

SCO INTERNATIONAL SCIENCE OLYMPIAD

GRADE 7 QUESTION PAPER SET A

SCO International Science Olympiad

Official rebranded question paper for Class 7 learners globally.

Designed for scientific reasoning, evidence-based thinking, case-study analysis, and Olympiad readiness.

Science	Scientific Reasoning	Life Science	Physical Science	Case Study
Scientific Inquiry	Data Skills	Application	Achievers	Class 7

Details	Description
Exam Name	SCO International Science Olympiad
Class / Grade	Class 7
Question Paper	Official Question Paper Set A
Duration	60 minutes
Type of Exam	Objective multiple-choice questions
Total Questions	50 questions
Answering Rule	Each question has one correct answer unless specifically stated.
Academic Conduct	Read each question carefully. Calculators are not required unless the exam instructions specifically allow them.

Question Paper

Section A: Core Science Concepts

Q1. Cuscuta (dodder) lacks chlorophyll and obtains food from its host. What term describes its mode of nutrition?

- A. Autotrophic
- B. Saprophytic
- C. Parasitic
- D. Insectivorous

Q2. The Venus flytrap catches and digests insects. This adaptation helps it obtain which essential nutrient?

- A. Carbon
- B. Nitrogen
- C. Phosphorus
- D. Calcium

Q3. A cow regurgitates and re-chews its food (“cud”) before digesting it. This behavior is characteristic of:

- A. Monogastric animals
- B. Ruminant animals
- C. Carnivorous animals
- D. Omnivorous animals

Q4. Which is the correct sequence to turn raw cotton into cloth?

- A. Spinning -> Ginning -> Weaving -> Carding
- B. Ginning -> Carding -> Spinning -> Weaving
- C. Carding -> Weaving -> Spinning -> Ginning
- D. Weaving -> Spinning -> Carding -> Ginning

Q5. Silk, produced by silkworms, is composed mainly of the protein:

- A. Cellulose
- B. Fibroin
- C. Keratin
- D. Elastin

Q6. You hold a metal spoon and a wooden spoon in a flame. After a while, the metal spoon’s handle feels hot but the wooden one doesn’t. This difference is due to:

- A. Thermal expansion
- B. Heat radiation
- C. Conduction
- D. Convection

Q7. A metal ball passes easily through a ring at room temperature but gets stuck after heating. This demonstrates:

- A. Thermal contraction
- B. Thermal expansion
- C. Specific heat
- D. Latent heat

Q8. When hydrochloric acid (HCl) reacts with sodium hydroxide (NaOH), the products are:

- A. Water and hydrogen gas

- B. Water and sodium chloride
- C. Sodium and chlorine gas
- D. Oxygen and sodium oxide

Q9. Which of these is a chemical change?

- A. Dissolving sugar in water
- B. Melting wax
- C. Rusting of iron
- D. Tearing paper

Q10. Polar bears have thick fur and a layer of blubber. These adaptations help them survive:

- A. Arctic storms
- B. High humidity
- C. Extreme cold
- D. Intense sunlight

Q11. In the Northern Hemisphere, a tropical cyclone's winds rotate:

- A. Clockwise
- B. Counterclockwise
- C. East to west
- D. South to north

Q12. Which layer of soil is richest in humus and most fertile for plant growth?

- A. Bedrock
- B. Subsoil
- C. Topsoil
- D. Parent rock

Q13. Fish extract dissolved oxygen from water using:

- A. Lungs
- B. Tracheae
- C. Gills
- D. Spiracles

Q14. In plants, phloem conducts:

- A. Water and minerals upward
- B. Food (sugars) from leaves to other parts
- C. Oxygen from leaves to roots
- D. Sap from roots to stems

Q15. Grafting, used to propagate fruit trees, is a form of:

- A. Sexual reproduction
- B. Asexual (vegetative) propagation
- C. Spore formation
- D. Pollination

Q16. A runner covers 400 m in 50 s. What is her average speed?

- A. 5 m/s

- B. 6 m/s
- C. 7 m/s
- D. 8 m/s

Q17. A fuse in an electric circuit is designed to blow (melt) when too much current flows. This relies on the heating effect because the fuse wire is made of:

- A. High melting-point metal
- B. Low melting-point alloy
- C. Insulator
- D. Ferromagnetic material

Q18. Stars appear to twinkle because of:

- A. Their changing brightness
- B. Rotation of the Earth
- C. Refraction through layers of Earth's atmosphere
- D. Movement of stars in the sky

Q19. Rainwater harvesting helps replenish groundwater by directing water into:

- A. Storm drains
- B. Recharge pits
- C. Swimming pools
- D. Sewage lines

Q20. In a sewage treatment plant, the primary treatment step removes suspended solids by:

- A. Filtration through sand
- B. Sedimentation in settling tanks
- C. Chlorination
- D. Aeration

Section B: Case Study and Application-Based Reasoning

Q21. A team of researchers is studying a forest ecosystem located near an industrial area where wastewater is routinely discharged. They observe that many plants exhibit symptoms of nutrient deficiency despite an abundance of water. Soil analyses reveal markedly low levels of nitrogen and phosphorus. Weather records show irregular rainfall and elevated temperatures. The researchers suspect that the acidic wastewater is lowering the soil pH, which in turn converts essential nutrients into forms that are not readily available to plants. Simultaneously, some plant species in the forest have developed modified leaf structures to capture more sunlight, compensating for reduced chlorophyll efficiency. Question: Which of the following best explains the nutrient deficiency observed in the forest plants?

