the land, rocks frozen into the bottom of the ice scrape across the bedrock beneath it. What feature does this scraping action leave on the bedrock?

A. Long parallel scratches and grooves carved into the bedrock, all aligned in the direction that the glacier was moving

B. Rounded, well-sorted sand dunes built up across the bedrock by the steady wind blowing over the surface of the ice

C. Deep V-shaped canyons cut straight down into the bedrock by the fast, narrow streams that flow beneath the glacier

D. Smooth layers of fine mud gently deposited across the bedrock as the still water of a calm lake slowly evaporates away

30. In the ground beneath the surface, there is an upper region where the pore spaces are filled mostly with air and a lower region where the pore spaces are completely filled with water. The lower region, where all the pore spaces are filled with water, is called the:

A. The zone of aeration, the upper region where the spaces between particles are filled mainly with air rather than water

B. The recharge area, the place at the surface where rainwater first soaks down into the ground to refill the groundwater

C. The capillary fringe, a very thin layer in which water is drawn slightly upward into the otherwise dry soil above it

D. The zone of saturation, the region below the water table where all of the pore spaces are completely filled with water

31. When the sedimentary rock shale is subjected to relatively low heat and pressure, it is transformed into a fine-grained metamorphic rock that splits easily into flat sheets. What is this metamorphic rock?

A. Quartzite, a hard, non-foliated metamorphic rock that forms when quartz-rich sandstone recrystallizes under heat and pressure

B. Slate, a fine-grained, foliated metamorphic rock that forms from shale and splits easily into flat, smooth sheets

C. Limestone, a sedimentary rock that forms from the accumulation of shells and the chemical precipitation of calcite

D. Pumice, a light, glassy, full-of-holes volcanic rock that forms when frothy, gas-rich lava cools very quickly at the surface

32. What is the basic difference between intrusive and extrusive igneous rocks?

A. Intrusive rocks form from sediment, while extrusive rocks form from the heat and pressure applied to older existing rocks

B. Intrusive rocks erupt onto the surface and cool quickly, while extrusive rocks cool slowly far below the ground surface

C. Intrusive rocks form when magma cools slowly underground, while extrusive rocks form when lava cools quickly at the surface

D. Intrusive and extrusive rocks are exactly the same and form in exactly the same way in the very same locations every time

33. Over time, a meandering river bend becomes so curved that the river eventually cuts a new, straighter channel across the neck of the loop, leaving the abandoned bend behind as a separate curved body of water. What is this abandoned bend called?

A. An oxbow lake, a curved, isolated body of water formed when a river cuts a new channel and abandons a former meander

B. A delta, a fan-shaped deposit of sediment that builds up where a river flows into a calm lake or the open ocean

C. A tributary, a smaller stream or river that flows into and joins a larger main river somewhere along its course

D. A waterfall, a place where a river plunges steeply over a sudden drop in elevation along the path of its channel

34. For millions of years, carbon was stored underground in coal, oil, and natural gas. How does burning these fossil fuels affect the natural carbon cycle?

A. It removes carbon dioxide from the atmosphere, which gradually cools the planet by strengthening the natural carbon cycle

B. It has no effect at all on the carbon cycle, since the carbon released by burning the fuels simply vanishes completely

C. It locks even more carbon permanently underground, slowing the natural movement of carbon through the environment

D. It rapidly releases long-stored carbon into the atmosphere as carbon dioxide, adding to the greenhouse effect and warming

35. Despite the environmental drawbacks of fossil fuels, they still supply most of the world's energy. Which of the following is a genuine challenge of switching entirely to renewable energy sources such as solar and wind?

A. Renewable sources release far more carbon dioxide than fossil fuels do, which makes switching over to them pointless

B. Renewable sources are completely impossible to use anywhere on Earth with any technology that currently exists today

C. The output of solar and wind power varies with weather and time of day, requiring storage or backup to ensure a steady supply

D. Renewable sources have already been completely used up worldwide, so there is none of them left to switch over to at all

36. A large oil spill occurs in the ocean near a coastline. Which of the following is a likely direct harmful effect of this oil spill on the marine environment?

