Class IX Session 2024-25
Subject - Science
Sample Question Paper - 11

Time: 3 Hours. **Total Marks: 80**

General Instructions:

i. *All questions would be compulsory. However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.*

ii. *Section A would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.*

iii. *Section B would have 6 Short Answer (SA) type questions carrying 02 marks each.*

iv. *Section C would have 7 Short Answer (SA) type questions carrying 03 marks each.*

v. *Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.*

vi. *Section E would have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.*

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. The major drawback of Rutherford's model of the atom is [1]

a) It does not provide any clue to explain the shapes of molecules.
b) It does not explain the effect of electric field on the atoms.
c) It does not explain the stability of the atom.
d) None of the above.

2. In a chemistry lab, class 9 chemistry students were investigating different colloidal mixtures. They came across a mixture where tiny solid particles were evenly distributed throughout a liquid medium, resembling a thick suspension. A colloid with a solid dispersed phase and liquid dispersing medium is called [1]

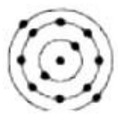
a) Emulsion
b) Sol
c) Foam
d) Gel

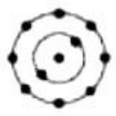
3. Latent heat of fusion is the amount of heat energy required to change: [1]

a) 1 kg of solid into its gaseous state at its boiling point
b) 1 kg of liquid into its gaseous state at its boiling point
c) 1 kg of solid into its liquid state at its melting point
d) 1 kg of liquid into its solid state at its freezing point

4. Which of the following is the correct atomic structure of sodium metal? [1]

a) 

b) 

c) 

d) 

5. Hydrogen and oxygen combine in the ratio 1:8 by mass to form water. How much mass of oxygen gas would be required to react completely with 3 g of hydrogen gas? [1]

a) 8 g
b) 16 g
c) 24 g
d) 32 g

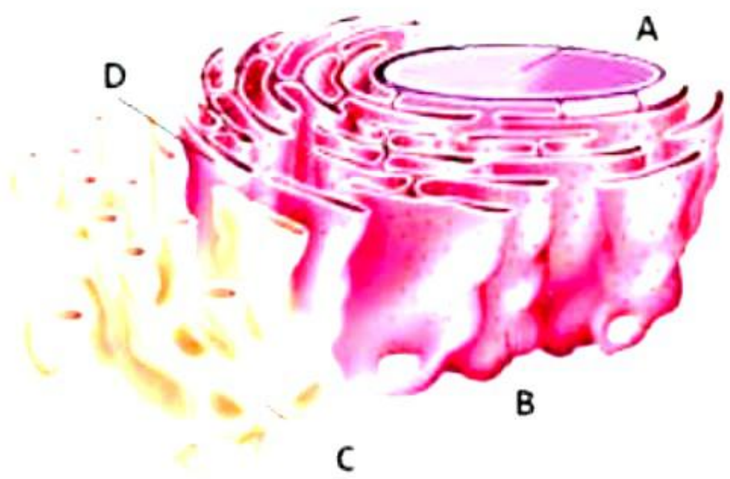
6. Which of the following statements is correct? [1]

a) A solution is a homogenous mixture.
b) A suspension is a homogenous mixture.
c) In a solution, the substance present in lesser quantity is called solvent.
d) In a solution, the substance present in greater quantity is called solute.

7. Argon has atomic number 18 and mass number 40. Calcium has atomic number 20 and mass number 40. Calcium and argon are examples of: [1]

