

SCO INTERNATIONAL BIOLOGY OLYMPIAD

Official Question Paper

Grade 9 / Class 9

The Fundamental Unit of Life | Tissues | Diversity | Health & Disease | Natural Resources | Food Resources

Conceptual Biology	Applied Reasoning	Global Readiness
Answer Key	Explanations	Academic Layout

DO NOT OPEN THIS BOOKLET UNTIL ASKED TO DO SO

Guidelines for the Candidate

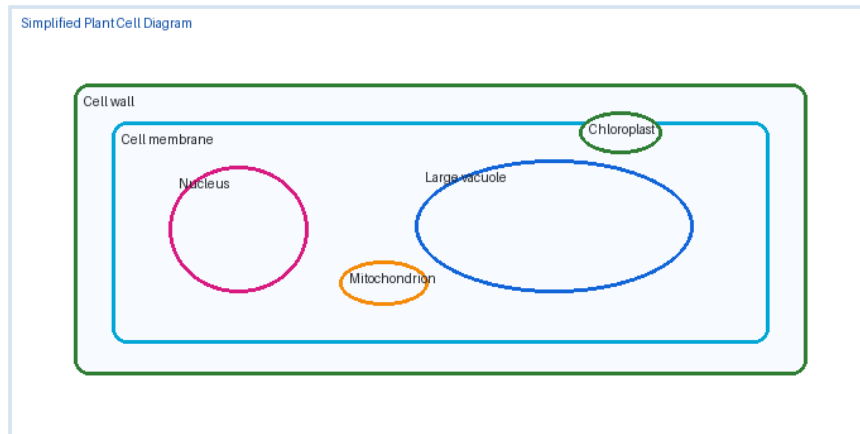
Paper Structure

Section	Question Nos.	Skill Focus	Marks
General Biology	1-30	Concept clarity, diagrams, basic application	30
Reason/Assertion	31-40	Scientific explanation and reasoning	10
Case Study	41-45	Data, passage, and applied biology	5
Achievers Section	46-50	Higher-order challenge questions	10

General Section

Questions 1 to 30 test conceptual clarity, observation, classification, health awareness, and resource management.

Q1 A student observes a cell under a microscope and finds a distinct nucleus, mitochondria, endoplasmic reticulum, and Golgi apparatus. Which conclusion is most suitable?



- A. The cell is prokaryotic because it has many organelles.
- B. The cell is eukaryotic because it has membrane-bound organelles.
- C. The cell must be a virus because it has genetic material.
- D. The cell cannot be living because organelles are visible.

Answer: B

Explanation: Eukaryotic cells contain a membrane-bound nucleus and several membrane-bound organelles. Prokaryotic cells lack a true nucleus and most membrane-bound organelles.

Q2 When raisins are placed in water, they swell after some time. Which process explains this observation?

- A. Diffusion of sugar out of the raisins
- B. Osmosis, because water enters through a selectively permeable membrane
- C. Active transport of oxygen into the raisins
- D. Exocytosis from the raisin cells

Answer: B

Explanation: Water moves from a region of higher water concentration to lower water concentration through a semipermeable membrane. This is osmosis.

Q3 A plant cell is kept in a concentrated salt solution. What will most likely happen to the cell?

- A. Water enters and the cell becomes turgid
- B. Water leaves and the cytoplasm shrinks from the cell wall
- C. The nucleus immediately divides
- D. The cell wall dissolves in salt water

Answer: B

Explanation: In a hypertonic solution, water moves out of the cell by osmosis. The cytoplasm shrinks away from the cell wall; this is plasmolysis.

Q4 Which organelle is called the powerhouse of the cell and why?

- A. Ribosome, because it stores genetic information
- B. Mitochondrion, because it releases energy during cellular respiration
- C. Golgi apparatus, because it digests waste
- D. Vacuole, because it makes proteins

Answer: B

Explanation: Mitochondria are the main sites of aerobic respiration, where energy stored in food is released in the form of ATP.

Q5 The plasma membrane is described as selectively permeable. What does this mean?

