



Indian School Al Wadi Al Kabir

Mid-term Examination (2026-2027)

Class: IX
Date: 17/09/2026

Subject: SCIENCE (086)
Set- II

Max. Marks: 80
Time: 3 Hours

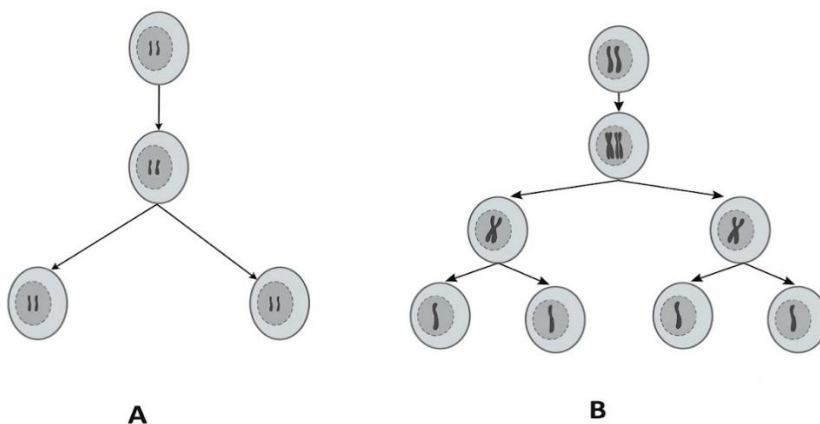
General Instructions:

(i) This question paper consists of 39 questions in 3 sections. Section A is Biology, Section B is Chemistry, and Section C is Physics.

(ii) All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

Section – A

- 1 Which statement accurately describes the biological significance of the cellular division processes depicted? 1

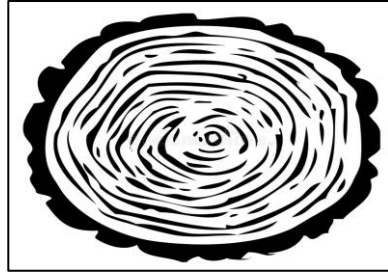


- A. Process A produces gametes, while Process B is involved in growth and repair.
- B. Process A maintains the chromosome number during growth, while Process B produces gametes.
- C. Process A occurs only in reproductive cells, while Process B occurs only in body cells.
- D. Both processes produce daughter cells with the same chromosome number as the parent cell.

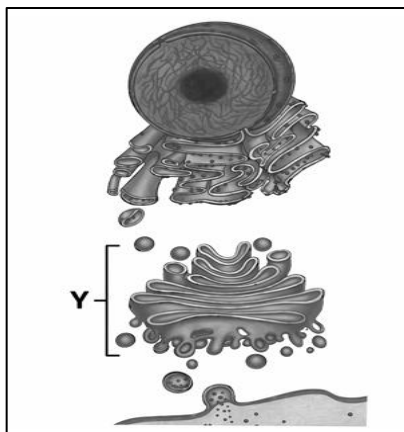
- 2 Identical pieces of potato were placed in four beakers containing unknown sugar solutions. Based on the mass changes recorded in the table, which beaker contained a hypotonic solution? 1

Beaker	Initial mass of potato piece (g)	Final mass after 2 hours (g)
Beaker P	5.0	5.0
Beaker Q	5.0	6.2
Beaker R	5.0	3.8
Beaker S	5.0	4.5

- A. Beaker P
B. Beaker Q
C. Beaker R
D. Beaker S
- 3 Which statement correctly describes the structure of the cell membrane according to the fluid-mosaic model? 1
- A. It has a lipid bilayer with proteins embedded in it.
B. It has a protein bilayer with lipids embedded in it.
C. It has a single lipid layer with proteins arranged outside it.
D. It consists only of lipids arranged in a mosaic pattern.
- 4 A plant is supplied with adequate water, but the stomata on its leaves remain closed for a prolonged period. Which of the following processes would be most directly affected as a consequence? 1
- A. Formation of new cells in the growing regions.
B. Gas exchange and evaporation of water vapours.
C. Transportation of food and elimination of wastes.
D. Storage of food in the plant body.
- 5 A scientist examines the cut surface of a tree trunk and observes that some ring-like patterns are broad, while others are narrow. What do these differences in the rings indicate? 1