- A. The wastewater has increased the soil's pH, causing nitrogen and phosphorus to precipitate.
- B. The acidic wastewater has lowered the soil's pH, converting essential nutrients into unavailable forms.
- C. Irregular rainfall dilutes the soil nutrients, reducing plant uptake.
- D. Elevated temperatures accelerate plant metabolism, depleting available soil nutrients.
- E. Altered leaf structures redirect plant energy away from nutrient uptake.

Q22. Scientists investigating animals living near urban-industrial zones discover that some species exhibit slowed respiration rates and reduced efficiency in oxygen transport. In these animals, researchers note an increased density of capillaries and modifications in hemoglobin that bind oxygen more tightly; however, these changes impede oxygen release at tissue sites. Additionally, the animals' diets consist largely of plants grown in contaminated soils. Analysis reveals the presence of heavy metals in the environment. Question: Which factor most likely contributes to the observed reduction in respiration efficiency and compromised oxygen transport in these animals?

- A. Increased levels of heavy metals in water altering hemoglobin structure.
- B. Reduced atmospheric oxygen due to urban pollution.
- C. Nutritional deficits in contaminated plants leading to low blood iron levels.
- D. An adaptive genetic mutation that intentionally slows respiration.
- E. Excessive capillary formation causing inefficient circulation.

Q23. A textile factory uses natural fibers extracted from plants cultivated under varying climatic and soil conditions. The fibers, rich in cellulose, are processed using heat treatments and chemical baths containing acids and bases to remove impurities and modify the fiber structure. However, excessive heat and harsh chemicals can lead to both physical and chemical degradation of the fibers. Meanwhile, selective breeding has produced plant varieties with inherently stronger fibers that are more resistant to chemical changes during processing. Question: Which process modification is most likely to improve the quality of the final fabric while preserving fiber strength?

- A. Increasing the heat treatment duration to ensure complete impurity removal.
- B. Using a stronger acid in the chemical bath to accelerate cellulose breakdown.
- C. Reducing both the temperature and duration of the heat treatment while optimizing the pH of the chemical bath to minimize fiber degradation.
- D. Replacing chemical baths with mechanical agitation only.
- E. Breeding plants for lower fiber strength to avoid chemical interactions.

Q24. In a coastal region prone to cyclones and high winds, acid rain-resulting from industrial emissions-has become frequent. This acid rain lowers the soil pH, leading to leaching of essential nutrients and alterations in the soil's salt composition. As a result, water retention is compromised, which impairs plant growth. In response, local animal species have adapted by modifying their foraging behaviors and seeking shelter during heavy rains. Question: Which of the following is the most direct effect of acid rain on soil that subsequently forces animal behavioral adaptations?

- A. Increasing the soil's temperature and altering animal metabolism.
- B. Leaching essential nutrients and altering salt composition, thereby reducing water retention and plant growth, which compels animals to adjust their foraging behavior.
- C. Direct dissolution of animal exoskeletons, forcing behavioral changes.
- D. Raising soil pH to encourage invasive plant species that animals avoid.
- E. Releasing toxic gases through chemical reactions that directly harm animals.

Q25. Engineers have developed an experimental device to study correlations between the respiratory rate of animals and their physical activity levels. The device uses sensors to measure limb motion (timing each movement) and records the electrical signals from muscle contractions (analogous to electric currents). It also monitors the rate of oxygen consumption. In some test subjects, a disproportionate increase in muscle electrical activity is recorded compared to the measured movement speed. Researchers hypothesize that inefficient oxygen transport may be causing a mismatch between muscle activation and mechanical output. Question: Which explanation best accounts for the observed discrepancy between high muscle electrical activity and lower-than-expected motion speed?

- A. A calibration error in the timing sensors misrepresents limb movement.
- B. Increased electrical activity indicates more muscle recruitment, but inefficient oxygen transport results in reduced movement speed and lower respiration efficiency.
- C. The device falsely registers muscle activity when oxygen consumption is high.
- D. Electrical interference from muscle signals delays the motion sensors.
- E. Nervous system hyperactivity unrelated to oxygen transport causes excessive muscle signals.