- A. It allows all substances to pass freely
- B. It permits some substances to pass while restricting others
- C. It is rigid and cannot change shape
- D. It is present only in plant cells

Answer: B

Explanation: The plasma membrane controls the movement of substances into and out of the cell. It allows selected molecules to pass based on size, charge, and transport mechanisms.

Q6 Which statement correctly compares plant and animal cells?

- A. Only animal cells have a cell wall
- B. Only plant cells usually have a cell wall and chloroplasts
- C. Only plant cells have a nucleus
- D. Only animal cells contain cytoplasm

Answer: B

Explanation: Plant cells generally have cell walls and chloroplasts, while animal cells do not. Both cell types have nucleus and cytoplasm.

Q7 Which part of the cell contains chromosomes and controls most cellular activities?

- A. Nucleus
- B. Vacuole
- C. Cell wall
- D. Ribosome

Answer: A

Explanation: The nucleus contains chromosomes made of DNA and regulates cell activities by controlling gene expression.

Q8 A cell has no true nucleus and its genetic material lies in a nucleoid region. This cell is most likely:

- A. A bacterial cell
- B. A plant cell
- C. An animal cell

D. A fungal cell

Answer: A

Explanation: Bacteria are prokaryotes. Their genetic material is not enclosed by a nuclear membrane and lies in a nucleoid region.

Q9 The Golgi apparatus is most directly involved in which cellular function?

- A. Synthesis of DNA
- B. Modification, packaging, and dispatch of materials
- C. Absorption of light energy
- D. Formation of the cell wall only

Answer: B

Explanation: The Golgi apparatus receives products from the ER, modifies them, packages them into vesicles, and sends them to specific destinations.

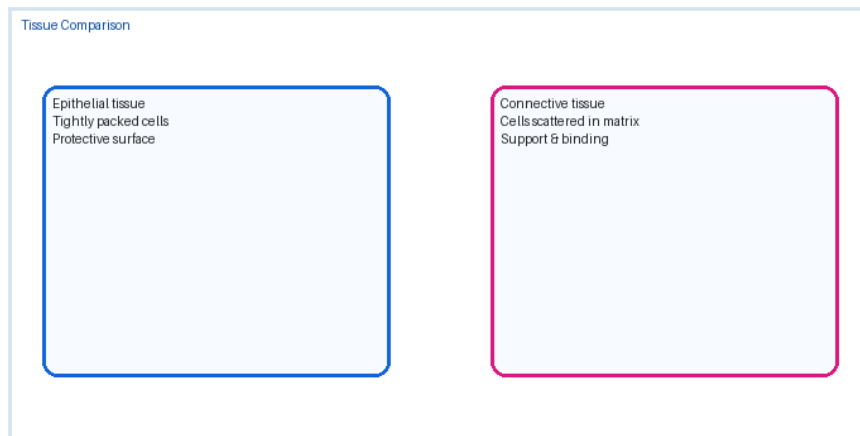
Q10 Which cell organelle is responsible for protein synthesis?

- A. Ribosome
- B. Lysosome
- C. Mitochondrion
- D. Vacuole

Answer: A

Explanation: Ribosomes translate genetic instructions into proteins. They may be free in cytoplasm or attached to rough endoplasmic reticulum.

Q11 Which tissue is most suitable for rapidly covering and protecting body surfaces?



- A. Epithelial tissue
- B. Nervous tissue
- C. Xylem tissue
- D. Adipose tissue

Answer: A

Explanation: Epithelial tissue forms protective coverings and linings. Its cells are compactly arranged and often regenerate quickly.

Q12 Which plant tissue is mainly responsible for transport of water and minerals from roots to leaves?

- A. Phloem
- B. Xylem
- C. Parenchyma
- D. Collenchyma

Answer: B

Explanation: Xylem transports water and minerals upward through the plant. Phloem transports food made in leaves.

Q13 A plant continues to grow in length at the tips of roots and shoots. Which tissue is responsible?

- A. Apical meristem
- B. Adipose tissue
- C. Cardiac muscle
- D. Bone tissue

Answer: A

Explanation: Apical meristems are found at the tips of roots and shoots and bring about increase in length.