A. The oil dissolves completely into the seawater within minutes, instantly making the ocean water far cleaner than before

B. The oil coats the feathers and fur of seabirds and marine mammals, harming their ability to stay warm and to float

C. The oil sinks immediately to the deep ocean floor, where it permanently fertilizes the seabed and boosts all marine life

D. The oil evaporates entirely into the atmosphere within a single hour, leaving absolutely no trace of any pollution behind

37. In a flat farming region with strong, dry winds, farmers plant long rows of trees along the edges of their fields. How do these rows of trees, called windbreaks, help protect the land?

A. The trees attract additional strong winds toward the fields, which helps to dry out the wet soil after each heavy rain

B. The trees completely block all sunlight from reaching the crops, which slows their growth and conserves soil moisture

C. The trees release chemicals that dissolve the bedrock beneath the fields, rapidly creating new fertile soil for the crops

D. The trees slow the wind near the ground, which reduces the wind erosion that would otherwise blow away the topsoil

38. Why do scientists consider the loss of biodiversity to be a serious problem for human society as well as for nature?

A. Many species provide resources such as food, medicines, and materials, and lost species and their potential benefits cannot be recovered

B. Losing species is beneficial to humans, since fewer kinds of organisms always make every ecosystem simpler and healthier overall

C. Biodiversity has no real connection to human society at all, so its loss affects only wild nature and never affects people

D. The loss of species automatically and instantly creates many brand-new species to replace them, so nothing is ever truly lost

39. Sustainable development is often defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs. Which action best reflects this principle of sustainability?

A. Using up a region's entire supply of a nonrenewable resource as quickly as possible to maximize profits in the present

B. Clearing all of a forest at once for short-term timber profits, with no plan to ever replant or restore any of the trees

C. Harvesting a renewable resource at a rate that allows it to replenish itself, so the resource remains available in the future

D. Polluting the air and water freely today, leaving the costs of cleaning it all up entirely to the people of future generations

40. Acid rain, which forms when certain pollutants combine with water in the atmosphere, can seriously harm the environment. Which of the following is a known harmful effect of acid rain?

A. It causes lakes and streams to become far less acidic, which dramatically increases the number of fish living in them

B. It lowers the pH of lakes and soils, which can kill fish and other aquatic life and damage forests over time

C. It adds valuable nutrients to the soil that cause forests to grow far faster and much healthier than they otherwise would

D. It has no measurable effect on the environment at all, since rainwater is naturally acidic and living things are adapted to it

41. Many nations set aside national parks and protected wilderness areas. How does protecting these natural areas most directly help maintain biodiversity?

A. It guarantees that every species inside the protected area will live forever and that none of them can ever go extinct

B. It speeds up the extraction of timber, minerals, and other valuable resources from inside the protected area for human use

C. It removes all of the native plants and animals from the area so that the bare land can slowly recover on its own over time

D. It preserves natural habitats where many species can continue to live, reproduce, and maintain healthy populations

42. Farmers in a region experiencing longer droughts begin planting drought-resistant crop varieties that need less water to grow. This response to a changing climate is best described as:

A. Adaptation, because the farmers are adjusting their practices to cope with climate changes that are already occurring

B. Mitigation, because planting these crops directly removes greenhouse gases from the atmosphere and reverses the warming

C. Geoengineering, because the farmers are deliberately altering the entire global climate system on a planetary scale

D. Pollution, because growing drought-resistant crops releases large amounts of harmful chemicals into the air and water

43. In an outcrop, a layer of sandstone lies on top of a layer of shale, and a vertical igneous dike cuts upward through both the shale and the sandstone. Using the principles of relative dating, which lists these three features from oldest to youngest?

A. The igneous dike first, then the sandstone, and finally the shale, ordered from the oldest feature to the youngest

B. The sandstone first, then the shale, and finally the igneous dike, ordered from the oldest feature to the youngest

C. The shale first, then the sandstone, and finally the igneous dike, ordered from the oldest feature to the youngest

D. The shale and the sandstone formed at the same time, and the dike formed at that same moment along with both of them

44. Fossils of tropical ferns and the remains of ancient coal swamps are found in the rocks of Antarctica, which today is a frozen polar continent. What does this evidence most strongly suggest?

