School Connect Online

SCO INTERNATIONAL OLYMPIAD

CLASS 6 QUESTION PAPER

Official Rebranded Question Paper | Set A

Designed from Class 6 Science learning pathways and aligned with SCO's platform flow for guided preparation, practice, reporting, and future-ready academic growth.

- age-fit science reasoning for Class 6 / upper-primary learners globally
- question blocks with clean options, answer keys, and explanations for concept clarity
- structured practice across life science, physical science, earth science, environment, and scientific method

Maths	English	Science	Mental Ability	Finance Knowledge
AI	Entrepreneurship	GK	Coding	Life Skills

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SCO International Science Olympiad - Class 6

Official Rebranded Question Paper | Set A | 2025-26

Exam Name	SCO International Science Olympiad	**Class**	Class 6
Question Paper Set	A	**Duration**	60 minutes
Total Questions	50	**Question Type**	Objective Type
Candidate Name	_____	**Registration ID**	_____

Guidelines for the Candidate

1. Before the exam begins, candidates may use the additional time given by the invigilator to complete OMR/personal details carefully.
2. Write name, school code, class, roll number, registration ID, and contact number clearly where required.
3. Total Questions: 50. Each question has only one correct answer unless explicitly stated otherwise.
4. All questions are compulsory. There is no negative marking in this sample/official practice paper format.
5. Calculator use is not allowed unless the official exam instructions specifically permit it.
6. Use only an HB pencil or a blue/black ballpoint pen to darken the correct option on the answer sheet.
7. At the end of the test, hand over the answer sheet to the invigilator.

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Section A - General Science

Q.1 From which part of the sugarcane plant is table sugar obtained?

A. Root
B. Stem
C. Leaf
D. Flower

Answer: B

Explanation: Sugarcane stores sucrose in its stem, which is crushed to extract juice for making sugar.

Q.2 Which nutrient helps in the repair and growth of body tissues?

A. Carbohydrates
B. Proteins
C. Fats
D. Minerals

Answer: B

Explanation: Proteins provide amino acids that are building blocks for tissue repair and growth.

Q.3 A deficiency of which vitamin leads to night blindness?

A. Vitamin A
B. Vitamin C
C. Vitamin D
D. Vitamin K

Answer: A

Explanation: Vitamin A is essential for forming visual pigments in the retina; its lack impairs vision in low light.

Q.4 Which two processes turn raw cotton into fabric?

A. Spinning and weaving
B. Knitting and dyeing
C. Combing and pressing
D. Bleaching and embroidering

Answer: A

Explanation: Cotton fibers are spun into yarn, and the yarn is woven into cloth.

Q.5 Which property is best for separating magnetic from non-magnetic materials?

A. Color
B. Magnetism
C. Density
D. Solubility

Answer: B

Explanation: Materials like iron are attracted by a magnet, while non-magnetic ones are not.

Q.6 What is the best method to separate sand from water?

A. Filtration
B. Evaporation
C. Distillation
D. Decantation

Answer: A

Explanation: Filtration traps sand on filter paper, letting water pass through.

Q.7 Which of the following is an irreversible change?

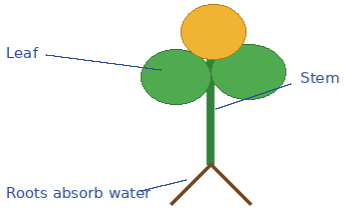
A. Melting ice
B. Burning paper
C. Boiling water
D. Dissolving sugar

Answer: B

Explanation: Burning paper converts it to ash and gases; you cannot revert it to paper.

Q.8 Which tissue carries water from roots to leaves?

A. Phloem
B. Xylem
C. Chloroplast
D. Stomata



Answer: B

Explanation: Xylem vessels form tubes that conduct water and minerals upward.

Q.9 Which joint allows you to rotate your head from side to side?

A. Hinge joint
B. Ball-and-socket joint
C. Pivot joint
D. Gliding joint

Answer: C

Explanation: The atlas-axis joint (pivot) between the first two neck vertebrae permits head rotation.

Q.10 Muscles can only pull, not push. Which pair works to bend and straighten your elbow?

A. Biceps and triceps
B. Quadriceps and hamstrings
C. Deltoid and pectoral
D. Gluteus and calf

Answer: A

Explanation: The biceps contract to bend the arm, and the triceps contract to straighten it.

Q.11 An orchid growing on a tree without harming it is called a(n):

A. Parasite
B. Epiphyte
C. Predator
D. Decomposer

Answer: B

Explanation: Epiphytes use other plants for support but do not draw nutrients from them.

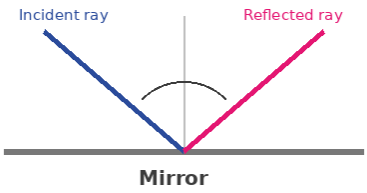
Q.12 A cyclist covers 150 km in 3 hours. What is the average speed?

A. 30 km/h
B. 45 km/h
C. 50 km/h
D. 75 km/h

Answer: C

Explanation: Speed = distance ÷ time = 150 km ÷ 3 h = 50 km/h.

Q.13 Which surface produces the clearest reflection?

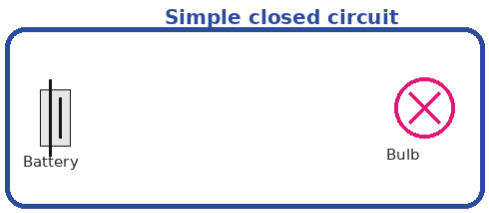


A. Rough sandpaper
B. Mirror
C. Black cloth
D. White wall

Answer: B

Explanation: A smooth glass mirror reflects light uniformly, forming sharp images.

Q.14 In a simple circuit (battery-bulb), what happens if the bulb is removed?