Q14 Which animal tissue conducts messages rapidly from one part of the body to another?

- A. Nervous tissue
- B. Epithelial tissue
- C. Cartilage
- D. Blood

Answer: A

Explanation: Nervous tissue contains neurons that transmit electrical impulses, helping coordinate body activities.

Q15 Which tissue stores fat and also provides insulation?

- A. Adipose tissue
- B. Skeletal muscle
- C. Xylem
- D. Epidermis

Answer: A

Explanation: Adipose tissue is a connective tissue that stores fat. It helps in insulation and energy storage.

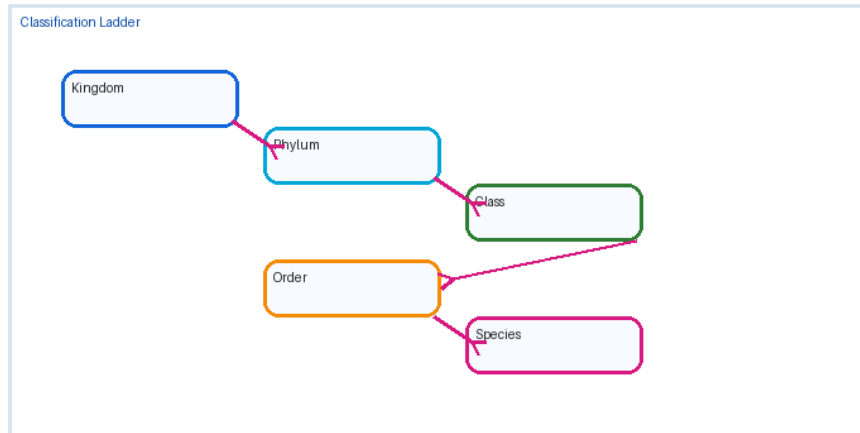
Q16 A slide shows long cylindrical cells with many nuclei and clear striations. Which tissue is most likely being observed?

- A. Smooth muscle
- B. Skeletal muscle
- C. Nervous tissue
- D. Simple squamous epithelium

Answer: B

Explanation: Skeletal muscles are striated, voluntary muscles with long cylindrical fibers and multiple nuclei.

Q17 In the hierarchy of classification, which order is correct from broader to narrower?



- A. Species -> Genus -> Family -> Order
- B. Kingdom -> Phylum -> Class -> Order -> Family -> Genus -> Species
- C. Genus -> Species -> Kingdom -> Class
- D. Family -> Kingdom -> Species -> Phylum

Answer: B

Explanation: The standard taxonomic hierarchy proceeds from Kingdom to Species through increasingly specific categories.

Q18 Why is binomial nomenclature useful in biology?

- A. It gives every organism many local names
- B. It gives a universal two-part scientific name to each species
- C. It replaces the need for classification
- D. It groups organisms only by color

Answer: B

Explanation: Binomial nomenclature uses genus and species names to give organisms internationally recognized scientific names.

Q19 Which kingdom includes organisms that are unicellular, prokaryotic, and lack a true nucleus?

- A. Monera
- B. Protista
- C. Fungi
- D. Plantae

Answer: A

Explanation: Kingdom Monera includes prokaryotic organisms such as bacteria.

Q20 Which feature best separates vertebrates from invertebrates?

- A. Presence of chlorophyll
- B. Presence of a backbone or vertebral column
- C. Ability to make food
- D. Small body size

Answer: B

Explanation: Vertebrates have a backbone or vertebral column. Invertebrates lack a backbone.

Q21 A disease spreads through contaminated water and causes diarrhea in many people. Which preventive step is most direct?

- A. Use unsafe open water sources
- B. Drink boiled or properly treated water
- C. Avoid all protein foods
- D. Stop vaccination for all diseases

Answer: B

Explanation: Water-borne diseases can be prevented by safe drinking water, sanitation, and hygiene.

Q22 Why are antibiotics ineffective against viral diseases like common cold?