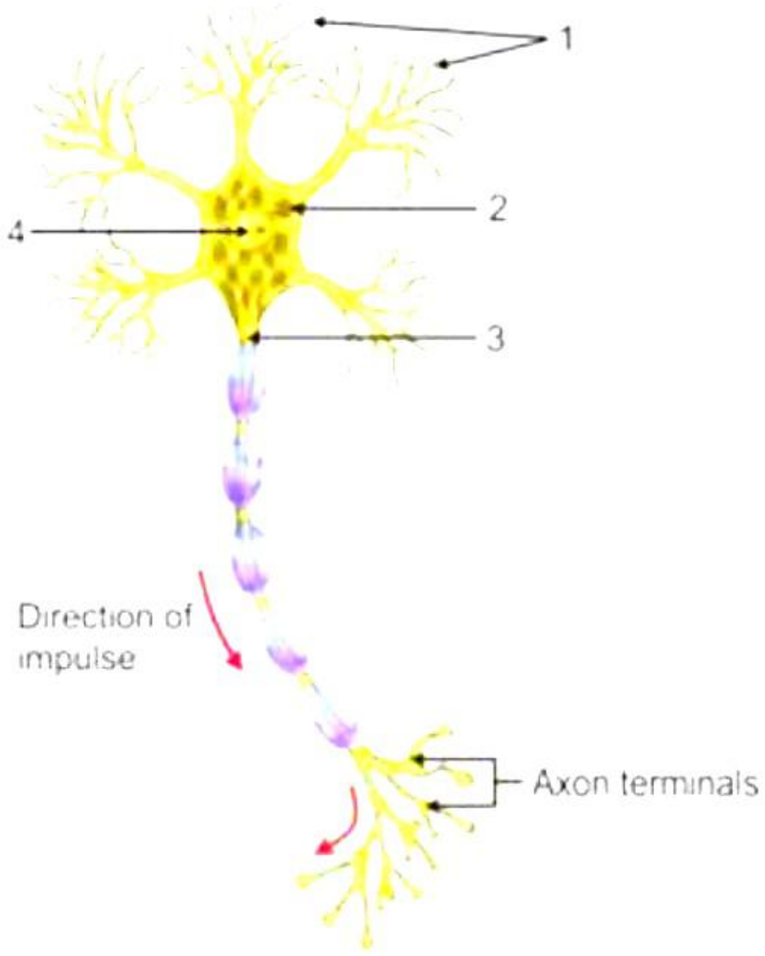
(a) Isotopes
(b) Isobars
(c) Isotones
(d) Isochores

8. Detoxifying several poisons and drugs in a cell is a function of [1]



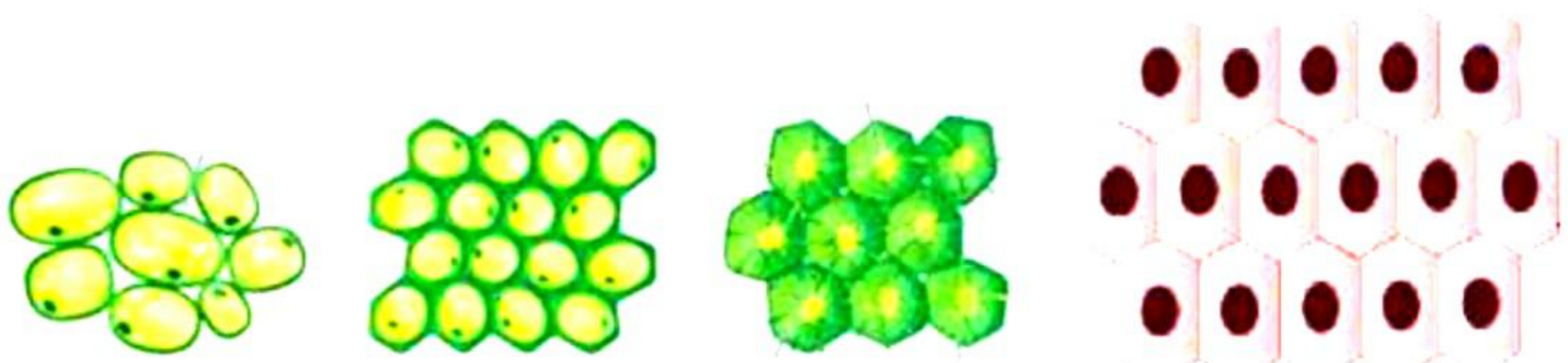
a) A
b) B
c) C
d) D

9. The given structure assists in the conduction and transmission of nerve impulses. Identify the parts labelled as 1, 2, 3 and 4, respectively. [1]



a) 1-Axon, 2-Dendrites, 3-Cell Body, 4-Nucleus
b) 1-Dendrites, 2-Cell Body, 3-Axon, 4-Nucleus
c) 1-Axon, 2-Nucleus, 3-Dendrites, 4-Cell Body
d) 1-Nucleus, 2-Axon, 3-Cell Body, 4-Dendrites

10. Which of the following tissues consists of dead cells? [1]



(i) (ii) (iii) (iv)

a) (i)
b) (ii)
c) (iii)
d) (iv)

11. On the distance-time graph, the Y-axis should be labelled as [1]

a) Speed
b) Displacement
c) Distance
d) Time

12. The vibrations or the pressure variations inside the inner ear are converted into electrical signals by the [1]

a) Cochlea
b) Hammer, anvil, and stirrup
c) Pinna
d) Nerves

13. It is due to which one of the following reasons that a body floats in a liquid? [1]

a) When the weight of the body is exactly half of the weight of the liquid displaced.
b) When the weight of the body is greater than the weight of the liquid displaced.
c) When the weight of the body is equal to the weight of the liquid displaced.
d) When the weight of the body is less than the weight of the liquid displaced.

