HALF YEARLY EXAMINATION—2023-24
CLASS–IX
SUBJECT–SCIENCE

Time : 3 Hrs.   M.M. : 80

No. of Pages 16   No. of Qs. 39

General Instructions:

(i)   *This question paper consists of 39 questions in 5 sections.*

(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.*

(iii)   *Section A consists of 20 objective type questions carrying 1 mark each.*

(iv)   *Section B consists of 6 Very Short questions carrying 2 marks each. Answers to these questions should be in the range of 30 to 50 words.*

(v)   *Section C consists of 7 Short Answer type questions carrying 3 marks each. Answers to these questions should be in the range of 50 to 80 words.*

(vi)   *Section D consists of 3 Long Answer type questions carrying 5 marks each. Answers to these questions should be in the range of 80 to 120 words.*

(vii)   *Section E consists of 3 source-based/case-based units of assessment of 4 marks each with sub-parts.*

Section-A

Select and write the most appropriate option out of the four options given for each of the questions 1-20. There is no negative mark for incorrect response.

1.   Two beakers A and B contain normal water and hot water respectively. Seema adds an equal amount of blue copper sulphate crystals to them. Which of the following observations is correct ? (1)

     (a)   Blue colour will spread more quickly in A.

     (b)   Blue colour will not spread in either of the beakers.

     (c)   Blue colour will spread more quickly in B.

     (d)   Blue colour will take the same time in both A and B to spread.

2. Melting points of four solids A, B, C and D are 368 K, 45 K, 180 K and 680 K. Arrange them in increasing order of interparticle forces of attraction. (1)
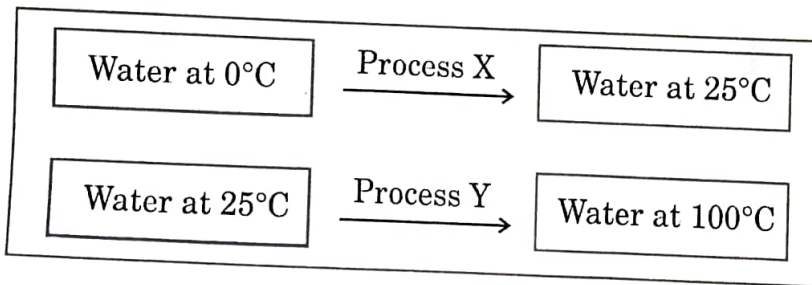
(a) A < B < C < D

(b) B < C < A < D

(c) C < B < A < D

(d) B < D < C < A

3. The image shows two changes. (1)

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┌─────────────────────────────────────────────────────────┐
│  ┌──────────────┐  Process X   ┌──────────────────┐      │
│  │ Water at 0°C │  ──────────→ │ Water at 25°C    │      │
│  └──────────────┘              └──────────────────┘      │
│                                                           │
│  ┌──────────────┐  Process Y   ┌──────────────────┐      │
│  │Water at 25°C │  ──────────→ │ Water at 100°C   │      │
│  └──────────────┘              └──────────────────┘      │
└─────────────────────────────────────────────────────────┘
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Identify Process X and Y.

(a) Process X – melting point; Process Y – evaporation

(b) Process X – freezing point; Process Y – melting

(c) Process X – condensation; Process Y – melting

(d) Process X – evaporation; Process Y – condensation

4. Which of the following are physical changes ? (1)

(i) Melting of iron metal

(ii) Rusting of iron

(iii) Bending of an iron rod
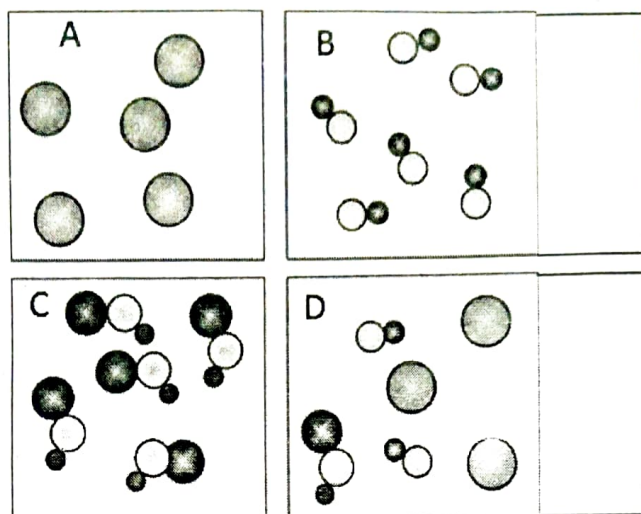
(iv) Drawing a wire of iron metal