A. The circuit remains complete, and current flows
B. The circuit opens, and current stops
C. The battery's voltage doubles
D. The wires overheat

Answer: B

Explanation: Removing the bulb breaks the loop (open circuit), so current cannot flow.

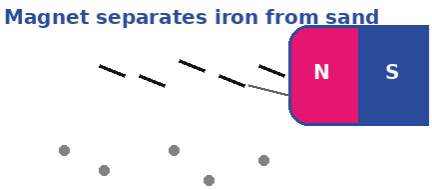
Q.15 Which material is a good conductor of electricity?

A. Plastic
B. Wood
C. Glass
D. Copper

Answer: D

Explanation: Copper has free electrons that allow electric current to pass easily.

Q.16 Which of these materials is NOT attracted to a magnet?



A. Iron nail
B. Paperclip
C. Aluminum foil
D. Steel pin

Answer: C

Explanation: Aluminum is non-magnetic and won't be drawn to a magnet.

Q.17 Hard water contains dissolved _____ that prevent soap from lathering.

A. Sugar
B. Calcium and magnesium salts
C. Sodium chloride
D. Vinegar

Answer: B

Explanation: Calcium and magnesium ions react with soap to form scum, reducing lather.

Q.18 Which gas makes up about 78% of Earth's atmosphere?

A. Oxygen
B. Carbon dioxide
C. Nitrogen
D. Argon

Answer: C

Explanation: Nitrogen is the most abundant gas in air at roughly 78%.

Q.19 Which of these items is biodegradable?

A. Plastic bottle
B. Styrofoam cup
C. Paper
D. Aluminum can

Answer: C

Explanation: Microorganisms can break down paper back into natural substances over time.

Q.20 Composting kitchen scraps and yard waste helps produce:

A. Plastic
B. Chemical fertilizers
C. Organic manure
D. Synthetic pesticides

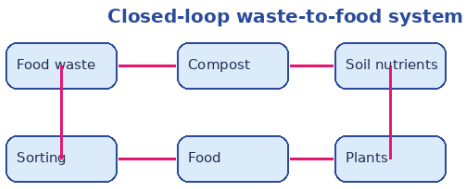
Answer: C

Explanation: Composting decomposes organic waste into nutrient-rich manure useful for soil enrichment.

Section B - Case Study and Application-Based Science

Q.21 In an eco-friendly community, a sustainable organic farm has developed an integrated system. In this system, food waste from a local kitchen is sorted using an electrically powered machine that employs sensors, magnets, and a mini-circuit board to separate biodegradable waste from plastics and metals. The biodegradable waste is then composted and used to enrich the soil for growing vegetables and fibre-rich plants, while the non-biodegradable materials are sent for recycling.

Which combination of processes best exemplifies a closed-loop sustainable agricultural system that integrates waste management, food production, and material recycling?



A. Using advanced sorting technology (with electric circuits and magnets) to separate waste, converting biodegradable waste into compost for enriching soil, and recycling non-biodegradable waste for reuse in production.
B. Manually sorting waste at the community center and using chemical fertilizers to enhance plant growth, while disposing of plastics in landfills.
C. Burning all waste to produce energy and using the energy to run irrigation systems for conventional crop fields.
D. Ignoring waste sorting altogether and relying solely on purchased fertilizers and recycled water for plant growth.

Answer: A

Explanation: Option A describes a comprehensive, integrated approach: advanced, electrically powered sorting separates waste accurately; biodegradable waste is transformed into compost (a practice reflecting "garbage in, garbage out" when managed correctly), which improves soil quality for growing food and fibre; and non-biodegradable materials are recycled rather than discarded. This closed-loop system minimizes waste, conserves resources, and enhances sustainability. The other options either lack integration or introduce processes that do not promote a true sustainable cycle.

Q.22 A rural textile enterprise sources its raw fibre from local cotton plants, which are cultivated using organic compost produced from the community's food waste. The harvested cotton is then cleaned, sorted, and processed into fabric by machines that use water-based cleaning and separation techniques, while quality is monitored by sensors integrated into an electric circuit.

Which explanation best illustrates the advantage of integrating organic waste recycling with fibre production and textile manufacturing?

A. It reduces environmental pollution, improves soil fertility, enhances cotton quality, and uses technological monitoring to ensure high-quality fabric production with minimal waste.

B. It speeds up production but relies heavily on chemical additives, thereby compromising the natural properties of the cotton fibres.

C. It increases costs significantly by requiring separate processes for waste management and fibre processing, resulting in a less efficient system.

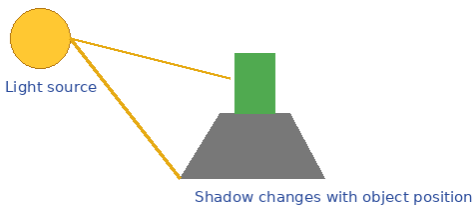
D. It uses up too much water in the cleaning process and offers little improvement in the final fabric's quality.

Answer: A

Explanation: Option A shows that recycling organic waste into compost improves soil health and supports high-quality cotton growth. In addition, using modern sensor-equipped machines during fibre processing ensures that the quality is maintained, and waste is minimized. This integrated approach simultaneously addresses environmental, agricultural, and manufacturing challenges. The other options either emphasize drawbacks not inherent to the process or ignore the sustainability benefits.

Q.23 A group of researchers studying plant growth sets up an experiment in which they use an array of reflective panels and controlled artificial light sources. The system is designed so that the length of the shadow cast by a plant can be observed and correlated with the plant's height and health. Electric circuits monitor the light intensity, and changes in shadow length are recorded over time to deduce growth rates.

Which conclusion best explains why this method of using light, shadows, and controlled reflection is effective for studying plant growth?



A. The controlled light and reflective surfaces allow researchers to create consistent conditions so that changes in shadow length accurately reflect changes in the plant's size and health, with electric circuits ensuring that light intensity remains constant.