Q26. In an arid region where water is scarce, plants have evolved deep root systems and specialized vascular tissues to optimize the transport of limited water and dissolved nutrients. They also produce seeds capable of remaining dormant until the rare rainfall occurs. However, industrial water extraction has further depleted water resources, placing additional stress on these ecosystems. Question: Under extreme water scarcity, which reproductive and physiological strategy is most effective for ensuring plant survival and reproductive success?

- A. Increasing leaf surface area to maximize photosynthesis despite greater water loss.

- B. Developing shallow root systems to absorb surface water rapidly.
- C. Enhancing vascular tissue efficiency for water and nutrient transport while producing highly dormant seeds that can withstand prolonged drought.
- D. Relying solely on animal pollinators to compensate for low water availability.
- E. Shifting entirely to asexual reproduction to conserve energy.

Q27. A municipal wastewater treatment plant uses a combination of physical and chemical processes to purify water. The process includes heating the water to accelerate chemical reactions, followed by the addition of controlled amounts of acids and bases to neutralize harmful compounds. During treatment, both physical changes (like salt precipitation) and chemical changes (such as oxidation-reduction reactions) occur simultaneously. However, if the heating is too intense, unwanted side reactions may reduce the efficacy of the neutralization process. Question: Which process modification is most likely to optimize chemical balance and improve water quality?

- A. Increasing the temperature to maximize salt precipitation.
- B. Using a stronger base to counteract any residual acidity.
- C. Carefully controlling the heat treatment to avoid unwanted side reactions while precisely adjusting the acid-base ratio for optimal neutralization.
- D. Reducing the water flow rate to allow for extended heating.
- E. Omitting heat treatment entirely to prevent chemical changes.

Q28. In a coastal region frequently impacted by cyclones, high winds, and subsequent heat spikes, local animal species have evolved remarkable adaptations. Some species alter their metabolic rates and blood flow to quickly regulate body temperature after sudden drops, while others adopt behavioral strategies like burrowing or group formation to reduce wind exposure. After storms, rapid heat increases force these animals to adjust their energy expenditure to avoid hyperthermia. Question: Which adaptation most directly enables these animals to cope with the combined stresses of cyclones and subsequent heat spikes?

- A. Development of thicker fur that insulates against both wind and heat.
- B. Enhanced ability to rapidly regulate body temperature through dynamic changes in blood flow and metabolic rate.
- C. Shifting all activity to nighttime to avoid daytime heat.
- D. Increased consumption of water-rich diets for evaporative cooling.
- E. Forming symbiotic relationships with plants to create shaded microhabitats.

Q29. Engineers have developed an electric vehicle that responds to ambient light variations using integrated light sensors. These sensors detect changes in light intensity and trigger electric motors accordingly. The vehicle's motion is measured by precise timing of its acceleration along a set track. However, during tests, gradual changes in light intensity result in inconsistent acceleration profiles. Engineers suspect that the sensor's response time, combined with fluctuations in electric current under variable light, is causing delays in motor activation. Question: Which modification is most likely to improve the vehicle's motion consistency under variable light conditions?

- A. Increasing the light sensor's sensitivity, even if it amplifies background noise.
- B. Enhancing the circuit design to stabilize the electric current and reduce sensor response time delays.
- C. Shortening the track length to minimize timing errors.
- D. Adding auxiliary light sources to maintain constant illumination.
- E. Replacing electric motors with mechanical springs for propulsion.

Q30. A sustainable textile company is developing an eco-friendly process that links the reproduction of fiber-producing plants with the conversion of their fibers into fabric. The company irrigates fields with treated wastewater, recycling water while providing nutrients. However, the wastewater contains trace acids and bases that can induce unwanted physical and chemical changes in the fibers during processing. These changes might compromise fiber strength and fabric quality. The company seeks a solution that maintains the integrity of the natural fibers throughout the transformation process. Question: Which strategy is most effective in ensuring that the chemical constituents in the wastewater do not adversely affect the quality of the plant fibers?

- A. Treating the wastewater with neutralizing agents before using it for irrigation.

- B. Increasing the acid concentration in the wastewater to promote controlled fiber breakdown.
- C. Using synthetic fertilizers instead of wastewater to avoid chemical inconsistencies.
- D. Reducing the plant's exposure time to wastewater by accelerating the fiber extraction process.
- E. Incorporating an extra heat treatment step during fiber processing to neutralize acids and bases.

Q31. A research team studies a forest located adjacent to an industrial zone that discharges wastewater containing trace acids and bases. Over time, acid rain combined with this wastewater has lowered the soil's pH significantly. As a result, essential nutrients such as nitrogen and phosphorus become chemically bound and unavailable to plants. Despite abundant water, many trees show signs of nutrient deficiency and reduced chlorophyll production. Some species, however, have adapted by developing broader leaves and enhanced vascular tissues to improve nutrient uptake and photosynthesis under these adverse conditions. Question: Which of the following best explains why the forest plants are nutrient deficient despite adequate water availability?