A. That tropical ferns have always grown easily on the frozen surface of Antarctica throughout the entire history of the Earth

B. That Antarctica once had a much warmer climate or was located at a different position on the globe in the distant past

C. That the fossils were carried to Antarctica from the tropics by strong ocean currents only a few hundred years ago

D. That coal and tropical plants can form only in extremely cold polar climates like the one found in Antarctica today

45. Radiometric dating is considered a reliable method for determining the absolute age of very old rocks. Why is the radioactive decay of an isotope a dependable natural clock?

A. Because the rate of radioactive decay speeds up and slows down with temperature, allowing it to track the local climate

B. Because radioactive decay occurs only during daylight hours, so geologists can simply count the number of days that pass

C. Because the decay rate can be easily changed in the laboratory, letting scientists set the clock to any age they wish

D. Because each radioactive isotope decays at a constant, known rate that is not affected by ordinary heat, pressure, or chemistry

46. In terms of the geologic time scale, modern humans are currently living during which era?

A. The Paleozoic Era, the era during which trilobites filled the seas and the first fish and amphibians first appeared

B. The Mesozoic Era, the era during which the dinosaurs were the dominant large animals living on the land and in the seas

C. The Cenozoic Era, the most recent era, often called the Age of Mammals, which continues right up to the present day

D. The Precambrian, the earliest and longest span of time, during which only simple single-celled organisms existed

47. Wegener's idea of continental drift was eventually absorbed into a broader, well-supported modern theory that explains the movement of the continents as part of the motion of large plates. What is this modern theory called?

A. Plate tectonics, the theory that Earth's outer shell is divided into large moving plates whose motion shapes the surface

B. The nebular hypothesis, the theory describing how the Sun and the planets first formed from a spinning cloud of gas and dust

C. The greenhouse effect, the theory describing how certain gases in the atmosphere trap heat and warm the planet's surface

D. Uniformitarianism, the principle stating that the same natural processes seen today have also operated throughout the past

48. Many scientists warn that the current rapid loss of species worldwide may represent the beginning of a new mass extinction. What is unusual about this possible mass extinction compared with the major mass extinctions of the distant past?

A. It is being caused entirely by a single giant asteroid impact, exactly like every mass extinction that has come before it

B. It is happening far more slowly than any previous extinction, unfolding gradually over many hundreds of millions of years

C. It involves only the extinction of microscopic single-celled organisms and has no effect at all on larger plants or animals

D. It is being driven largely by the activities of a single species, human beings, rather than by a natural catastrophe alone

49. In the engineering design process, why do engineers build and test a prototype before producing the final version of a product?

A. Building a prototype guarantees that the final product will be completely free of any flaws and will never fail in use

B. A prototype lets engineers test how a design actually performs and identify problems to fix before full production begins

C. Building a prototype is required only by law and provides no useful information at all to the engineers who design the product

D. A prototype is always exactly the same as the final product, so once it is built no further work or testing is ever needed

50. A long-accepted scientific explanation is challenged when new evidence is discovered that it cannot account for. According to how science works, what is the appropriate response of the scientific community?

A. The new evidence should be ignored and hidden, since a long-accepted explanation must never be questioned or changed at all

B. The scientist who found the new evidence should be removed, so that the original explanation can remain widely accepted forever

C. The explanation should be re-examined and, if necessary, revised or replaced to account for the new evidence

D. All scientific work should stop permanently, since the discovery of conflicting evidence proves that science can never be trusted

Practice Exam 38: Answer Key with Explanations

1. B — The four inner planets in order from the Sun are Mercury, Venus, Earth, and Mars. Knowing this order is fundamental to understanding the structure of the solar system and the contrast between the inner rocky planets and the outer gas giants.
2. D — During a new moon the Moon lies between Earth and the Sun, so its sunlit side faces away from Earth and the side facing us is dark. This geometry, not Earth's shadow, is why the Moon is not visible during the new phase.
3. C — Jupiter's far greater mass is responsible for its stronger surface gravity, because the gravitational pull an object produces increases with its total mass. Mass, not rotation or distance, is the key factor determining gravitational strength.