B. The reflective panels create artistic distortions in the plant images, making it difficult to accurately measure growth.

C. The system shows that shadows are not affected by plant growth, as the electric circuits only record light intensity.

D. The method is ineffective because artificial light does not mimic natural sunlight, and therefore, the measurements are not reliable.

Answer: A

Explanation: Option A correctly explains that by controlling light intensity and using reflective surfaces, researchers can minimize external variables. This allows the shadow length to become a reliable indirect measure of the plant's height and overall health. The electric circuits help maintain and monitor consistent conditions. The other options either misinterpret the purpose of the method or dismiss its validity without considering the controlled setup.

Q.24 During a school sports day event, a new training machine is introduced that uses sensors and circuits to analyze the body movements of students as they run and jump. The machine records parameters such as speed, distance, and the angles of limb movement, converting these observations into a model that explains the energy transformations in their bodies.

Which principle best describes the relationship between body movements and energy usage as demonstrated by this machine?

A. The kinetic energy generated during movement is directly linked to the speed and mass of the moving body parts, and the machine's sensors help in correlating these movements with energy expenditure.

B. The energy used during movement is generated entirely by the machine's circuits, which then add extra energy to the students' muscles.

C. Body movements do not produce any measurable energy changes because human motion is entirely regulated by the nervous system.

D. The machine shows that energy usage during movement is independent of speed or distance, relying solely on muscle strength.

Answer: A

Explanation: Option A correctly states that kinetic energy (the energy of motion) depends on the mass and speed of moving body parts. The sensors capture these variables, which are then used to understand the energy transformations occurring during movement. The other options either confuse the role of technology in measurement or ignore the fundamental physics behind kinetic energy.

Q.25 In a simulated laboratory experiment designed to mimic a river's natural environment, scientists work with a mixture containing fine sediment, water, and organic matter. To separate these components, they employ multiple techniques: mechanical filtration, magnetism (to isolate any metallic particles), and a gentle electric field to encourage separation based on particle charge.

Which explanation best describes why using multiple separation techniques yields more effective results than relying on a single method?

A. Different substances in the mixture possess unique physical and chemical properties; therefore, combining techniques-such as mechanical filtration for sediment, magnetism for metals, and electric fields for charged particles-ensures that each component is separated according to its specific characteristics.

B. Using multiple techniques complicates the process and increases the likelihood that substances will re-mix rather than separate.

C. A single technique is always sufficient, making the additional methods redundant and unnecessary.

D. Combining techniques only works if the substances are artificially added to the mixture, not when they occur naturally.

Answer: A

Explanation: Option A is correct because each separation method targets specific properties (size, magnetic properties, electrical charge) of the components in the mixture. By employing multiple techniques, scientists can more effectively isolate each substance, which is particularly important when dealing with a naturally complex mixture. The other options ignore the benefits of targeted separation or suggest issues that do not arise when techniques are correctly combined.

Q.26 During an outdoor science experiment, students investigate how both air movement (wind) and water flow in a small canal affect the motion of lightweight objects. They notice that objects placed in the water and air behave differently: some drift with the current, while others are slightly pushed by gusts of wind.

Which conclusion best explains how air and water interact with objects to influence motion and distance measurements in this experiment?

A. Both air and water currents exert forces that can accelerate or decelerate objects; understanding these influences is crucial to accurately measuring distances, as the forces may cause objects to deviate from their expected paths.

B. Air and water have no significant effect on the movement of objects, so any deviations are due solely to measurement errors.

C. Only the water current affects object motion, while air movement is too weak to have any noticeable impact.

D. Air and water currents always cancel each other out, ensuring that the objects move in a perfectly straight line.

Answer: A

Explanation: Option A correctly explains that both air (wind) and water currents can influence an object's motion by applying additional forces. This understanding is vital for accurate motion and distance measurements, as external forces may alter the object's trajectory. The other options either deny the effects of these forces or assume a cancelation that is unrealistic in natural conditions.

Q.27 In a biology lab, students construct a simple circuit to model the transmission of nerve impulses in a living organism. They compare the flow of electrical current in the circuit with the way signals are passed along nerve cells in the human body.

Which of the following best describes how this circuit serves as an analogy for nerve impulse transmission?

A. Just as an electrical circuit carries a current through wires, nerve cells transmit electrical impulses along their membranes, with the speed and strength of the signal being influenced by the properties of the cell and its connections.

B. The circuit shows that electrical current is entirely different from biological nerve signals, so the analogy is not useful.

C. The circuit demonstrates that nerve impulses are generated by batteries embedded in the human body.

D. The circuit proves that nerve signals rely solely on chemical processes and cannot be compared to electrical circuits.

Answer: A

Explanation: Option A is correct because it highlights that both electrical circuits and nerve cells use the movement of charged particles (ions or electrons) to transmit signals. The analogy helps students understand that the speed and strength of the signal depend on the medium through which it travels. The other options either dismiss the analogy or incorrectly describe the biological processes.

Q.28 A team of environmental scientists is developing a computer simulation to predict how changes in waste management practices affect a local ecosystem. The simulation incorporates various inputs such as water quality, air composition, organic matter decay rates, and waste recycling efficiency. They find that if any of the input data are inaccurate or incomplete, the simulation's predictions become unreliable.

Which statement best explains the concept of "garbage in, garbage out" in the context of this ecosystem model?

A. The reliability of the simulation's output depends entirely on the quality and accuracy of the input data; if flawed or incomplete data are entered, the results will also be flawed, regardless of how advanced the model is.

B. The simulation can correct any inaccuracies in the input data through built-in error correction algorithms, ensuring reliable outputs regardless of data quality.

C. Only the water quality input affects the accuracy of the simulation, so other data can be approximate without issue.

D. The concept is irrelevant because computer simulations always produce valid results if the software is sophisticated enough.