- A. Increased soil moisture dilutes nutrient concentration even though pH remains stable.
- B. The combined effect of acid rain and acidic wastewater lowers soil pH, converting key nutrients into forms that plants cannot absorb.
- C. The broadened leaf morphology causes plants to expend excess energy on photosynthesis instead of nutrient uptake.
- D. Enhanced vascular tissues in adapted species inadvertently reduce nutrient absorption from the soil.
- E. High water availability leads to excessive leaching of nutrients from the soil independent of pH changes.

Q32. In a polluted urban area adjacent to farmlands irrigated with chemically treated water, scientists observe that certain small mammals display abnormal respiration rates and altered blood oxygen transport. These animals feed on plants that have absorbed heavy metals and other contaminants from the soil and water. Post-mortem studies reveal modifications in hemoglobin structure, with a higher affinity for oxygen but reduced release at tissues. Additionally, the animals' capillary density has increased, possibly as a compensatory mechanism. Question: What is the most plausible explanation for the observed discrepancy between high oxygen-binding affinity and inefficient oxygen delivery in these animals?

- A. Heavy metal contamination alters hemoglobin conformation, leading to tighter oxygen binding but hampering oxygen release at the tissue level.
- B. Excessive capillary density slows blood flow, resulting in inefficient oxygen distribution.
- C. The plants' contaminated nutrients force the animals to metabolize oxygen at a slower rate.
- D. Increased oxygen-binding affinity is a genetic mutation unrelated to environmental toxins.
- E. Enhanced hemoglobin affinity results from adaptive responses to low atmospheric oxygen levels.

Q33. A textile company uses natural plant fibers as a sustainable alternative to synthetics. The process involves extracting cellulose fibers, then subjecting them to heat treatments and chemical baths (using controlled acid and base solutions) to remove impurities. However, excessive heat and aggressive chemical conditions lead to both physical (e.g., fiber breakage) and chemical (e.g., depolymerization) changes that degrade fiber strength. In response, plant breeders have developed varieties with naturally robust fibers. The factory now seeks to optimize processing to preserve these fibers while achieving effective impurity removal. Question: Which processing strategy is most likely to produce high-quality fabric while preserving the inherent strength of the natural fibers?

- A. Prolonging heat treatment at high temperatures to ensure complete impurity removal.
- B. Using highly concentrated acid baths to rapidly break down impurities.
- C. Implementing a reduced-temperature, shorter-duration heat treatment combined with a precisely pH-controlled chemical bath to minimize fiber degradation.
- D. Eliminating chemical treatments entirely in favor of mechanical processing.
- E. Sacrificing fiber strength by selecting for plant varieties with lower cellulose crystallinity.

Q34. In an arid region prone to cyclones and severe windstorms, a group of botanists studies native desert plants that rely on sporadic rainfall for reproduction. The soil, already low in nutrients, suffers further from erosion and altered salt composition due to high winds and heavy rains. These harsh conditions force plants to modify their reproductive strategies: some produce seeds with extended dormancy periods, while others evolve rapid flowering cycles

immediately after rainfall. Question: Which adaptation is most critical for plant survival in this challenging environment?

- A. Developing large, broad leaves to maximize photosynthesis during short rain periods.
- B. Enhancing seed dormancy mechanisms and rapid post-rain flowering to ensure reproduction despite erratic water availability and soil nutrient loss.
- C. Increasing root surface area to absorb more water even if the soil nutrient levels are suboptimal.
- D. Shifting to clonal reproduction exclusively to avoid the uncertainties of seed germination.
- E. Evolving thicker stems to resist wind erosion at the expense of reproductive output.

Q35. Engineers develop a smart agricultural system that monitors the growth of fiber-producing crops. The system employs high-speed cameras and light sensors to track plant motion (e.g., leaf orientation changes) in response to daily light cycles. Simultaneously, electric current sensors monitor the energy consumption of automated irrigation and nutrient delivery systems. During calibration tests, slight delays in sensor responses lead to discrepancies between the expected motion timing of the plants and the recorded electrical activity. Question: What is the most effective solution to synchronize the data from the light, motion, and electric current sensors?

- A. Increase the sampling rate of the electric current sensor while leaving others unchanged.
- B. Employ a centralized timing controller that synchronizes sensor data acquisition across all modalities, ensuring accurate correlation between plant motion and system energy usage.
- C. Use separate, high-precision clocks for each sensor and manually align the data afterward.
- D. Rely solely on the optical sensor data and ignore the electric current readings.
- E. Implement a delay in the light sensor signal to match the electric sensor's slower response.