- A. Viruses are too large for medicines
- B. Antibiotics target bacterial structures or processes that viruses do not have
- C. Viruses have cell walls stronger than bacteria
- D. Antibiotics increase viral replication

Answer: B

Explanation: Antibiotics act on bacterial targets such as cell wall synthesis or ribosomes. Viruses use host machinery and lack these targets.

Q23 Which option best explains vaccination?

- A. A vaccine always cures a disease after symptoms appear
- B. A vaccine trains the immune system to recognize a pathogen safely
- C. A vaccine kills all microbes in the environment
- D. A vaccine replaces the need for hygiene

Answer: B

Explanation: Vaccines expose the immune system to harmless forms or parts of a pathogen, helping it respond faster during future exposure.

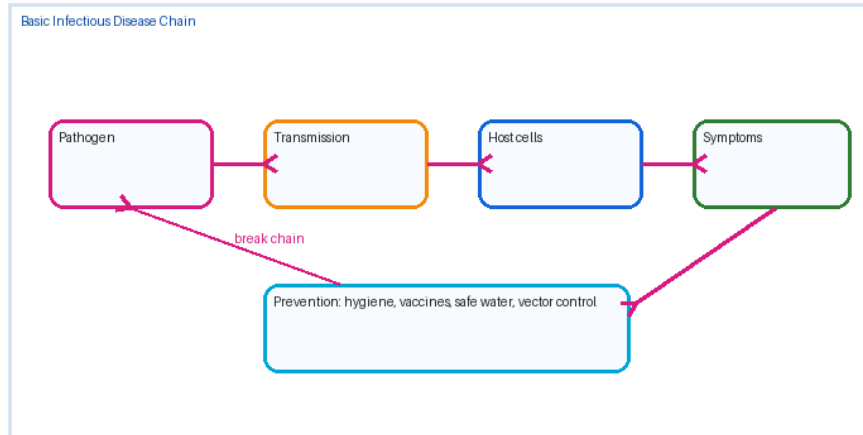
Q24 Which is a non-infectious disease?

- A. Tuberculosis
- B. Malaria
- C. Diabetes
- D. Influenza

Answer: C

Explanation: Diabetes is generally non-infectious and cannot spread from person to person. Tuberculosis, malaria, and influenza are infectious.

Q25 The chain shown in the diagram can be broken most effectively by which public health approach?

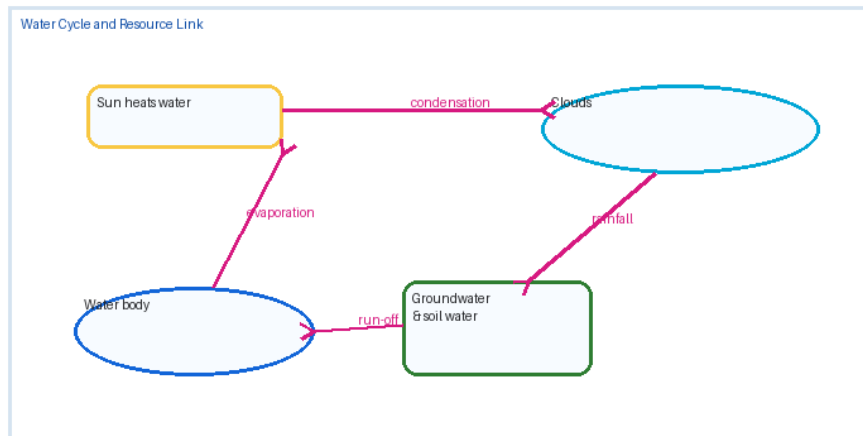


- A. Allowing stagnant water to remain near homes
- B. Combining hygiene, safe water, vaccination where available, and vector control
- C. Using antibiotics for every fever
- D. Ignoring early symptoms in a community

Answer: B

Explanation: Infectious disease control requires breaking transmission through sanitation, safe water, vaccination when relevant, vector control, and early treatment.

Q26 Which process adds water vapour to the atmosphere from plant leaves?



- A. Condensation
- B. Transpiration
- C. Precipitation
- D. Nitrogen fixation

Answer: B

Explanation: Transpiration is the loss of water vapour from aerial parts of plants, mainly through stomata. It is important in the water cycle.