Answer: A

Explanation: Option A precisely encapsulates the "garbage in, garbage out" principle: the output quality of any model or simulation is directly tied to the input data quality. Inaccurate or incomplete inputs will lead to unreliable or erroneous predictions, regardless of the model's sophistication. The other options either misunderstand or minimize the importance of high-quality input data.

Q.29 In an experiment to understand how environmental factors influence plant growth, researchers cultivate several groups of plants under different conditions. Some plants receive varying intensities of light, others are watered with water of different qualities, and some are grown in soil with varying compositions. Sensors record detailed data on plant height, leaf distance, and overall health over several weeks.

Which conclusion best describes how this comprehensive experimental approach helps scientists understand plant-environment interactions?

A. By simultaneously varying multiple environmental factors and monitoring plant responses with precise sensors, researchers can correlate specific conditions (light, water, soil) with changes in plant physiology and growth, leading to deeper insights into how plants adapt to their surroundings.

B. Varying several factors at once makes it impossible to determine which individual factor is affecting plant growth, so the experiment provides no useful information.

C. Only light intensity affects plant growth, so varying water quality and soil composition unnecessarily complicates the experiment.

D. The experiment is flawed because sensors cannot accurately capture the subtle differences in plant responses under varying environmental conditions.

Answer: A

Explanation: Option A is correct because the experiment's design-varying several environmental parameters while using precise measurements-allows researchers to identify correlations and interactions between different factors and plant growth. This comprehensive approach leads to a better understanding of how plants adapt to and interact with their surroundings. The other options ignore the benefits of multi-factor analysis or incorrectly assert that such data are too complex to interpret.

Q.30 A research team is exploring innovative methods to improve textile production. They start by growing natural fibre plants in fields enriched with compost derived from food waste (demonstrating "garbage in, garbage out" when managed properly). The fibres are extracted and then processed using modern machinery equipped with sensors and electric circuits to monitor quality at every stage. These technologies ensure that the natural properties of the fibres are preserved as they are transformed into high-quality fabric.

Which statement best reflects the integrated approach of combining biological processes with technological innovations to improve fibre quality and reduce waste?

A. Merging organic waste recycling with fibre extraction and technological quality control allows researchers to optimize every step-from enhancing plant growth with nutrient-rich compost to ensuring high-quality fabric production through real-time monitoring-resulting in improved textile quality and reduced environmental impact.

B. Integrating technology into fibre processing unnecessarily complicates the traditional methods, leading to higher costs without significant improvements in fabric quality.

C. Biological factors are the only determinants of fibre quality, so using technology for monitoring is redundant and does not contribute to waste reduction.

D. The approach relies solely on advanced sensors and electric circuits, which ignore the natural benefits provided by compost and traditional cultivation techniques.

Answer: A

Explanation: Option A accurately describes the synergy between biological processes (using compost to enhance plant growth) and technological innovations (using sensors and circuits for quality control) to achieve superior fibre quality while reducing waste. This integrated approach addresses multiple challenges across the production cycle. The other options either overlook the benefits of integration or incorrectly attribute the improvements to a single factor.

Q.31 In a laboratory experiment, a laser beam is directed into a complex setup consisting of several mirrors arranged at fixed angles along a circuit-like path. Each mirror is mounted using small, precisely positioned magnets to ensure that its angle remains constant. An electric circuit with a high-precision timer records the total time it takes for the laser beam to travel through the entire series of reflections and reach a sensor located at the end of the circuit.

Which explanation best describes how the combined roles of reflective surfaces, magnetic stabilization, and circuit timing enable the accurate calculation of the light's total travel distance?

A. The magnets secure each mirror at a fixed, known angle so that the laser beam follows a predictable path; the circuit's timer then accurately measures the beam's journey, and using the constant speed of light, the total distance is determined. B. The magnets alter the path of the laser beam by creating local magnetic fields that accelerate the light, and the circuit's timer compensates by averaging these accelerations over the path. C. The reflective mirrors generate a secondary light pulse when influenced by the magnetic field, and the circuit adds the delays from these pulses to estimate

the distance. D. The electric circuit uses the strength of the magnetic fields at each mirror to directly calculate the distance between mirrors, bypassing the need to time the light's travel.

Answer: A

Explanation: Option A is correct because the fixed-angle mirrors-held steadily by magnets-ensure the laser follows a precise, predictable route. The circuit's timer measures the total time for the light's journey, and because the speed of light is constant, the distance can be accurately calculated. Options B, C, and D introduce effects (magnetic acceleration of light, secondary pulses, or direct magnetic distance measurements) that do not occur in this setup.

Q.32 In a school laboratory experiment, students roll a ball along a flat surface while a fixed light source casts its shadow onto a wall. The wall's surface is enhanced with a reflective coating to provide a sharp, well-defined shadow. An electronic circuit connected to a high-speed sensor records the time intervals as the shadow moves along the wall. In certain trials, small electromagnets positioned near the ball are activated briefly to alter its path without making physical contact.

Which explanation best describes how this system uses light, shadow, circuits, and magnets to accurately measure the ball's motion and distance?

A. The consistent light source produces a clear shadow whose motion is precisely tracked by the sensor circuit; the electromagnets can gently modify the ball's trajectory to study changes in acceleration, enabling a detailed analysis of motion and distance.

B. The shadow length directly increases with the ball's speed, and the electromagnets generate additional shadows to simulate faster movement, which the circuit then averages.

C. The reflective coating and electromagnets together create an interference pattern in the shadow, and the circuit measures these patterns to calculate the ball's motion. D. The electromagnets freeze the ball momentarily, so the shadow remains stationary, allowing the sensor to measure the ambient light intensity rather than distance.