Q36. A municipal wastewater treatment plant serves an industrial district and a nearby agricultural area. The treatment process uses heat to accelerate reactions, then adds acids and bases to neutralize contaminants. However, if the heating is not carefully controlled, unwanted chemical reactions occur that alter the water's mineral composition. This treated water is then reused for irrigation, where residual imbalances affect soil chemistry, leading to physical and chemical changes that compromise plant nutrition and, ultimately, forest health in the region. Question: Which modification in the treatment process is most likely to ensure that recycled water does not negatively affect soil and plant health?

- A. Significantly increasing the water's temperature during treatment to ensure all contaminants are destroyed.
- B. Adding a high concentration of base to completely offset any residual acids.
- C. Precisely controlling the heat treatment to prevent undesired side reactions, combined with accurate acid-base titration to achieve a neutral pH before irrigation.
- D. Reducing the flow rate to allow for extended reaction times without temperature control.
- E. Bypassing heat treatment entirely and relying solely on mechanical filtration.

Q37. In a region where industrial pollution, erratic rainfall, and rising temperatures are common, a team of ecologists studies a forest ecosystem that is critical for regional water regulation and biodiversity. The forest is subject to acid rain and contaminated wastewater, which alter soil chemistry. In response, tree species exhibit changes in both their reproductive strategies (e.g., altered flowering times and seed dormancy) and nutrient transportation mechanisms. Concurrently, the forest's organic matter and litter layer are affected by physical and chemical changes that modify water retention and nutrient recycling. Question: Which integrated strategy best explains the forest's resilience in the face of these combined stressors?

- A. Trees rely solely on deep root systems to bypass poor soil conditions.
- B. Trees adapt by modifying both their reproductive cycles (to optimize seed survival) and their internal nutrient transport systems, while the forest floor's organic matter adjusts to maintain soil moisture and nutrient recycling despite chemical imbalances.
- C. Forest resilience is achieved by a complete shift to asexual reproduction, eliminating the need for seed-based regeneration.
- D. Increased leaf size in all species compensates for reduced nutrient availability, regardless of soil conditions.
- E. Enhanced wind pollination mechanisms overcome any deficiencies in nutrient cycling.

Q38. A group of bioengineers investigates how rising ambient temperatures affect both plant transpiration and animal respiration in an experimental controlled ecosystem. They use electrical sensors to measure the ionic currents in plant vascular tissues (related to water transport) and muscle electrical activity in animals during periods of heat stress. They notice that at higher temperatures, both the electrical conductivity in plant tissues and the animal muscle signals change unexpectedly. These observations suggest that increased heat is influencing ion mobility, altering the efficiency of both water transport in plants and oxygen transport in animals. Question: Which mechanism best explains the observed changes in both plant and animal electrical signals under increased temperature conditions?

- A. Increased temperatures cause the plant cell walls to thicken, thereby reducing ion mobility.
- B. Higher temperatures increase ion mobility, which in turn enhances electrical conductivity in plant tissues and alters the excitability of animal muscle cells, affecting respiration and transport efficiency.
- C. Heat stress causes a complete shutdown of ion channels in both plants and animals, reducing all electrical signals.
- D. Elevated temperatures increase the resistance of biological tissues, leading to a drop in measured electrical currents.
- E. Temperature-induced changes in ion mobility have no effect on electrical conductivity in living organisms.

Q39. Farmers in a cyclone-prone coastal region have developed an innovative planting system for fiber-producing crops. The region experiences extreme winds and heavy rainfall during cyclones, which can erode soil, wash away seeds, and damage plant structures. To mitigate these effects, farmers stagger planting times, use windbreaks, and select plant varieties with rapid reproductive cycles and strong root systems. Additionally, they employ sensors that monitor wind speeds, soil moisture, and light intensity to optimize irrigation and fertilization schedules in real time. Question: Which integrated approach is most effective in ensuring crop survival and optimal fiber quality under these harsh climatic conditions?

- A. Planting all crops simultaneously to take advantage of a short window of calm weather.
- B. Relying solely on genetically modified crops with thicker stems to resist wind damage.
- C. Combining staggered planting schedules with the selection of varieties that exhibit rapid flowering, strong root anchorage, and integrated sensor-based management to adjust irrigation and fertilization dynamically.
- D. Focusing exclusively on soil conservation measures while ignoring plant reproductive timing.
- E. Installing permanent greenhouses to completely eliminate exposure to external weather.

Q40. A cutting-edge smart farm integrates diverse technologies to maximize sustainable production. The system monitors plant nutrition (through spectral analysis of leaf pigments), soil moisture and nutrient levels, and water purity from recycled wastewater. It also tracks animal health through sensors that record respiration rates and body temperature, while mechanical components (electric motors, timing devices, and light sensors) manage automated irrigation and harvesting. The farm faces challenges such as variable weather, potential chemical changes during wastewater treatment, and fluctuating electrical demands during peak irrigation times. Data from all sensors must be fused to adjust system operations in real time. Question: Which integrated strategy is most likely to ensure that the smart farm maintains optimal plant growth, animal health, and resource efficiency?