14. When a ball is thrown vertically upwards its velocity keeps on decreasing. What happens to its kinetic energy when it reaches the maximum height? [1]

a) Kinetic energy is maximum at maximum height.
b) Kinetic energy is half the initial value.
c) Kinetic energy is zero.
d) Kinetic energy is double.

15. A permanent slide shows thin-walled isodiametric cells with a large vacuole. The slide contains [1]

a) Parenchyma cells
b) Nerve cells
c) Sclerenchyma cells
d) Collenchyma cells

16. Neel Kranti mission aims at enhancing the economic prosperity of the country by augmenting the production of which of the following? [1]

I

II

III

IV

a) I
b) II
c) III
d) IV

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):** Elements with valency one are always metals. [1]
Reason (R): Metals are elements which lose electrons to form cations.

18. **Assertion (A):** De-shelled eggs swell up in a hypotonic solution. [1]
Reason (R): An egg is rich in protein.

19. **Assertion (A):** It is difficult to balance our body when we accidentally slip on a peel of banana. [1]
Reason (R): According to Newton's third law of motion "Every action have an equal and opposite reaction."

20. **Assertion (A):** Most plant tissues are dead. [1]
Reason (R): Due to sedentary existence of plants, dead cells provide mechanical strength more easily than live cells and need less maintenance.

SECTION - B

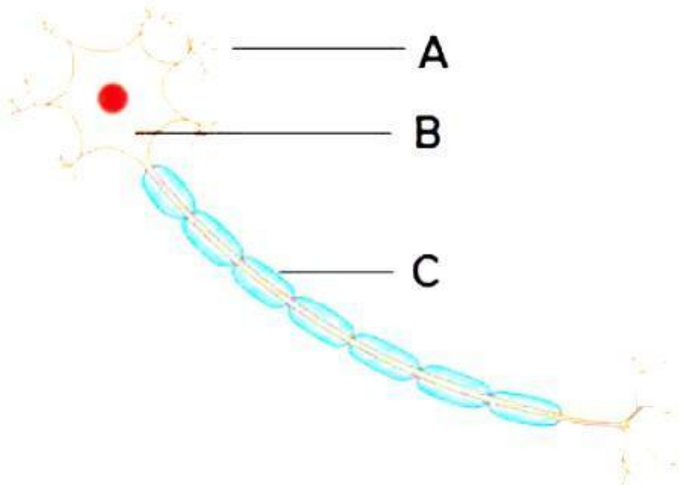
Question No. 21 to 26 are very short answer questions.

21. [2]

(a) Siddhesh is helping his grandfather organise his storage closet, and he notices that the naphthalene balls he placed inside last year have completely disappeared without leaving any solid residue. Curious about this, his grandfather asks him: "Why do naphthalene balls disappear over time without leaving any solid residue?"

(b) Give reason: We can get the smell of perfume even while sitting several metres away.

22. Deepa was asked to draw the structure of a neuron as observed under a microscope. Observe the figure drawn by her and answer the questions based on it. [2]



(a) Identify A, B and C.

(b) What is the function of part A?

23. What will happen if the plasma membrane ruptures or breaks down? [2]

OR

We add salt to the vegetables during the cooking process. Why?

24. Write the parameters required to express a scalar quantity. [2]

25. When two spring balances joined at their free ends are pulled apart, both show the same reading. Explain. [2]

OR

A hammer of mass 500 g moving at 50 m/s, strikes a nail. The nail stops the hammer in a very short time of 0.01s. What is the force of the nail on the hammer? [2]

26. Should farmers use pesticides to protect their crops from weeds, insects, and diseases? Give your suggestion. [2]

SECTION - C

Question No. 27 to 33 are short answer questions.

27. Anaya was exploring different substances around her. She was curious about the differences between smoke, fog, and mixtures. [3]

(a) Anaya noticed that smoke and fog both are aerosols. In what way are they different?