Answer: A

Explanation: Option A correctly describes the system: the fixed light casts a clear shadow on a reflective wall, and the sensor circuit records the movement of that shadow over time. The electromagnets, when activated, slightly alter the ball's path (without contact), which can be used to study how changes in acceleration affect motion. Options B, C, and D introduce incorrect ideas-such as generating artificial shadows, creating interference patterns, or freezing the motion-that do not apply to this controlled experimental design.

Q.33 At a science fair, a demonstration features a small vehicle that levitates above a track using magnetic repulsion. The levitation system is powered by an electric circuit that carefully controls the magnetic field strength to maintain a stable height, thereby reducing friction. Along the track, reflective markers are fixed at known intervals. As the vehicle passes these markers, a sensor array connected to a circuit logs the exact times at which the vehicle is detected via light reflection.

Which explanation best encapsulates how the integrated system-magnetic levitation, electric circuits, reflective markers, and sensors-works together to measure the vehicle's motion and distance traveled accurately?

A. The magnetic levitation minimizes friction for smooth, constant motion, while the reflective markers provide fixed reference points; the sensor array and circuit precisely record time intervals between markers, which, along with known distances, enable accurate measurement of the vehicle's speed and total distance.

B. The magnetic fields from the levitation system modify the speed of the light reflected off the markers, and the circuit compensates by calibrating a variable light speed to measure distance.

C. The reflective markers generate their own magnetic signals that are detected by the vehicle's circuit, directly indicating the distance between each marker.

D. The levitation causes the vehicle to move in a random pattern, and the system relies on averaging the irregular time intervals to estimate the distance traveled.

Answer: A

Explanation: Option A correctly details the process: magnetic levitation reduces friction, ensuring smooth motion; fixed reflective markers serve as known reference points; and the sensor circuit logs the time intervals between markers. With the known spacing and accurate timing, the vehicle's speed and distance can be calculated precisely. Option B incorrectly suggests that magnetic fields alter light speed, while C and D introduce ideas that do not reflect how the system functions.

Q.34 A research team has designed a novel device to map the dimensions of a room. The device consists of a motorized platform with an attached mirror that can rotate at controlled angles. A collimated beam of light (from a laser) is directed onto the mirror, which reflects the beam onto a stationary sensor. The time delay between the light's emission and its detection is recorded by an electric circuit. To ensure that the mirror maintains the correct orientation during its rotation, small permanent magnets and a magnetic sensor array are integrated into the platform.

Which explanation best describes how combining light reflection timing with magnetic field mapping enhances the accuracy of the room dimension measurements?

A. The magnetic sensor array ensures the mirror's orientation remains fixed during rotation by providing real-time feedback, while the electric circuit accurately records the light's time-of-flight; together, these factors allow for precise calculation of distances to the room's boundaries.

B. The magnets cause the light beam to slow down, so the time-of-flight increases and makes it easier for the circuit to measure longer distances.

C. The magnetic field mapping replaces the need for time-of-flight measurements by directly providing distance readings from the mirror to the walls.

D. The light reflection is modulated by the magnetic field, causing the sensor to receive multiple overlapping signals that are averaged to estimate the room's dimensions.

Answer: A

Explanation: Option A is correct because the magnetic sensor array helps maintain the mirror's precise orientation, ensuring that the light beam is reflected accurately to the sensor. The electric circuit's recording of the time-of-flight of the light beam (a well-established method) then yields an accurate distance measurement. Options B, C, and D propose effects (slowing light, replacing time-of-flight, or signal modulation by magnets) that do not occur in this system.

Q.35 A research team has built a dynamic navigation system for a small autonomous vehicle that moves through a tunnel. The system uses a laser mounted on the vehicle that emits a narrow beam toward a series of reflective panels fixed along the tunnel walls. In order to maintain accurate alignment despite vibrations and minor deviations, the vehicle also incorporates small electromagnets that interact with strategically placed permanent

magnets along the walls, keeping its path stable. An electronic circuit records the time delay of the reflected laser beam, which is used to calculate the distance to the panels and monitor the vehicle's position.

Which explanation best describes how combining the laser reflection timing with magnetic stabilization and circuit-based measurements leads to precise navigation in the tunnel?

A. The electromagnets, by counteracting vibrations, ensure that the laser beam always strikes the reflective panels at the correct angle. The electronic circuit then measures the time-of-flight of the light pulse with high accuracy, allowing the system to calculate distances and position the vehicle reliably.

B. The electromagnets directly alter the speed of the laser light, and the circuit uses these changes in speed to estimate distances along the tunnel.

C. The reflective panels emit their own magnetic signals that combine with the electromagnet's fields, so the circuit can bypass time-of-flight measurements and determine the vehicle's position solely from magnetic feedback.

D. The system relies on the electromagnets to generate a secondary light beam that interferes with the primary laser beam; the interference pattern is used by the circuit to estimate distances indirectly.

Answer: A

Explanation: Option A is correct because the electromagnets stabilize the vehicle by counteracting vibrations and minor misalignments, ensuring that the laser beam consistently strikes the reflective panels at the intended angle. The electronic circuit accurately records the time-of-flight (the time the light takes to return), and since the speed of light is constant, the distance to each panel can be calculated precisely. Options B, C, and D introduce effects that do not occur in this system (modifying light speed, bypassing time-of-flight, or generating interference patterns) and thus do not explain the integration of these technologies.

Q.36 In a classroom demonstration, a rotating mirror setup is used to measure distances around a complex obstacle course. A fixed laser beam is directed at a mirror mounted on a platform that rotates at a controlled speed. The reflected beam then strikes various stationary targets placed around the room. A circuit with a precise timer records the interval between the laser's emission and the beam's return after being reflected off the targets. To ensure the mirror rotates at an exact angle, small magnetic brakes are applied, using permanent magnets that interact with the mirror's magnetic material to slow and stabilize its rotation.