- A. Relying exclusively on pre-programmed irrigation schedules without real-time sensor feedback.
- B. Using separate control systems for plants and animals, with no integration of environmental data.
- C. Implementing an advanced central control system that fuses real-time data from environmental, biological, and mechanical sensors using adaptive algorithms (e.g., machine learning or Kalman filters) to dynamically adjust irrigation, nutrient delivery, and climate control.
- D. Prioritizing water purity over all other sensor data, regardless of plant or animal needs.
- E. Scheduling all operations during daylight hours to ensure maximum use of solar power.

Section C: Achievers Section

Q41. A ball is released from rest at the top of a smooth ramp. It reaches the bottom in 4 s with a final speed of 8 m/s. Assuming uniform acceleration, what is the acceleration of the ball?

- A. 1 m/s²
- B. 2 m/s²
- C. 4 m/s²
- D. 8 m/s²

Q42. A student connects two identical bulbs in series to a battery. One bulb is removed and the circuit becomes open. What happens to the other bulb?

- A. It glows brighter
- B. It glows dimmer
- C. It stops glowing
- D. It glows normally

Q43. A beaker contains a solution that turns blue litmus red and reacts with magnesium to produce bubbles of hydrogen gas. What is the nature of the solution?

- A. Acidic
- B. Basic
- C. Neutral
- D. Saturated sugar solution

Q44. A plane mirror forms an image of a candle placed 25 cm in front of it. How far is the image from the candle?

- A. 25 cm
- B. 50 cm
- C. 12.5 cm
- D. 75 cm

Q45. A metal lid on a glass jar is stuck. Pouring warm water over the metal lid helps open it mainly because:

- A. Glass expands more than metal
- B. Metal expands on heating and loosens slightly
- C. Water dissolves the lid
- D. The jar contracts rapidly

Q46. During a drought, a town uses rainwater harvesting pits. Which statement best explains their scientific purpose?

- A. They immediately convert salty water into drinking water
- B. They allow rainwater to percolate and recharge groundwater
- C. They increase evaporation from streets
- D. They remove all impurities from wastewater

Q47. A plant cutting develops into a new plant without the formation of seeds. This is an example of:

- A. Sexual reproduction
- B. Pollination
- C. Vegetative propagation
- D. Fertilization

Q48. Two soil samples are tested. Sample X lets water pass very quickly, while Sample Y holds water for a long time. Which conclusion is most reasonable?

- A. X is likely sandy and Y is likely clayey
- B. X is likely clayey and Y is likely sandy
- C. Both samples have the same particle size
- D. Neither sample can support plant growth

Q49. In a forest, decomposers break down dead leaves and animal remains. What is the most important result of this process?

- A. Oxygen is removed permanently from the atmosphere
- B. Nutrients return to the soil for plant growth
- C. Rainfall stops in the area
- D. All plants become parasites

Q50. In primary wastewater treatment, large suspended particles are mainly removed by letting the water stand in tanks. Which process is being used?

- A. Sedimentation
- B. Neutralization
- C. Photosynthesis
- D. Condensation

Answer Key and Explanations

Q.No.	Answer	Chapter / Skill Area	Explanation
1	C	Nutrition / Reproduction / Transport in Plants	Cuscuta wraps around a host plant and draws sugars and water from it- it is a parasite.
2	B	Nutrition / Reproduction / Transport in Plants	Insectivorous plants live in nitrogen-poor soils, so they digest insects to get nitrogen for proteins.
3	B	Nutrition and Respiration in Animals	Ruminants (e.g., cows, sheep) have a multi-chambered stomach and chew cud to break down cellulose.
4	B	Fibre to Fabric	Cotton is first ginned (seed removal), then carded, spun into yarn, and finally woven into fabric.
5	B	Fibre to Fabric	Fibroin is the structural protein secreted by silkworms to form silk fibers.
6	C	Integrated Science Reasoning	Metals conduct heat well via free electrons (conduction); wood is a poor conductor.
7	B	Heat	Heating increases the ball's volume-the metal expands and no longer fits.
8	B	Acids, Bases and Salts	$\text{HCl} + \text{NaOH} \rightarrow \text{NaCl (salt)} + \text{H}_2\text{O}$; a neutralization reaction.
9	C	Physical and Chemical Changes	Rusting produces a new substance (iron oxide); the others are physical changes.
10	C	Weather, Climate, Storms and Adaptations	Fur and fat insulate against heat loss in extremely cold Arctic climates.
11	B	Acids, Bases and Salts	Due to the Coriolis effect, cyclonic winds spin counterclockwise north of the Equator.
12	C	Nutrition / Reproduction / Transport in Plants	Topsoil contains decayed organic matter (humus), nutrients, and microorganisms.