Q27 Which human activity most directly increases carbon dioxide concentration in air?

- A. Planting trees
- B. Burning fossil fuels
- C. Using drip irrigation
- D. Composting plant waste carefully

Answer: B

Explanation: Burning fossil fuels releases carbon dioxide, a greenhouse gas, into the atmosphere.

Q28 Which organism converts atmospheric nitrogen into forms usable by plants?

- A. Rhizobium bacteria
- B. Mosquito larvae
- C. Yeast in bread
- D. Amoeba

Answer: A

Explanation: Rhizobium bacteria live in root nodules of leguminous plants and fix atmospheric nitrogen into usable compounds.

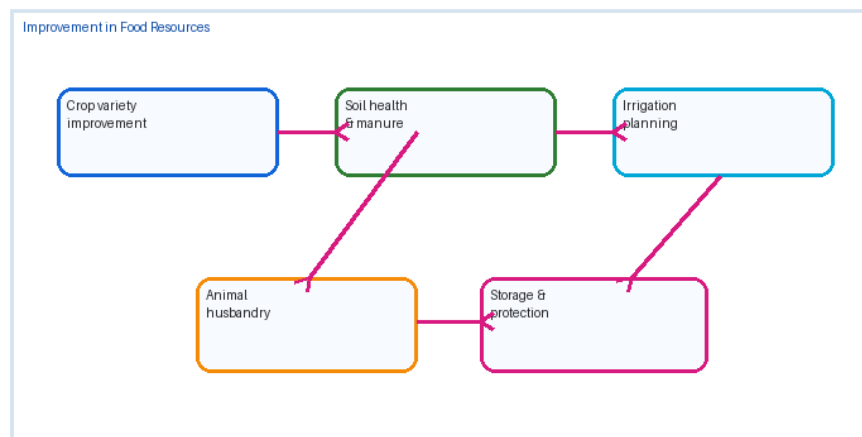
Q29 Why is excessive use of chemical fertilizers harmful in the long term?

- A. It always increases biodiversity
- B. It may reduce soil health and pollute water bodies through runoff
- C. It prevents plant growth immediately
- D. It converts all soil into humus

Answer: B

Explanation: Overuse of fertilizers can damage soil structure, reduce microbial balance, and cause nutrient pollution in water bodies.

Q30 Which practice supports sustainable improvement in food resources?



- A. Crop rotation and use of organic manure
- B. Continuous monoculture without soil care
- C. Using only more pesticides each year
- D. Removing all beneficial insects

Answer: A

Explanation: Crop rotation, organic manure, soil testing, improved varieties, and balanced irrigation support long-term food production.

Reason and Assertion

For Questions 31 to 40, choose the correct option based on the relationship between the Assertion and Reason.

Q31 Assertion: The plasma membrane helps maintain the internal environment of the cell. Reason: It controls the movement of selected substances into and out of the cell.

- A. Both Assertion and Reason are true, and Reason correctly explains Assertion.
- B. Both are true, but Reason does not explain Assertion.
- C. Assertion is true, Reason is false.
- D. Assertion is false, Reason is true.

Answer: A

Explanation: The selective permeability of the plasma membrane directly helps maintain the internal environment of the cell.

Q32 Assertion: Plant cells placed in a hypertonic solution may show plasmolysis. Reason: Water moves out of the cell by osmosis.

- A. Both Assertion and Reason are true, and Reason correctly explains Assertion.
- B. Both are true, but Reason does not explain Assertion.
- C. Assertion is true, Reason is false.
- D. Assertion is false, Reason is true.

Answer: A

Explanation: In a hypertonic solution, water leaves the cell, causing the cytoplasm to shrink away from the cell wall.

Q33 Assertion: Meristematic tissue helps plants grow. Reason: Its cells actively divide.

- A. Both Assertion and Reason are true, and Reason correctly explains Assertion.
- B. Both are true, but Reason does not explain Assertion.
- C. Assertion is true, Reason is false.
- D. Assertion is false, Reason is true.