Which explanation best describes how the integration of the rotating mirror, precise timing circuits, and magnetic braking results in accurate distance measurements around the obstacle course?

A. The magnetic brakes maintain a constant rotational speed for the mirror, ensuring that the laser beam is reflected along a predictable path. The timer records the light's round-trip time accurately, and with the known speed of light, the distances to the stationary targets can be determined with precision.

B. The magnetic brakes accelerate the mirror's rotation to create a Doppler shift in the reflected laser beam, and the circuit measures this frequency change to calculate distances.

C. The rotating mirror, when slowed by the magnetic brakes, emits its own light pulses that interfere with the laser, and the circuit uses the interference pattern to determine the positions of the targets.

D. The integration allows the mirror to deflect the laser beam randomly, and the circuit averages multiple random measurements to estimate the distances to the targets.

Answer: A

Explanation: Option A correctly explains that magnetic braking is used to maintain a constant, predictable rotation of the mirror. This consistency ensures that the laser beam is directed along a known path toward the stationary targets. The circuit's timer measures the time taken for the light to travel to the target and back (time-of-flight), and because the speed of light is known, the

distances can be calculated accurately. Options B, C, and D introduce phenomena (Doppler shifts, interference from self-emission, or randomness) that do not represent how such a system would be designed for precision measurement.

Q.37 A group of students designs an experiment to study the motion of an object using both its physical movement and the corresponding changes in its shadow. A controlled light source projects a sharp shadow of a rolling ball onto a surface marked with reflective strips. At the same time, an array of light sensors connected to an electric circuit records the time intervals at which the shadow crosses each strip. To add an element of control, small magnets are placed along the path to gently alter the ball's speed by creating localized magnetic fields that interact with a magnetic element embedded in the ball.

Which explanation best describes how this system combines the tracking of shadows, sensor circuits, and magnetic speed control to measure motion and distance accurately?

A. The fixed light source and reflective strips provide a consistent reference, while the sensor array detects the movement of the shadow accurately. The magnets subtly adjust the ball's speed, and the circuit records the corresponding changes in time intervals, allowing for a precise analysis of the ball's motion and the distance traveled.

B. The magnets cause the ball to emit extra light, which creates additional shadows that confuse the sensors, and the circuit must filter out these errors to measure motion correctly.

C. The reflective strips are used to generate magnetic pulses, which are then interpreted by the sensor circuit to calculate the ball's speed, bypassing the need for shadow tracking.

D. The sensor circuit ignores the shadow movement and instead uses the changes in the ball's magnetic field (due to the magnets) to measure its motion, with the reflective strips serving only as decorative markers.

Answer: A

Explanation: Option A is correct because the experimental design uses a constant light source to cast a clear shadow, and reflective strips provide fixed positions where the shadow's passage is detected by the sensors. The small magnets adjust the ball's speed in a controlled manner, which is reflected in the changes in the time intervals recorded by the circuit. This integration of shadow tracking, precise timing, and magnetic speed modulation enables an accurate measurement of the ball's motion and distance traveled. The other options describe scenarios that either confuse the roles of light and magnets or ignore key aspects of the design.

Q.38 An innovative drone is equipped with multiple systems for autonomous navigation. It uses a downward-pointing laser to determine its altitude above a reflective landing pad by measuring the time delay of the reflected beam. Simultaneously, a set of electromagnets on the drone interact with permanent magnets embedded in the landing pad to provide fine adjustments for a smooth touchdown. An onboard electric circuit coordinates these systems, ensuring that both the laser measurement and magnetic interactions work in tandem.

Which explanation best describes how the combination of laser-based distance measurement, magnetic fine-tuning, and circuit coordination ensures the drone lands safely and precisely?

A. The laser system accurately measures the altitude by timing the light's round trip, while the electromagnets fine-tune the drone's position relative to the magnets on the landing pad. The circuit coordinates these inputs so that any changes in altitude or position are immediately corrected, ensuring a controlled and precise landing.

B. The electromagnets modify the frequency of the reflected laser light, and the circuit uses these changes to determine the exact altitude of the drone, rendering the time-of-flight method unnecessary.

C. The drone's circuit uses the magnetic fields to create a virtual mirror that doubles the laser's path, which is then used to enhance the sensitivity of the altitude measurement.

D. The laser and magnetic systems work independently, and the circuit averages the outputs of both systems, even though they provide conflicting data, to estimate a landing altitude.

Answer: A

Explanation: Option A explains that the laser measures altitude precisely by recording the time delay of the reflected beam, and the electromagnets are used to adjust the drone's position relative to fixed magnets on the landing pad. The circuit's role is to integrate these inputs in real time so that any deviation from the desired trajectory is corrected immediately. This combined system results in a safe, controlled, and precise landing. Options B, C, and D introduce concepts (modifying laser frequency, virtual mirrors, conflicting data averaging) that do not accurately describe the cooperative functions of these systems.

Q.39 A team of engineers has developed a mapping device that integrates several advanced technologies. The device consists of a motorized platform that slowly traverses a predetermined route while rotating a high-quality mirror. A collimated laser beam is projected onto the mirror, and its reflection is directed toward a series of fixed sensors arranged around the mapping area. At the same time, an array of magnetic sensors on the platform monitors the orientation of the mirror by interacting with built-in magnets. An electronic circuit synchronizes the laser emission, mirror rotation, sensor detection, and magnetic feedback.

Which explanation best describes how the integration of laser reflection timing, magnetic orientation sensing, and coordinated circuit control contributes to an accurate mapping of the environment?

A. The magnetic sensors ensure that the mirror maintains an exact orientation as it rotates, so the reflected laser beam follows a predictable path toward the fixed sensors. The circuit accurately records the time delays and angular positions, allowing for precise calculations of distances and angles, which together produce an accurate environmental map.