(a) (i), (ii) and (iii)

(b) (i), (ii) and (iv)

(c) (i), (iii) and (iv)

(d) (ii), (iii) and (iv)

5. Study the diagrams representing mixtures, elements and compounds shown, and choose the correct statement from the following : (1)


(a) A represents an element and D represents a mixture.

(b) B represents a compound and C represents a mixture.

(c) A represents an element and C represents a mixture.

(d) B represents an element and D represents a mixture.

6. Which of the following is an example of gas in liquid mixture ? (1)

(a) Air   (b) Aerated drink

(c) Alcohol and water   (d) Alloy

7. Substances that contain more than one element or compound which are not in fixed ratio are classified into I and II in the image. Identify I and II. (1)
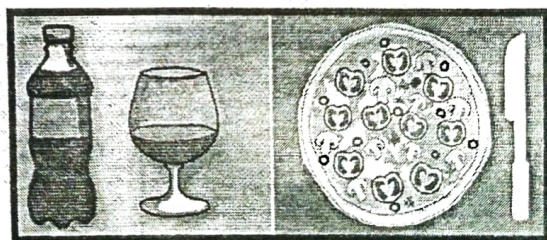

I   II

(a) I – heterogeneous mixture; II – homogeneous mixture

(b) Both I and II are heterogeneous mixture

(c) Both I and II are homogeneous mixture

(d) I – homogeneous mixture; II – heterogeneous mixture

8. X and Y are cell organelles bound by a single membrane. X is filled with digestive enzymes and Y is filled with cell sap. Select the incorrect statement regarding X and Y. (1)

   (a) X is a waste disposal system whereas Y is a storage sac for liquid or solid contents.

   (b) X takes part in autophagy and Y takes part in osmoregulation.

   (c) X is exclusive to plant cells and Y is exclusive to animal cells.

   (d) X is a digestive bag whereas Y is a storage bubble of cells.

9. Prokayrotic cells lack most of the cytoplasmic organelles present in eukaryotic cells except one. Identify it. (1)

   (a) Lysosome   (b) Ribosome

   (c) Plastid   (d) Nucleus

10. A student observes that the tree near his house is growing more in width than height. Which tissue is responsible for this type of growth ? (1)

    (a) Both apical and lateral   (b) Both apical and intercalary

    (c) Only intercalary   (d) Only lateral

11. After mitosis, the number of chromosomes in the daughter cells shall be: (1)

    (a) Twice of the parent cell   (b) One fourth of the parent cell

    (c) One half of the parent cell   (d) Same as the parent cell

12. The image shows the transverse structure of a sclerenchyma tissue. (1) Which characteristic of sclerenchyma cells provides strength to the plant parts?

    (a) Presence of thick walls and no internal space

    (b) Presence of thin walls and dead cells

    (c) Presence of large spaces between the cells

    (d) Presence of cells with regular shape
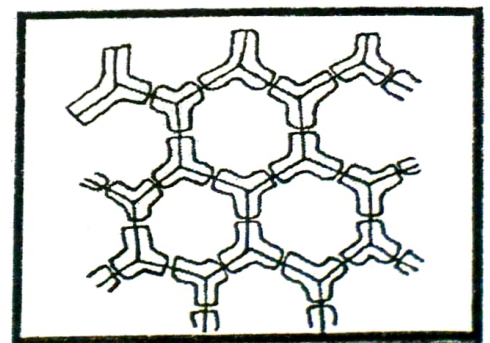
13. Velocity time graph for two car racers Narain and Jim are shown in the figure below then during 20s of driving : (1)
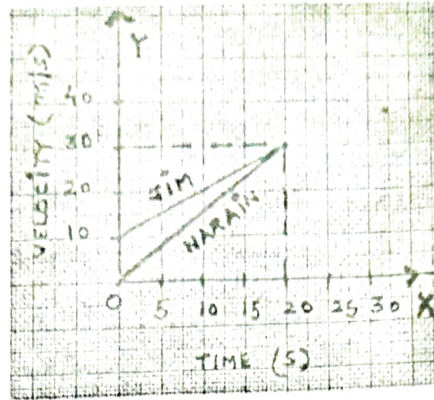
Figure