13	C	Nutrition and Respiration in Animals	Gills have thin filaments with large surface area for gas exchange in water.
14	B	Nutrition / Reproduction / Transport in Plants	Phloem carries manufactured food (assimilates) to roots and growing regions.
15	B	Nutrition / Reproduction / Transport in Plants	Grafting joins tissues of two plants to grow as one-an asexual method.
16	D	Motion and Time	Average speed = total distance / total time = 400 m / 50 s = 8 m/s, so the correct option is D.
17	B	Heat	The low-melting-point alloy heats up quickly and melts, breaking the circuit.
18	C	Light	Temperature and density variations in air refract starlight, making them seem to twinkle.
19	B	Soil and Water	Recharge pits allow water to percolate down, recharging aquifers.
20	B	Nutrition / Reproduction / Transport in Plants	Sedimentation lets heavy solids settle out before further biological treatment.
21	B	Nutrition / Reproduction / Transport in Plants	Acidic wastewater lowers soil pH, which can chemically alter the forms of nitrogen and phosphorus so that they are not accessible to plants. Option A is incorrect because an increase in pH (alkaline conditions) would cause different nutrient issues. Option C misidentifies dilution as the primary cause, and Option D does not address the chemical inaccessibility of the nutrients. Option E misinterprets an adaptive response rather than a cause.
22	A	Nutrition / Reproduction / Transport in Plants	Heavy metals are known to bind to or alter the structure of hemoglobin, impairing its oxygen-carrying capacity. Although poor nutrition (Option C) can contribute to anemia, the direct effect of toxins on hemoglobin is a more immediate cause for the changes in respiration and oxygen transport. Options B, D, and E do not accurately capture the toxicological impact observed.
23	C	Nutrition / Reproduction / Transport in Plants	Option C balances the need for impurity removal with the preservation of the cellulose structure. Lower temperatures and shorter treatment times reduce the risk of degrading fiber strength, while careful pH control ensures that chemicals remove impurities without damaging the fibers. Options A and B risk over-processing, Option D may not effectively remove impurities, and Option E is counterproductive to fabric quality.
24	B	Nutrition / Reproduction / Transport in Plants	Acid rain reduces soil pH, causing leaching of nutrients and altering the balance of salts, which in turn reduces water retention and negatively impacts plant growth. This forces animals to adapt their foraging and sheltering behaviors. Options A, C, D, and E either misstate the effects of acid rain or propose mechanisms not directly linked to soil chemistry.
25	B	Nutrition and Respiration in Animals	Option B explains that although muscles are being activated (high electrical activity), inefficient oxygen delivery limits energy production, resulting in slower physical movement. This mismatch between the energy input (electrical/muscular effort) and the mechanical output (motion) is best explained by compromised oxygen transport. The other options either point to sensor errors or factors that do not fully account for the observed phenomenon.
26	C	Nutrition / Reproduction / Transport in Plants	Option C is correct because improving the efficiency of vascular tissues maximizes the use of scarce water and nutrients, and producing seeds with high dormancy ensures that reproduction can occur when favorable conditions return. Options A and B would increase water loss or reduce water capture in arid conditions, while Options D and E