B. The magnetic sensors cause the laser to modulate its brightness based on mirror orientation, and the circuit uses these brightness changes instead of time delays to estimate distances.

C. The mirror's rotation generates periodic magnetic pulses that are interpreted by the circuit as distance measurements, bypassing the need for laser timing altogether.

D. The circuit disregards the data from the magnetic sensors and relies solely on the reflected laser beam's intensity, assuming that a constant orientation is maintained throughout the mapping process.

Answer: A

Explanation: Option A correctly describes how the mapping device works. The magnetic sensors continuously monitor the mirror's orientation to ensure that it remains fixed relative to the platform as it rotates. This guarantees that the laser beam's reflection follows a predictable, known path toward the fixed sensors. The circuit then accurately records both the time-of-flight (to calculate distances) and the angular positions (to calculate directions), integrating these data to produce a precise map of the environment. Options B, C, and D either alter the fundamental principles (using brightness modulation or magnetic pulses as substitutes for timing) or ignore the integration of critical sensor data.

Q.40 A high-tech race track uses an integrated system to monitor a race car's distance from a reflective wall. In this setup, an LED light emits pulses toward a high-reflectivity wall, and a sensor records the time delay of the reflected light pulse to calculate the distance using the time-of-flight method. Simultaneously, the track employs

a non-contact magnetic braking system (using permanent magnets positioned along the track) that slows the car by inducing eddy currents in its conductive parts without any physical friction.

Which explanation best describes how these different technologies work together to provide accurate distance measurements during high-speed motion?

A. The LED and sensor system precisely measures the time it takes for light to bounce back from a highly reflective, fixed-angle surface, while the magnetic brakes ensure a smooth deceleration, maintaining consistent conditions for accurate time-of-flight calculations.

B. The magnetic brakes alter the LED light's frequency during deceleration, so the sensor calculates distance based on changes in light frequency instead of time delay.

C. The reflective wall is designed to absorb and slowly re-emit light, thereby delaying the pulse in a controlled way that the sensor uses to estimate the car's speed and distance.

D. The LED sensor continuously increases its emission intensity to counteract any variations in reflection caused by the magnetic field, ensuring that the light always reflects at the optimal angle regardless of speed.

Answer: A

Explanation: Option A correctly explains the integration: the LED-sensor system uses the time-of-flight principle on a fixed, highly reflective wall (whose surface and angle remain constant) to measure distance accurately, while the magnetic braking system minimizes friction and sudden accelerations or decelerations. The magnets in the braking system do not affect the light's properties (ruling out B and D), and the wall does not absorb and re-emit light (ruling out C).

Section C - Reason and Assertion

Q.41 Assertion (A): Digestive enzymes break down complex food into simpler forms to facilitate absorption in the intestines.

Reason (R): Fiber is not digested by the human body, but it plays a crucial role in aiding digestion and preventing constipation.

A. Both Assertion (A) and Reason (R) are correct, and the Reason (R) correctly explains Assertion (A).

B. Both Assertion (A) and Reason (R) are correct, but the Reason (R) does not correctly explain Assertion (A).

C. Assertion (A) is correct, but Reason (R) is incorrect.

D. Assertion (A) is incorrect, but Reason (R) is correct.

Answer: B

Explanation: Assertion (A) is correct because digestive enzymes break down complex food into simple molecules like glucose, amino acids, and fatty acids. However, the reason provided does not directly explain the assertion because fiber does not participate in digestion by breaking down food but rather assists in pushing food along the digestive tract. Hence, both statements are correct but not directly related.

Q.42 Assertion (A): Cotton, a plant fiber, is spun into yarn to produce fabric.

Reason (R): Cotton is composed of cellulose, which is a natural polymer that provides strength and durability to fabrics.

A. Both Assertion (A) and Reason (R) are correct, and the Reason (R) correctly explains Assertion (A).

B. Both Assertion (A) and Reason (R) are correct, but the Reason (R) does not correctly explain Assertion (A).
C. Assertion (A) is correct, but Reason (R) is incorrect.
D. Assertion (A) is incorrect, but Reason (R) is correct.

Answer: A

Explanation: Assertion (A) is correct because cotton fibers are indeed spun into yarn and then woven or knitted to create fabric. The reason (R) correctly explains the assertion, as cellulose, which is found in cotton, is a polymer known for its strength and durability, contributing to the fabric's toughness and elasticity.

Q.43 Assertion (A): Materials are grouped into metals and non-metals based on their physical and chemical properties.

Reason (R): Metals generally have high electrical conductivity, malleability, and luster, while non-metals lack these properties.

A. Both Assertion (A) and Reason (R) are correct, and the Reason (R) correctly explains Assertion (A).
B. Both Assertion (A) and Reason (R) are correct, but the Reason (R) does not correctly explain Assertion (A).
C. Assertion (A) is correct, but Reason (R) is incorrect.
D. Assertion (A) is incorrect, but Reason (R) is correct.

Answer: A

Explanation: Assertion (A) is correct because materials are classified based on their properties like conductivity and malleability. Reason (R) correctly explains Assertion (A) by stating the characteristic properties of metals and non-metals that are used for classification.

Q.44 Assertion (A): A physical change is a change in the form or appearance of matter without altering its chemical composition.

Reason (R): Chemical changes result in the formation of new substances with different properties.

A. Both Assertion (A) and Reason (R) are correct, and the Reason (R) correctly explains Assertion (A).
B. Both Assertion (A) and Reason (R) are correct, but the Reason (R) does not correctly explain Assertion (A).
C. Assertion (A) is correct, but Reason (R) is incorrect.
D. Assertion (A) is incorrect, but Reason (R) is correct.

Answer: B

Explanation: Both statements are correct, but the reason describes chemical change and does not directly explain the definition of a physical change. Therefore, the correct choice is B.