   (a) Displacement of Narain is more than that of Jim.
   (b) Displacement of both Jim and Narain is equal.
   (c) Displacement of Jim is more than that of Narain.
   (d) Displacement of both Jim and Narain is zero.

14. For a planetary motion the force of gravitation on a planet due to sun F1 and force of gravitation on sun due to planet F2 are correlated as : (1)
   (a) $F1 = F2$ (b) $F1 = -F2$
   (c) $F1 > F2$ (d) $F1 < F2$

15. Which of the following functions is performed by smooth endoplasmic reticulum? (1)
   (a) It helps expel excess water and waste out of the cell.
   (b) It helps produce ATP molecules.
   (c) It helps digest small foreign particles.
   (d) It helps detoxify the drugs.

16. What property of the plasma membrane helps amoeba acquire food ? (1)
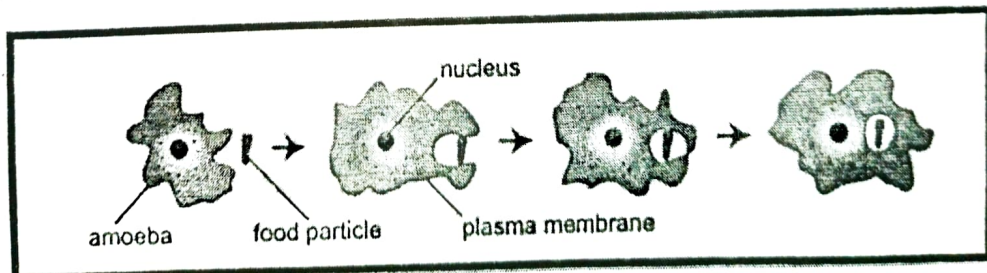
   (a) It allows diffusion of some substances across it.
   (b) It is selectively permeable.
   (c) It is flexible.
   (d) It is made up of protein and lipids.

Question No. 17 to 20 consist of two statements – Assertion (A) and Reason (R). Answer these questions 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.

17.   **Assertion (A) :** Humidity is the amount of water vapor in the air.   (1)

   Reason (R) : Evaporation increases in excessively humid weather.

18.   **Assertion (A) :** Xylem and phloem are both conducting tissues and constitute a vascular bundle.   (1)

   Reason (R) : Xylem and phloem are examples of complex tissues.

19.   **Assertion (A) :** The value of acceleration due to gravity does not depend on the mass of the object on which force of gravity acts.   (1)

   Reason (R) : Acceleration due to gravity is the same as the universal constant of gravitation.

20.   **Assertion (A) :** Mitochondria and chloroplasts are the organelles partly under the control of nucleus and partly working independently.   (1)

   Reason (R) : They contain DNA but lack protein synthesizing machinery.

Section-B

Question No. 21 to 26 are very short answer questions.

21.   A small quantity of water was placed on the palm of one hand, and petrol was placed on the other palm. Which palm will experience a greater cooling effect, and why ?   (2)

22.   Name the living component common to both the complex permanent tissues found in plants. What is its function ?   (2)

23. How does the nuclear region of a bacterial cell and nuclear region of an animal cell differ from each other ? (2)

OR

Most mature plant cells have a large central vacuole that occupy 50-90% of the cell volume. Why ?

24. Chandrayaan-3 was successfully launched on July 14, 2023 from Sriharikota space station in Andhra Pradesh. (2)

    (a) State the law behind the propulsion of Chandrayaan-3.