Answer: A

Explanation: Meristematic cells keep dividing and produce new cells, which leads to growth in plants.

Q34 Assertion: Xylem transports food from leaves to other parts of the plant. Reason: Xylem contains vessels and tracheids.

- A. Both Assertion and Reason are true, and Reason correctly explains Assertion.
- B. Both are true, but Reason does not explain Assertion.
- C. Assertion is true, Reason is false.
- D. Assertion is false, Reason is true.

Answer: D

Explanation: The assertion is false because phloem transports food. The reason is true because xylem has vessels and tracheids.

Q35 Assertion: High biodiversity can make ecosystems more stable. Reason: Different organisms perform different ecological roles and support resilience.

- A. Both Assertion and Reason are true, and Reason correctly explains Assertion.
- B. Both are true, but Reason does not explain Assertion.
- C. Assertion is true, Reason is false.
- D. Assertion is false, Reason is true.

Answer: A

Explanation: Biodiversity provides functional variety and resilience against disturbances.

Q36 Assertion: Antibiotics should not be used unnecessarily. Reason: Misuse of antibiotics can select for resistant bacteria.

- A. Both Assertion and Reason are true, and Reason correctly explains Assertion.
- B. Both are true, but Reason does not explain Assertion.
- C. Assertion is true, Reason is false.
- D. Assertion is false, Reason is true.

Answer: A

Explanation: Unnecessary or improper antibiotic use creates selective pressure that favours resistant strains.

Q37 Assertion: Viruses are not included in the five-kingdom classification as cellular organisms. Reason: Viruses lack cellular structure and replicate only inside host cells.

- A. Both Assertion and Reason are true, and Reason correctly explains Assertion.
- B. Both are true, but Reason does not explain Assertion.
- C. Assertion is true, Reason is false.
- D. Assertion is false, Reason is true.

Answer: A

Explanation: Viruses are acellular and depend on host machinery, so they do not fit the same cellular kingdom framework.

Q38 Assertion: Forests influence rainfall patterns. Reason: Trees release water vapour through transpiration and contribute to atmospheric moisture.

- A. Both Assertion and Reason are true, and Reason correctly explains Assertion.
- B. Both are true, but Reason does not explain Assertion.
- C. Assertion is true, Reason is false.
- D. Assertion is false, Reason is true.

Answer: A

Explanation: Transpiration from forests contributes to the water cycle and can influence local moisture and rainfall.

Q39 Assertion: Manure improves soil health in ways that chemical fertilizers alone may not. Reason: Manure adds organic matter and supports soil microorganisms.

- A. Both Assertion and Reason are true, and Reason correctly explains Assertion.
- B. Both are true, but Reason does not explain Assertion.
- C. Assertion is true, Reason is false.
- D. Assertion is false, Reason is true.

Answer: A

Explanation: Manure improves soil structure, water retention, and microbial activity in addition to supplying nutrients.

Q40 Assertion: All diseases are infectious. Reason: Diseases can be caused by microbes, genetic factors, poor nutrition, or lifestyle conditions.

- A. Both Assertion and Reason are true, and Reason correctly explains Assertion.
- B. Both are true, but Reason does not explain Assertion.
- C. Assertion is true, Reason is false.
- D. Assertion is false, Reason is true.

Answer: D

Explanation: The assertion is false because many diseases are non-infectious. The reason is true and shows that causes of disease vary.

Case Study Section

Questions 41 to 45 use short passages, diagrams, or real-life biological situations. The passage is part of the question block.

Q41 Case Study: A student places onion peel cells in pure water and then in a concentrated sugar solution. In pure water, the cells appear swollen; in sugar solution, the cell contents shrink away from the wall. Which process explains both observations?

- A. Photosynthesis
- B. Osmosis
- C. Protein synthesis
- D. Binary fission

Answer: B

Explanation: Both observations are due to water movement through the plasma membrane. Water enters in hypotonic conditions and leaves in hypertonic conditions.

Q42 Case Study: A farmer grows the same cereal crop every season and notices declining yield and more pests. Which plan is scientifically better for long-term improvement?