- A. The different stages of development of the roots.
 B. The different types of tissues present in the stem.
 C. The favourable and unfavourable growth conditions during different years
 D. The different directions in which the stem grows
- 6 A plant transports food from its leaves to other parts. In the phloem, different elements perform different functions. Which option correctly matches a phloem element with its function? 1
- A. Sieve tubes — store food materials, resin, tannins and latex
 B. Companion cells — monitor loading and unloading of sugars in sieve tubes
 C. Phloem fibres — transport food from leaves to other parts
 D. Phloem parenchyma — provide strength to the phloem
- 7 A grapevine growing along a support develops slender tendrils that bend around the support without breaking. Which type of plant tissue enables these tendrils to provide support while retaining flexibility? 1
- A. Epidermis
 B. Sclerenchyma
 C. Collenchyma
 D. Parenchyma
- The following two questions consist of two statements – **Assertion (A)** and **Reason (R)**. Answer these questions by selecting the appropriate option given below:
- A. Both A and R are true, and R is the correct explanation of A.**
B. Both A and R are true, and R is not the correct explanation of A.
C. A is true, but R is false.
D. A is false, but R is true.
- 8 **Assertion (A):** A plant cell remains firm even when the amount of water inside its vacuole decreases. 1
Reason (R): The vacuole helps maintain pressure inside the cell by storing large amounts of water.
- 9 **Assertion (A):** Cellular flexibility helps animals make their bodies suitable for locomotion. 1
Reason (R): Without a rigid cell wall, animal cells can change shape easily.
- 10 (i) Why are lysosomes commonly called the clean-up system of the cell? 2
 (ii) Study the diagram given below and answer the following:



- (a) Identify the cell organelle marked Y.
 (b) State one important function of this organelle.
- 11 **Students to attempt either option A or B.** 2
- A.
- (i) Why is a thick cuticle on the outer wall of the epidermis advantageous to a plant growing in desert conditions?
- (ii) A plant has a greater number of root hairs than another plant. What advantage would this provide to the plant in absorbing water and minerals from the soil?
- OR**
- B. What are the characteristics of meristematic tissue that enable it to undergo continuous and rapid cell division?
- 12 (i) Why are the cells of coconut husk considered hard and dead? What substance is deposited in their cell walls? 2
- (ii) A student observes a growing plant and finds that the meristematic tissue continuously adds new cells to the plant body. Some of these cells later become specialised to perform functions such as support, transport and storage.
- (a) What type of tissue do these cells become?
- (b) What is the process by which meristematic tissue becomes specialised to perform specific functions called?
- 13 (i) Draw a neat and labelled diagram of a prokaryotic cell. Label the following parts: 3
- (a) Nucleoid
- (b) Cell wall
- (ii) Write any one point of difference between a prokaryotic cell and a eukaryotic cell.
- 14 Compare apical, intercalary, and lateral meristems in terms of their locations in the plant body and their respective functions 3
- 15 A farmer observed that different parts of the same plant showed very different characteristics. The leaves were green and received sunlight, some flowers and fruits developed bright colours, and underground parts such as tubers accumulated food. These differences were related to the presence of different types of plastids in the cells. The farmer also learnt that plastids and mitochondria share certain structural features. 4

Attempt either subpart A or B.

A. Identify the three types of plastids likely to be present in the leaves, coloured parts, and storage regions described above. State the function of the plastid present in the leaves.

OR

- B. State one similarity and one difference between plastids and mitochondria.
C. What is the name of the colourless plastid found in plant cells? State its function.
D. Why are bright colours of flowers and fruits important for plants?

16 **Attempt either option A or B.**

5

- A. (i) Draw a neat and labelled diagram of an animal cell.
(ii) Differentiate between rough endoplasmic reticulum (RER) and smooth endoplasmic reticulum (SER) based on their structure and function.

OR

- B. (i) How is the inner membrane of a mitochondrion structurally different from its outer membrane, and what is the significance of this difference?
(ii) A circular field of view of a microscope has a diameter of 6 mm. When an onion peel is observed, 30 cells are seen along the diameter in a straight line. Calculate the estimated size of one onion cell in micrometres (μm).
(iii) What is contact inhibition? What happens when cancer cells lose this control?

Section – B

- 17 In Ernest Rutherford's alpha-particle scattering experiment, a very small fraction of alpha particles bounced back by 180° . What conclusion was drawn from this specific observation? 1
A. Electrons revolve around the nucleus in circular paths.
B. Most of the space inside the atom is empty.
C. The mass of the atom is uniformly distributed throughout the volume.
D. The positive charge and mass of the atom are concentrated in a very small volume at the centre.
- 18 How do the solubilities of solid solutes and gaseous solutes in liquid solvents generally change when the temperature is increased? 1
A. The solubility of solids increases, while the solubility of gases decreases.
B. The solubility of solids decreases, while the solubility of gases increases.
C. The solubility of both solids and gases increases.
D. The solubility of both solids and gases decreases.
- 19 Which of the following substances changes directly from a solid state to a vapour state upon heating below its melting point? 1
A. Copper sulphate
B. Camphor
C. Sodium chloride
D. Alum