    (b) Illustrate the working of this law in context with launching Chandrayaan -3.

25. Gravitational force 'F' acts between two objects of masses 'M' and 'm' separated by a finite distance 'r'. If the distance between these two objects is doubled then calculate the magnitude of gravitational force between them. (2)

26. The data regarding the motion of two different objects A and B are given in the table below : (2)

Time	Distance travelled by object A in m	Distance travelled by object B in m
9:30 am	10	12
9:45 am	20	19
10:00 am	30	23
10:15 am	40	35
10:30 am	50	37
10:45 am	60	41
11:00 am	70	44

Examine the above data carefully and state whether the motion of the two objects A and B is uniform or non uniform. Give reason for your conclusion.

Section-C

Question No. 27 to 33 are short answer questions.

27. (a) How can we convert a saturated solution into an unsaturated solution?

    (b) A solution contains 50 g of glucose in 250 g of water. Calculate the concentration in terms of mass by mass percentage of the solution. (1+2)

28. Sanchit's friend visited his house in Mumbai, and he was surprised to see air conditioners installed in all of his rooms. The friend advised Sanchit to use desert-coolers and save electricity. To this, Sanchit told him that desert-coolers are not at all effective in coastal areas. (3)

    (a) Why are desert-coolers not effective in coastal areas ?

    (b) What are the other two factors on which the evaporation of water depends?

OR

Differentiate between boiling and evaporation. (three points)

29. Study the figure and answer the questions given below : (1+1+1)
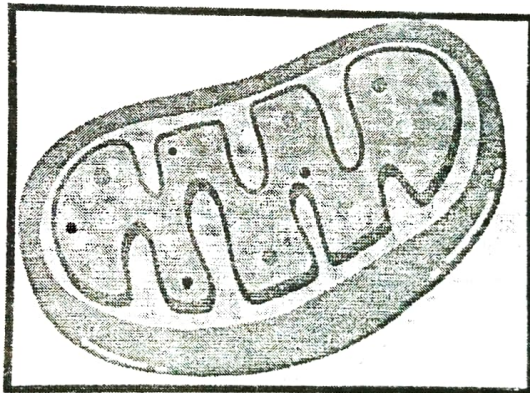
    (a) Mention the role of deeply folded inner membrane in a given cell organelle.

    (b) Name the energy-rich molecule produced during cellular respiration in mitochondria.

    (c) Which type of cells would have a higher number of mitochondria : muscle cells or skin cells ? Explain why.

30. (a) During a visit to the lakeside Ritik saw water hyacinth floating on the surface of water. What can be the reason for the floating of such plants on water ? (2+1)

(b) Name the phloem cells with perforated walls.

31. (i) Establish a relation for acceleration due to gravity in terms of mass and radius of the earth. (1+2)

(ii) "The earth is not a perfect sphere." State whether the value of "g" remains the same at all places or varies on the earth. Give reasons for your answer.

32. (a) State law of inertia. (1+1+1)

(b) Kinjal has three solid blocks of the same size and shape made up of steel, wood and plastic. Which one of these has highest inertia ? Give reasons for your choice.

(c) If you jerk a piece of cloth under a book quick enough, the book does not move. Why ?

33. Jerry on a toboggan starts from rest and accelerates down a snow covered hill at 10 m/s². How long does Jerry take in toboggan to reach the bottom of the hill if it is 625 m away. Identify the type of motion observed by Jerry in the toboggan. (3)

Section-D

Question No. 34 to 36 are long answer questions.