- A. Continue monoculture and use more pesticide only
- B. Introduce crop rotation, balanced nutrients, resistant varieties, and field monitoring
- C. Stop irrigation permanently
- D. Burn crop residues and remove all soil organisms

Answer: B

Explanation: Crop rotation, balanced nutrient management, improved varieties, and pest monitoring improve soil health and reduce pest pressure.

Q43 Case Study: A community has repeated outbreaks of mosquito-borne disease after rains. Stagnant water is found in containers, tyres, and open drains. Which intervention attacks the source most directly?

- A. Keep all water containers uncovered
- B. Remove stagnant water and prevent mosquito breeding
- C. Use antibiotics for all households
- D. Avoid washing hands

Answer: B

Explanation: Mosquito control begins by removing breeding sites such as stagnant water, along with nets, repellents, and community sanitation.

Q44 Case Study: In a pond ecosystem, fish deaths increase after fertilizer runoff enters the water. Algal growth becomes excessive and dissolved oxygen falls. What is this process called?

- A. Eutrophication
- B. Transpiration
- C. Osmoregulation
- D. Pollination

Answer: A

Explanation: Nutrient enrichment causes algal bloom. When algae die and decompose, dissolved oxygen decreases, harming aquatic life.

Q45 Case Study: A scientist compares two organisms. Organism X has a notochord, dorsal nerve cord, and vertebral column. Organism Y lacks a backbone. Which classification is correct?

- A. X is an invertebrate and Y is a vertebrate
- B. X is a vertebrate and Y is an invertebrate
- C. Both must be plants
- D. Both belong to Monera

Answer: B

Explanation: A vertebral column indicates a vertebrate. Absence of backbone indicates an invertebrate.

Achievers Section

Questions 46 to 50 are higher-order questions and carry 2 marks each.

Q46 Achievers: A red blood cell placed in distilled water may burst, while a plant cell usually does not burst under the same condition. What is the best explanation?

- A. Plant cells have no plasma membrane
- B. Plant cells have a rigid cell wall that resists bursting
- C. Animal cells have chloroplasts
- D. Water cannot enter plant cells

Answer: B

Explanation: Both cells take in water, but the plant cell wall provides mechanical support and prevents bursting.

Q47 Achievers: A researcher blocks ribosome activity in a growing cell. Which immediate effect is most likely?

- A. Protein synthesis will be reduced
- B. Cell wall will immediately disappear
- C. Osmosis will stop completely
- D. Chromosomes will become circular

Answer: A

Explanation: Ribosomes are the site of protein synthesis. Blocking them reduces the cell's ability to make proteins.

Q48 Achievers: In a classification activity, two organisms are similar in body plan but DNA evidence shows they are not closely related. Which concept explains this mismatch?

- A. Convergent evolution
- B. Osmosis
- C. Transpiration
- D. Vaccine memory

Answer: A

Explanation: Convergent evolution can produce similar features in unrelated organisms due to similar environmental pressures.

Q49 Achievers: A district wants to reduce antibiotic resistance. Which policy is most scientifically sound?

- A. Allow antibiotics for every cold and cough
- B. Use antibiotics only when clinically needed and complete prescribed courses
- C. Stop sanitation programs
- D. Use higher antibiotic doses without diagnosis

Answer: B

Explanation: Responsible antibiotic use reduces selection pressure for resistant bacteria. Viral colds do not need antibiotics.

Q50 Achievers: A drought-prone village wants to improve food production without degrading soil. Which combined strategy is best?

- A. Flood irrigation plus continuous monoculture
- B. Drought-tolerant varieties, drip irrigation, mulching, crop rotation, and organic amendments
- C. Only pesticides and no soil testing
- D. Remove all local crop varieties

Answer: B

Explanation: The combined strategy conserves water, improves soil health, and uses crop diversity to reduce risk.

Answer Key

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
B	B	B	B	B	B	A	A	B	A
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
A	B	A	A	A	B	B	B	A	B
Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30
B	B	B	C	B	B	B	A	B	A
Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
A	A	A	D	A	A	A	A	A	D
Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50
B	B	B	A	B	B	A	A	B	B