- 20 Emulsions are colloids where both the dispersed phase and the dispersion medium are liquids. Which of the following is classified specifically as a water-in-oil emulsion? 1
 A. Milk
 B. Vanishing cream
 C. Butter
 D. Vinegar
- 21 How does paper chromatography separate the different components of a mixture? 1
 A. By separating them based on their boiling points.
 B. By using differences in their densities as the paper is spun rapidly.
 C. By using differences in their interactions with the solvent and the paper as they move up at different speeds.
 D. By freezing the mixture so that the components solidify at different rates.
- 22 You are given a dry, solid-solid mixture containing naphthalene and sand. Which technique is most appropriate to isolate the sand? 1
 A. Evaporation
 B. Sublimation
 C. Coagulation
 D. Decantation
- 23 Some gas mixtures are actually heterogeneous. Which of the following is an example of a heterogeneous mixture where a gas is one of the components? 1
 A. A mixture of hydrogen and oxygen used as rocket fuel
 B. Aerated drinks like soda
 C. Smoke consisting of solid particles suspended in air
 D. Vinegar
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- 24 **Assertion (A):** Brass is classified as a homogeneous mixture of copper and zinc. 1
Reason (R): The copper and zinc components in brass can be easily separated from one another using standard laboratory filtration.
- 25 If 15 g of glucose is dissolved in water to make 300 mL of solution, calculate its concentration in mass by volume percentage. 2
- 26 Attempt either option A or B. 3
 A.
 (i) Contrast the particle sizes of true solutions, colloids, and suspensions.
 (ii) Define Tyndall effect.

- (iii) Identify two real-world applications or occurrences of the Tyndall effect in our surroundings.

OR

B.

- (i) What is a crystal?
(ii) State the principle on which purification by crystallization is based.
(iii) How does the rate of evaporation affect crystallization?

- 27 (i) Which physical phenomenon disproved the idea of the indivisible atom? 3
(ii) Who discovered the subatomic particle having charge equal and opposite to that of protons?
(iii) Mention one postulate proposed by Rutherford about the model of an atom that makes it highly unstable.

- 28 During a laboratory session, Meera accidentally mixed acetone with water. Her teacher told her that these two liquids are miscible and can be separated by a method 'A' that uses the difference in their boiling points. Acetone boils at about 56 °C while water boils at 100 °C. Meera sets up the apparatus, heats the mixture, and collects both liquids in separate flasks after passing them through a condenser. 4
A. Identify Method 'A' and justify why it is appropriate for separating this specific mixture.
B. Predict which liquid will be collected in the receiving flask first. Explain.
C. What is the name of the process used in petroleum refineries to separate crude oil? How is it different from method 'A'?

OR

- C. Explain the role of the condenser in 'A'. Why is this method preferred over simple evaporation for this mixture?

- 29 **Attempt either option A or B.** 5

A.

- (a) Is blood a true solution, a colloid, or a suspension? Explain. Name the method used to separate its components.
(b) What is the principle behind this method?
(c) How is this technique different from coagulation?
(d) Write one real-life application of coagulation and name the coagulant used.

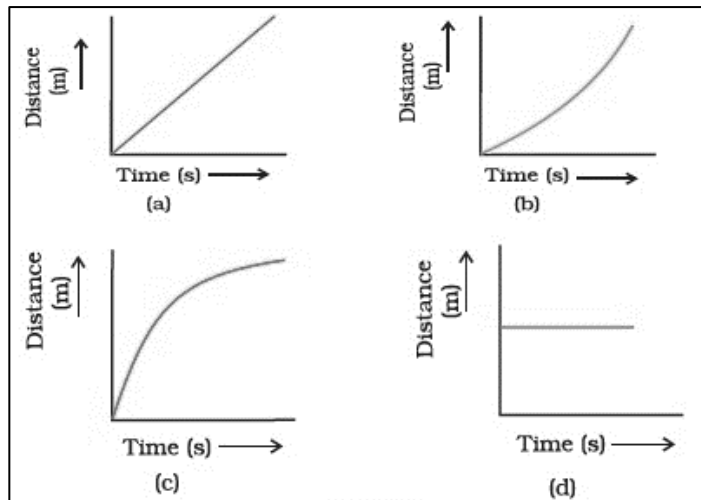
OR

B.

- (a) Name the technique used to separate a mixture of two immiscible liquids. Draw a labelled diagram of the experimental setup.
(b) Which method is suitable to separate different pigments from the green extract of spinach leaves? Explain the procedure.
(c) You are given two closed test tubes containing clear liquids. One contains a sugar solution, and the other contains a starch solution. Give any method to distinguish between them without opening the tubes. Explain.