34. A group of students took an old shoe box and covered it with a black paper from all sides. They fixed a source of light (a torch) at one end of the box by making a hole in it and made another hole on the other side to view the light. They placed a sample of egg albumin in water in a beaker/tumbler in the box as shown in the Fig. They were amazed to see that egg albumin in the water taken in the tumbler was illuminated. They tried the same activity by taking an alum solution but found that light simply passed through it. (5)
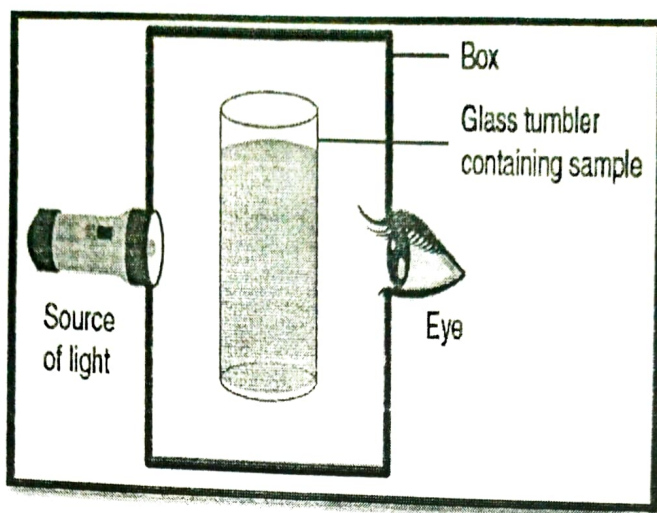
(a) Explain why the sample of egg albumin in water was illuminated and name the phenomenon involved.

(b) The same results were not observed with an alum solution. Explain why?

(c) Can you suggest two more examples that would demonstrate the same effect as shown by the sample of egg albumin in water ?

OR

Four students (A), (B), (C) and (D) observed the colour and solubility of iron, sulphur and iron sulphide in carbon disulphide. The tick mark (✓) represents 'soluble', and cross mark (×) represents 'insoluble', in carbon disulphide. Their observations are tabulated below :

Student	Colour			Solubility in carbon disulphide		
	Fe	S	FeS	Fe	S	FeS
(A)	Yellow	Silvery	Greyish silver	(✓)	(×)	(✓)
(B)	Silvery	Orange	Reddish brown	(×)	(✓)	(✓)
(C)	Grey	Yellow	Greyish black	(×)	(✓)	(×)
(D)	Silvery	White	Silvelry white	(✓)	(×)	(×)

(a) Out of the four students, which student reported the correct observation? Justify your answer.

(b) When iron powder and Sulphur powder were mixed together and divided into two parts **P** and **Q**. When part **P** was heated strongly over a burner, then a substance **R** was formed. The part **Q** was, however, not heated at all. When dilute hydrochloric acid was added to substance **R**, then gas **S** was evolved and when dilute hydrochloric acid was added to part **Q** then gas **T** was evolved.

    (i) What type of substance is **Q** ?

    (ii) What type of substance is **R** ?

    (iii) Name the gases **S** and **T**.

    (iv) State one characteristics property of the gas **S**.

35. A student investigated the loss of water from plant leaves. Following steps were taken by the student to conduct the experiment. (5)

Step 1 : Two sets of leaves from the same potted plant species were selected.

Step 2 : One set of leaves was covered with grease, while on the other set no grease was applied.

Step 3 : Both sets of leaves were kept in a controlled environment with consistent temperature, humidity and light conditions.

Step 4 : Water loss through transpiration was measured over a specified time period for both the set ups.

Table shows the result obtained by the student

Treatment of leaves	Amount of water lost by leaves (in grams)
No grease was used on leaves	0.98
Grease used on upper and lower surface of the leaves	0.01

(a) Which part of the leaf is responsible for the loss of water in the form of vapours ?

(b) Very little water was lost from the leaf when both the surfaces were covered with grease. Give a reason.

(c) What is the other function of the structure responsible for loss of water from the leaves ?

(d) Compare the rate of transmission in a bright day and night.

OR

(a) Complete the following table ?

Example	Type of Tissue	Nature of cell (Dead/living)	Main function
Husk of coconut			
In leaf stalk below the epidermis			

(b) Why is the cell wall of cork or bark impervious to glass and water ?