4. A — The Sun appears brightest only because it is extremely close to Earth compared with all other stars, so its light is far less spread out when it reaches us. Apparent brightness depends heavily on distance, which is why a relatively average star dominates our sky.
5. B — Earth being closer to the Sun during Northern Hemisphere winter shows that distance is not the cause of the seasons, which instead arise from the tilt of Earth's axis. The axial tilt, by changing the angle and duration of sunlight, drives the seasons.
6. A — Meteor showers occur as small bits of comet debris burn up brightly from friction while passing through Earth's atmosphere. The streaks are glowing trails of vaporizing debris, not falling stars or moon fragments.
7. C — The solar system lies within one of the Milky Way's spiral arms, partway out from the center and far from the crowded core. Knowing our off-center location helps place the Sun within the structure of the galaxy.
8. D — The faint halo visible around the Moon during a total solar eclipse is the corona, the Sun's hot outer atmosphere, which is normally hidden by the bright disk. Only when the disk is blocked can this outermost layer be seen.
9. B — The Moon causes most of the tides because it is far closer to Earth than the Sun, and its nearness gives it a stronger tidal effect despite its much smaller mass. Tidal influence depends strongly on distance, favoring the nearby Moon.
10. C — Different objects and processes in space emit different forms of radiation, so each type of telescope reveals information the others miss. Observing across the spectrum gives a far more complete picture than visible light alone.
11. A — The Big Bang theory states that the universe began about 13.8 billion years ago from an extremely hot, dense state and has been expanding ever since. This expanding, evolving origin is supported by galactic redshifts and the cosmic background radiation.
12. D — The water cycle proceeds as water evaporates from the surface, condenses into clouds, falls as precipitation, and then runs off or soaks into the ground. This continuous circulation, powered by the Sun, moves water among the oceans, atmosphere, and land.
13. A — Rising air expands and cools, and if it cools to its dew point the water vapor condenses into cloud droplets. This cooling-to-saturation of ascending air is the basic mechanism of cloud formation.
14. B — Rising air in a low-pressure system cools, and its water vapor condenses, producing cloudy skies and an increased chance of precipitation. This is why low-pressure systems are generally associated with unsettled, stormy weather.
15. A — The equator-to-pole circulation of rising warm air and sinking cooler air is convection, the transfer of heat by the movement of a fluid. This large-scale convection drives the global wind belts and redistributes heat around the planet.
16. D — Tornadoes are small and short-lived, while hurricanes are very large storms that can last for days over the ocean. Recognizing this difference in scale and duration distinguishes the two kinds of severe storms.
17. C — The parallel rise and fall of carbon dioxide and temperature in ice cores shows the two are closely linked, with higher carbon dioxide associated with warmer conditions. This relationship is key evidence connecting greenhouse gases to climate.
18. B — An anemometer measures wind speed, the rate at which air blows past the station. Pairing each instrument with its correct quantity is basic to reading weather-station data accurately.

19. D — The Coriolis deflection weakens toward the equator and drops to zero there because of the geometry of Earth's rotation. This is why winds at the equator are essentially undeflected and storms do not form right on the equator.
20. A — A warming climate is projected with strong support to bring more frequent and intense heat waves and longer, more severe droughts in many regions. These trends follow directly from higher average temperatures.
21. C — The dew point is the temperature to which air must be cooled, at constant pressure, to become saturated and begin to condense. Reaching the dew point is what triggers the formation of dew, fog, and clouds.
22. D — Igneous rock forms when molten rock material such as magma or lava cools and solidifies, whether underground or at the surface. The cooling and solidifying of melt is the defining process for igneous rock.
23. B — The heavier of two equal-sized samples has greater density, meaning more mass packed into the same volume. Density is what makes one mineral feel heavier than another of the same size.
24. A — Earthquakes concentrate in narrow belts that correspond to the boundaries between Earth's tectonic plates, where plates interact. This pattern is strong evidence that plate boundaries are the sites of most earthquake activity.
25. C — Roots prying a rock apart as they grow is biological weathering, in which living organisms physically break rock without changing its chemical makeup. This mechanical action by organisms is a recognized form of weathering.
26. D — Fine sediment deposited across the flat land beside a river during repeated floods builds the floodplain. This flood-built, fertile land bordering a river is what the term floodplain describes.
27. B — Earth's magnetic field is generated by the churning motion of molten iron and nickel in the liquid outer core. This flowing, electrically conductive metal acts like a dynamo to produce the planet's magnetic field.
28. C — The silicates, built around a basic unit of silicon and oxygen, are the largest and most common group of rock-forming minerals in the crust. Their abundance makes them central to understanding most rocks.
29. A — Rocks dragged along the base of a moving glacier carve long parallel scratches and grooves into the bedrock, aligned with the ice flow. These striations are clear evidence of past glacial movement and its direction.
30. D — The region below the water table where all pore spaces are completely filled with water is the zone of saturation. This saturated zone is the source of groundwater pumped from wells.
31. B — Low-grade metamorphism of shale produces slate, a fine-grained, foliated rock that splits easily into flat sheets. The development of this sheet-splitting foliation from shale defines slate.
32. C — Intrusive igneous rocks form when magma cools slowly underground, producing large crystals, while extrusive rocks form when lava cools quickly at the surface, producing small ones. The location and cooling rate are the basic distinction.
33. A — A cut-off, abandoned river meander left as a separate curved body of water is an oxbow lake. It forms when a river straightens its course and isolates a former bend.
34. D — Burning fossil fuels rapidly releases long-stored carbon into the atmosphere as carbon dioxide, adding to the greenhouse effect and warming the planet. This sudden release disrupts the slow natural balance of the carbon cycle.
35. C — A genuine challenge of solar and wind power is that their output varies with weather and time of day, requiring storage or backup to maintain a steady supply. Managing this variability is a key obstacle to a full transition to renewables.