Section – C

- 30 A body is moving with a uniform speed 'u' for 't' seconds; then the distance travelled by the body is given by: 1
- A. $s = u t + \frac{1}{2}at^2$
- B. $s = u t - \frac{1}{2}at^2$
- C. $s = u t$
- D. $s = \frac{u}{t}$
- 31 Which of the following graphs correctly represents the uniform accelerated motion of an object? 1

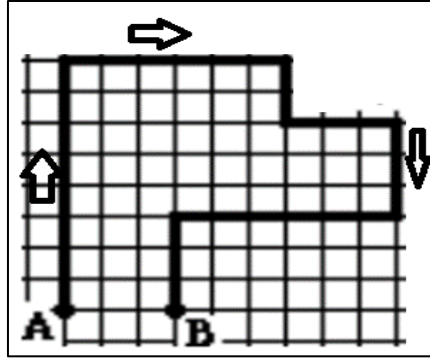


- A. Fig. a
- B. Fig. b
- C. Fig. c
- D. Fig. d

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- 32 **Assertion (A):** The forces are said to be balanced if the net force is zero 1
Reason (R): A balanced force is responsible for a change in the position or state of an object
- 33 Observe the diagram below. A person starts at A, walks along the bold path and finishes at B in 30 seconds. Each square is 1 m along its edge. Use the diagram in answering the following questions. 2



- (i) What is the displacement of the person in 30 seconds?
 (ii) What is his velocity during the journey?
- 34 **Attempt either option A or B.** 2

A.

- (i) Define acceleration and write its SI unit.
 (ii) Is it a scalar or vector quantity?

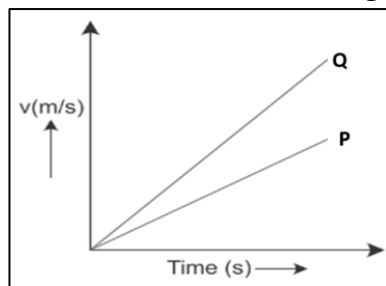
OR

B.

- (i) What is the difference between speed and velocity? What is the unit of velocity?
 (ii) Is speed a scalar or vector quantity?

- 35 (i) Define uniform circular motion 3
 (ii) Why is this type of motion considered to be accelerated motion even if the speed remains constant?

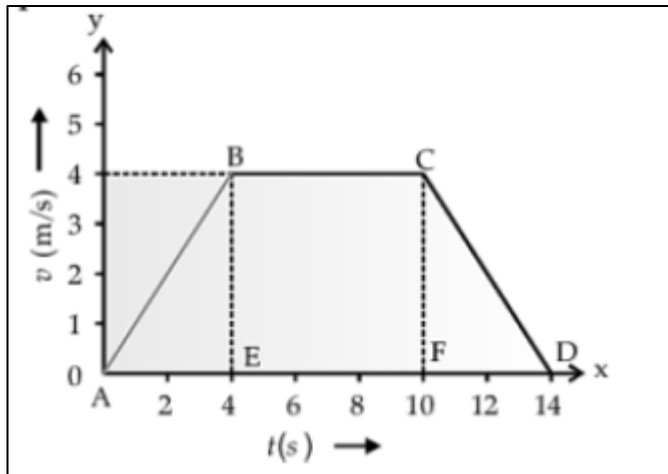
- 36 Velocity – time graphs of two bodies P and Q are as shown below 3
 (i) Which of the two bodies, P or Q, is moving with lower acceleration, and why?



- (ii) What is the quantity that is measured by the area occupied below the velocity-time graph?
 (iii) What can you say about the motion of an object whose velocity-time graph is a straight line parallel to the time axis?
- 37 (i) Draw a velocity–time graph for a body starting from rest that moves under uniform acceleration and acquires a velocity of 2m/s in 5 seconds. 3

(ii) A bus starting from rest moves with a uniform acceleration of 0.5m/s^2 for 50s. Find the speed acquired and the distance travelled by the bus.

- 38 The following case is the velocity-time graph for the motion of a car. The total time taken by the car to complete the journey is 14 seconds. Study the given graph and answer the following questions. 4



- A. Name the physical quantity measured by the slope of the velocity-time graph.
 B. Which part of the graph shows zero acceleration? Write whether AB, BC or CD.
Attempt either subpart C or D.
 C. Calculate the negative acceleration[retardation] produced during the journey.

OR

- D. Find out the distance covered by the car in the first 4 seconds.

- 39 **Attempt either option A or B.** 5

A. Using the velocity-time graph, derive the equations:

(i) $v = u + at$

(ii) $s = ut + \frac{1}{2}at^2$

- (iii) A bus starting from rest moves with a uniform acceleration of 2 ms^{-2} for 30 s. Find the speed acquired.

OR

B. (i) Using the velocity-time graph, derive the equation

$$v^2 = u^2 + 2as$$

- (ii) Find the acceleration of the bus when it decreases its speed from 50m/s to 25m/s in 5 s.

All the best