36. When a helicopter is in flight the rotor blade exhibits uniform circular motion, that is the four blades of a helicopter are in hover spin at 136 revolutions per minute. These blades are attached to a central hub as shown in the picture below : (1+1+1+2)
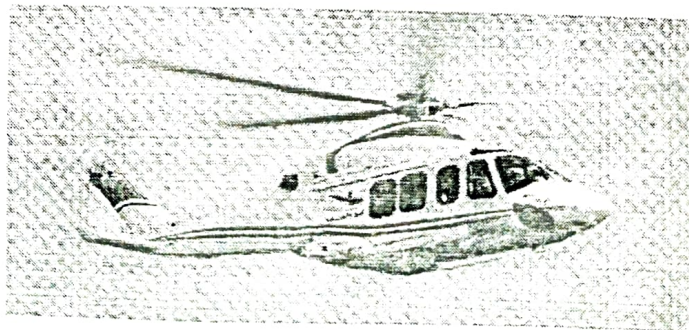

(a) Write one difference between circular motion and uniform circular motion.

(b) Give two examples of uniform circular motion from daily life other than the above mentioned case.

(c) If a body being revolved uniformly along a circular path is let loose at an instant, in what direction does it move ?

(d) The helicopter blades spin at 136 revolutions per minute as given above, the blade tip is 7 m from the center of rotation. Calculate the speed of the blade tip in the helicopter frame of reference in meters per sec.

OR

Study the motion of a ball rolling on a surface in a straight line as shown in the figure below :
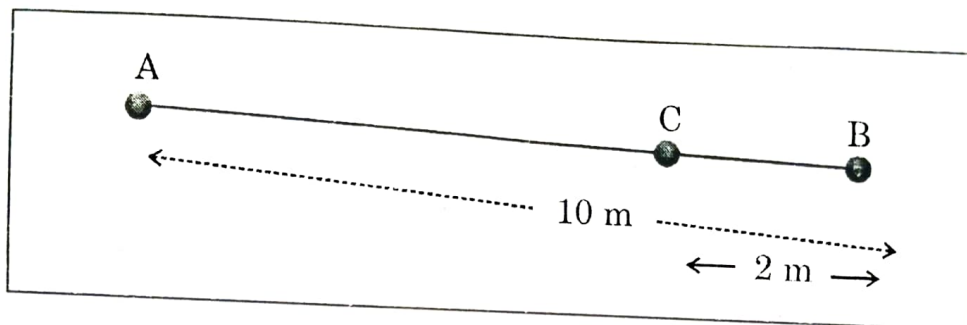

(2+2+1)

(i) Find the displacement and distance covered-

   (a) When it rolls from A to B and then to C.

   (b) Finally the ball comes back to A (the position from where it started). Take A as a reference point.

(ii) State the reason for the following types of motion :

   (a) The motion of the ball has negative acceleration.

   (b) The motion of ball has positive acceleration.

(iii) Plot the graph if the rolling ball has a negative acceleration.

Section-E

Question No. 37 to 39 are case-based/data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.

37. The heat energy used to bring about a phase change is called hidden heat. It is buried in the substance undergoing a state transition. During a state transition, the hidden heat is used to overcome the force of attraction between the particles of the substance. The temperature-time graph given alongside shows the heating curve for pure substance.

(1+3)
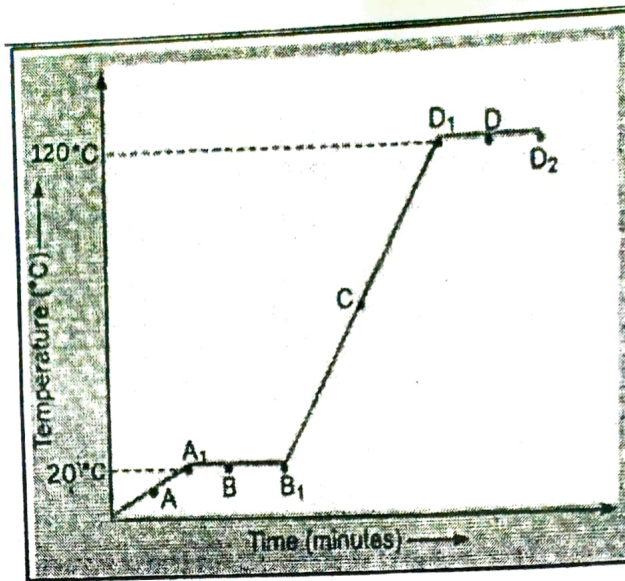
(a) What is the melting point and boiling point of the above substance ?