36. B — A direct harm of an oil spill is that oil coats the feathers and fur of seabirds and marine mammals, impairing their ability to stay warm and afloat. This fouling of animals is among the most immediate damages of a spill.
37. D — Windbreaks slow the wind near the ground, reducing the wind erosion that would otherwise blow away valuable topsoil. By cutting wind speed at the surface, rows of trees protect exposed farmland from erosion.
38. A — Biodiversity loss is serious for people because many species provide food, medicines, and materials, and once a species is gone its potential benefits cannot be recovered. The irreversibility of extinction is what makes the loss so costly.
39. C — Harvesting a renewable resource at a rate that lets it replenish itself reflects sustainability, keeping the resource available for future generations. Using resources within their capacity to renew is the core of sustainable development.
40. B — Acid rain lowers the pH of lakes and soils, which can kill fish and other aquatic life and damage forests over time. This acidification of ecosystems is the central environmental harm of acid precipitation.
41. D — Protecting natural areas maintains biodiversity by preserving habitats where many species can continue to live, reproduce, and sustain healthy populations. Safeguarding habitat is the most direct way these reserves protect species.
42. A — Planting drought-resistant crops to cope with droughts already occurring is adaptation, an adjustment to existing climate change. Adaptation addresses the impacts of warming rather than its underlying causes.
43. C — By superposition the shale (bottom) is oldest and the sandstone above it is younger, and by cross-cutting the dike that slices through both is youngest, giving shale, then sandstone, then dike. Combining these principles establishes the full order of events.
44. B — Tropical fern fossils and coal swamps in frozen Antarctica indicate it once had a much warmer climate or lay at a different position on the globe. Such fossils are evidence that continents have moved and climates have changed over geologic time.
45. D — Radiometric dating is reliable because each isotope decays at a constant, known rate unaffected by ordinary heat, pressure, or chemistry. This steady decay makes radioactive isotopes dependable natural clocks for dating rocks.
46. C — Modern humans live in the Cenozoic Era, the most recent era and the Age of Mammals, which continues to the present. Placing ourselves in the Cenozoic situates human history at the very top of the geologic time scale.
47. A — Continental drift was absorbed into the modern theory of plate tectonics, which explains continental movement as part of the motion of large lithospheric plates. Plate tectonics provided the mechanism that Wegener's original idea had lacked.
48. D — The current possible mass extinction is unusual because it is being driven largely by the activities of a single species, human beings, rather than by a natural catastrophe. This human cause sets it apart from the asteroid impacts and other natural drivers of past extinctions.
49. B — Engineers build and test a prototype to see how a design actually performs and to identify problems to fix before full production begins. Testing a prototype catches flaws early, when they are far cheaper and easier to correct.
50. C — When new evidence challenges an accepted explanation, the scientific response is to re-examine and, if necessary, revise or replace it to account for that evidence. This willingness to update ideas in light of evidence is central to how science self-corrects.