Q.45 Assertion (A): The movement of muscles is controlled by signals from the brain transmitted through the nervous system.

Reason (R): Muscles can only contract, so for movement to occur, they must work in pairs-one contracts, and the other relaxes.

A. Both Assertion (A) and Reason (R) are correct, and the Reason (R) correctly explains Assertion (A).
B. Both Assertion (A) and Reason (R) are correct, but the Reason (R) does not correctly explain Assertion (A).
C. Assertion (A) is correct, but Reason (R) is incorrect.
D. Assertion (A) is incorrect, but Reason (R) is correct.

Answer: B

Explanation: Both statements are correct. Brain signals control muscles, and muscles work in antagonistic pairs, but the reason explains the mechanics of movement rather than directly explaining how the brain sends signals. Therefore, the correct choice is B.

Q.46 Assertion (A): Flowering plants reproduce through pollination followed by fertilization, where pollen reaches the female part and seed formation can begin.

Reason (R): Pollination occurs through various methods, including wind, water, and animal interactions, leading to the formation of seeds.

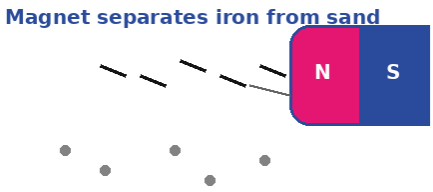
A. Both Assertion (A) and Reason (R) are correct, and the Reason (R) correctly explains Assertion (A).
B. Both Assertion (A) and Reason (R) are correct, but the Reason (R) does not correctly explain Assertion (A).
C. Assertion (A) is correct, but Reason (R) is incorrect.
D. Assertion (A) is incorrect, but Reason (R) is correct.

Answer: A

Explanation: Assertion (A) is correct because pollination is the process by which pollen from the male part (anther) fertilizes the female part (stigma) of a flower. Reason (R) is also correct, as pollination can occur through various mechanisms like wind, water, and animals, which ultimately lead to seed formation.

Q.47 Assertion (A): When an electric current flows through a wire, it creates a magnetic field around the wire.

Reason (R): This magnetic field can be used to generate electricity or to control magnetic objects.



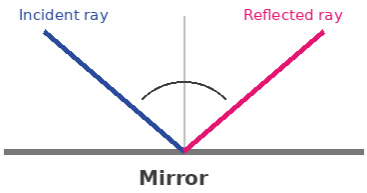
A. Both Assertion (A) and Reason (R) are correct, and the Reason (R) correctly explains Assertion (A).
B. Both Assertion (A) and Reason (R) are correct, but the Reason (R) does not correctly explain Assertion (A).
C. Assertion (A) is correct, but Reason (R) is incorrect.
D. Assertion (A) is incorrect, but Reason (R) is correct.

Answer: B

Explanation: Both statements are correct, but the reason gives an application of the magnetic field and does not explain why electric current creates a magnetic field. Therefore, the correct choice is B.

Q.48 Assertion (A): Reflection occurs when light bounces off a surface, and the angle of incidence is equal to the angle of reflection.

Reason (R): Refraction occurs when light bends while passing from one medium to another, and the bending depends on the change in the light's speed.



A. Both Assertion (A) and Reason (R) are correct, and the Reason (R) correctly explains Assertion (A).
B. Both Assertion (A) and Reason (R) are correct, but the Reason (R) does not correctly explain Assertion (A).
C. Assertion (A) is correct, but Reason (R) is incorrect.
D. Assertion (A) is incorrect, but Reason (R) is correct.

Answer: B

Explanation: Both statements are correct, but the reason describes refraction, not the law of reflection. Therefore, the correct choice is B.

Q.49 Assertion (A): A car moving at a constant speed travels the same distance in equal time intervals.

Reason (R): The total distance traveled by the car is the product of its speed and the time taken, provided the speed is constant.

A. Both Assertion (A) and Reason (R) are correct, and the Reason (R) correctly explains Assertion (A).
B. Both Assertion (A) and Reason (R) are correct, but the Reason (R) does not correctly explain Assertion (A).
C. Assertion (A) is correct, but Reason (R) is incorrect.
D. Assertion (A) is incorrect, but Reason (R) is correct.

Answer: A

Explanation: Assertion (A) is correct because if a car moves at constant speed, it will cover the same distance over equal time intervals. Reason (R) correctly explains this by stating that the distance is a product of constant speed and time, which results in consistent travel distance over equal intervals.

Q.50 Assertion (A): Water is essential for all forms of life because it is involved in a wide variety of biological processes.

Reason (R): Water has high heat capacity, which helps regulate temperature in organisms and environments, and is a universal solvent, aiding in metabolic reactions.

A. Both Assertion (A) and Reason (R) are correct, and the Reason (R) correctly explains Assertion (A).

B. Both Assertion (A) and Reason (R) are correct, but the Reason (R) does not correctly explain Assertion (A).

C. Assertion (A) is correct, but Reason (R) is incorrect.

D. Assertion (A) is incorrect, but Reason (R) is correct.

Answer: A

Explanation: Assertion (A) is correct because water plays a crucial role in metabolic processes, transport, and maintaining cellular functions. Reason (R) correctly explains this as water's high heat capacity helps maintain stable temperatures in living organisms and environments, and its solvent properties make it vital for biochemical reactions.

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Consolidated Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	B	3	A	4	A	5	B
6	A	7	B	8	B	9	C	10	A
11	B	12	C	13	B	14	B	15	D
16	C	17	B	18	C	19	C	20	C
21	A	22	A	23	A	24	A	25	A
26	A	27	A	28	A	29	A	30	A
31	A	32	A	33	A	34	A	35	A
36	A	37	A	38	A	39	A	40	A
41	B	42	A	43	A	44	B	45	B
46	A	47	B	48	B	49	A	50	A

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