(b) (i) Which portions of the graph indicate that a change of state is taking place ?

(ii) What happens to the temperature while the substance is changing its state ?

OR

(b) Name and define the terms used for heat absorbed during the change of states involved in the above process.

38. Sania conducts an experiment to know how plant cells loose or gain water through osmosis. She cuts out 5 cm long potato strips. She puts three potato strips in each of the following beakers. (1+1+2)

Sania leaves the potato strips in the beaker for 5 hours.

- Beaker 3 containing 2% salt solution.

- Beaker 2 containing 1% salt solution.

- Beaker 1 containing only water.

Beaker 1
Water

Beaker 2
1% salt solution

Beaker 3
2% salt solution
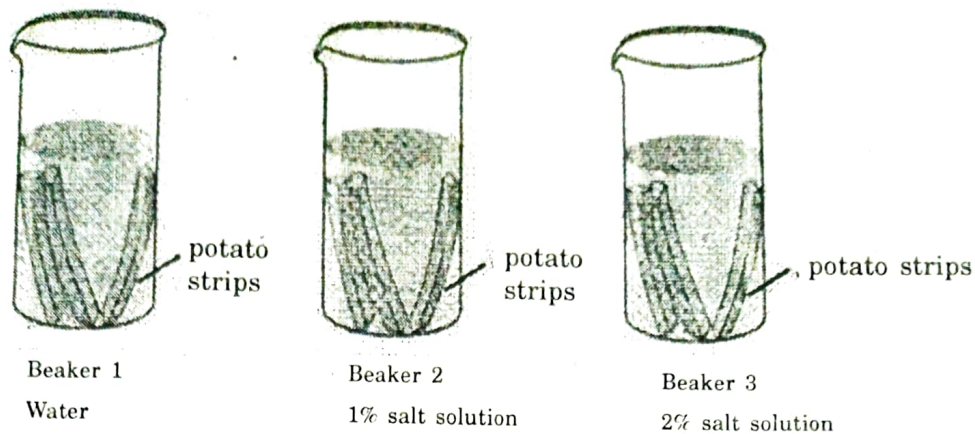
She records the length of the potato strips in each beaker after 5 hours.

	Length of the potato strip before placing in the beaker (cm)	Length of the potato strip after 5 hours in the beaker (cm)
Beaker 1 water	5.0	5.3
	5.0	5.2
	5.0	5.2
Beaker 2 1% salt solution	5.0	5.0
	5.0	5.0
	5.0	4.9
Beaker 3 2% salt solution	5.0	4.8
	5.0	4.9
	5.0	4.7

(a) Name the process involved in the movement of water in and out of the potato strips placed in the beaker.

(b) In which beaker was the concentration of water molecules inside and outside the potato cells likely to be the same ?

(c) What happens if Sania boiled the potato strips in water first before placing them in each beaker and then put a drop of sugar syrup on it?

OR

(c) Why did the length of the potato strip in beaker 1 increase in size ? What will happen if these strips are transferred to the beaker containing sugar syrup ?

39. **Odisha Triple Train Collision**

The June 2, 2023 Odisha train collision is India's worst railway accident. The Coromandel Shalimar express moving with high speed derailed and smashed into a goods train then finally fast moving Yesvantpur-Howrah super-fast collided with the derailed coaches. Stopping such massive trains moving with such high speed requires at least a Mile distance to come at halt even if the conductor sees the danger on the track ahead. For a given frictional force applied to the train a certain amount of time must pass for the final velocity to be brought to zero.

India's Deadliest Rail Accident In Over 20 Years

(i) Mention the two factors on which the momentum of the body depends.

(ii) What is the relation between the forces required to stop the train with time ?

(iii) The Coromandel express train of mass 8,000,000 kg moving with the initial velocity of 126 km/hr takes 140 s to stop after the brakes are applied. Calculate the force required to stop the train.

OR

(iii) Derive the relation F = ma from the second law of motion in which 'F', 'm' and 'a' have their usual meanings.

□□□