			ignore the benefits of integrated physiological and reproductive adaptations.
27	C	Nutrition / Reproduction / Transport in Plants	Option C is correct because controlling the heating process minimizes undesired reactions while the careful adjustment of acid and base levels ensures proper neutralization. Options A and B risk overcorrecting the chemical balance, Option D may lead to other complications, and Option E would forgo the benefits of heat in accelerating necessary reactions.
28	B	Nutrition and Respiration in Animals	Option B is correct because the capacity to quickly adjust blood flow and metabolic rate is critical for maintaining internal temperature stability amid rapid external changes. Options A, C, D, and E represent strategies that might help in isolation but do not directly address the rapid physiological adjustments required after cyclonic weather events.
29	B	Motion and Time	Option B is correct because stabilizing the electric current and improving sensor response time directly addresses the delay between light intensity change and motor activation, thereby ensuring smoother acceleration. Options A and D might help but do not fix the underlying response time issues, while Options C and E change the experimental parameters without solving the sensor and circuit challenges.
30	A	Nutrition / Reproduction / Transport in Plants	Option A is correct because neutralizing the wastewater prior to irrigation will balance the pH, ensuring that the trace acids and bases are rendered harmless and do not induce unwanted chemical changes in the fibers. Options B and D risk damaging the fibers, Option C contradicts the sustainability goals, and Option E may not reliably counteract the chemical imbalance present in the irrigation water.
31	B	Nutrition / Reproduction / Transport in Plants	Acid rain and wastewater lower soil pH, causing chemical reactions that convert nutrients into insoluble compounds. Although water is abundant, the low pH renders nitrogen and phosphorus unavailable. Option A ignores the pH effect; Option C misattributes adaptation as a cause rather than a consequence; Option D incorrectly associates vascular adaptation with decreased absorption; and Option E, while leaching can occur, the primary mechanism here is the pH-induced chemical change.
32	A	Nutrition / Reproduction / Transport in Plants	Heavy metals can bind to or distort hemoglobin, increasing its oxygen affinity (i.e., oxygen is held too tightly) and impairing release to tissues. Option B misinterprets capillary density's role; Option C does not directly link to hemoglobin changes; Option D ignores the environmental toxin connection; and Option E is incorrect because the atmospheric oxygen is not low.
33	C	Nutrition / Reproduction / Transport in Plants	Option C strikes the optimal balance by reducing thermal and chemical stress while still removing impurities. High temperatures and concentrated chemicals (Options A and B) risk damaging the fibers, while eliminating chemicals (Option D) might not sufficiently clean them. Option E runs counter to the goal of preserving high fiber strength.
34	B	Nutrition / Reproduction / Transport in Plants	Option B directly addresses the challenge: in an environment with sporadic water and soil nutrient loss, producing seeds that remain dormant until conditions improve and flowering rapidly after rainfall ensures successful reproduction. Options A, C, D, and E address individual aspects but do not provide a holistic reproductive strategy under extreme weather conditions.
35	B	Nutrition / Reproduction / Transport in Plants	Option B is correct because a centralized timing controller ensures that all sensor data are synchronized in real time. This approach eliminates discrepancies arising from sensor-specific delays. Option A only addresses one sensor, Option C is cumbersome and error-prone, Option D ignores valuable information, and Option E arbitrarily delays data without addressing the root cause.

36	C	Nutrition / Reproduction / Transport in Plants	Option C is the most balanced approach: controlled heating prevents unwanted chemical reactions, and accurate acid-base adjustments ensure the water reaches a neutral pH. Options A and B risk creating new chemical imbalances, Option D may still lead to side reactions, and Option E does not address chemical contaminants effectively.
37	B	Nutrition / Reproduction / Transport in Plants	Option B provides the most comprehensive explanation, indicating that resilience is achieved by integrated adaptations at both the individual tree level (reproductive cycles and nutrient transport) and the ecosystem level (organic matter adjustments). The other options focus on single aspects of adaptation and do not fully address the multi-stressor environment.
38	B	Nutrition / Reproduction / Transport in Plants	Option B correctly links the effect of temperature on ion mobility: higher temperatures generally increase the kinetic energy of ions, enhancing conductivity and influencing the excitability of cells. Option A is contrary to typical physiological responses; Option C is an extreme scenario not observed here; Option D misunderstands the relationship between temperature and resistance in biological tissues; Option E is simply incorrect.
39	C	Nutrition / Reproduction / Transport in Plants	Option C is correct because it integrates multiple adaptive strategies—timing, varietal selection, and technology—to address both the immediate physical threats of wind and rain as well as longer-term issues such as soil erosion and nutrient management. Options A and B rely on single strategies; Option D ignores crucial reproductive adaptations; and Option E, while protective, is not a practical solution for large-scale agriculture in cyclone-prone areas.
40	C	Nutrition / Reproduction / Transport in Plants	Option C is the most comprehensive solution. By using an advanced central control system that integrates and processes data from all sensors in real time, the farm can dynamically adjust operations to maintain plant nutrition, animal health, and efficient resource use. Options A and B are too static or isolated, Option D is overly narrow, and Option E ignores the integrated management required under variable conditions.
41	B	Motion and Time	Acceleration = change in velocity / time = $(8 - 0) / 4 = 2 \text{ m/s}^2$.
42	C	Electric Current and its Effects	In a series circuit, removing one component breaks the complete path for current, so the other bulb also stops glowing.
43	A	Acids, Bases and Salts	Acids turn blue litmus red and react with active metals such as magnesium to produce hydrogen gas.
44	B	Light	In a plane mirror, the image forms the same distance behind the mirror as the object is in front. Total object-image distance = $25 + 25 = 50 \text{ cm}$.
45	B	Heat	Metal expands when heated. A slight expansion of the lid can loosen the grip on the jar.
46	B	Water: A Precious Resource	Recharge pits help rainwater seep into the ground, supporting groundwater replenishment.
47	C	Reproduction in Plants	A new plant produced from a stem, root, or leaf part is formed by vegetative propagation, an asexual method.
48	A	Soil	Sandy soil has larger particles and drains quickly; clayey soil has finer particles and holds water longer.
49	B	Forests: Our Lifeline	Decomposers recycle nutrients back into the soil, supporting plant growth and the forest food web.
50	A	Wastewater Story	Sedimentation allows heavier suspended solids to settle at the bottom before later treatment steps.