(b) Anaya's mother mixed sucrose crystals from sugarcane and beetroot. Will the resulting substance be a pure substance or a mixture? Give a reason for the same.

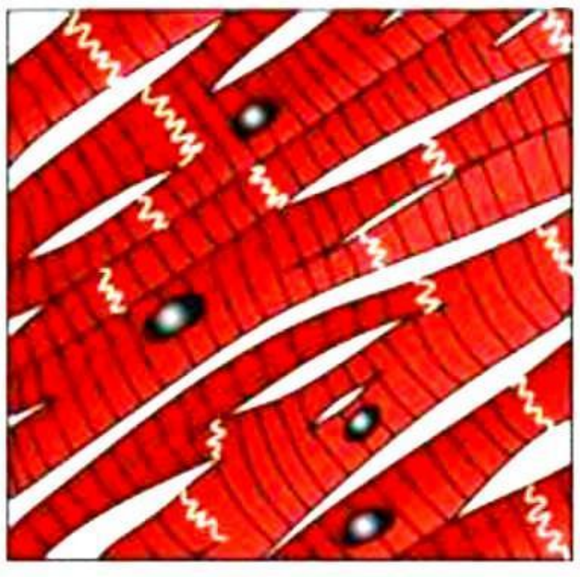
(c) Anaya's teacher showed her a dark brown liquid called 'Tincture of Iodine.' Can you identify the solute and solvent of the mixture?

28. List the properties of the compound. [3]

OR

Write any three differences of solid, liquid, and gaseous states. [3]

29. The given figure represents a tissue found in the human body. [3]



(a) Identify the tissue. Give reason for your identification.

(b) State its location in the body.

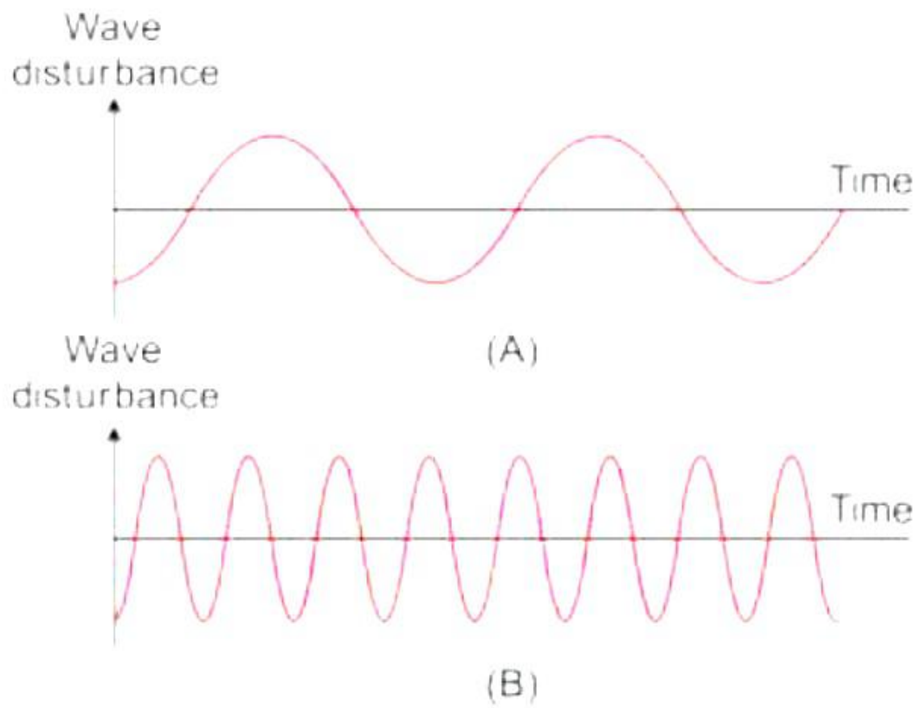
(c) Is it voluntary or involuntary in nature?

30. What would happen if poultry birds are larger in size and have no summer adaptation capacity? In order to get small-sized poultry birds having summer adaptability, what methods will be employed? [3]

31. [3]

(a) List the parameters which characterise a sound wave.

(b) Given below are graphical wave shapes of two sound waves. Identify the sound which has:



(i) higher pitch

(ii) higher loudness

Give reason for your answer.

(c) A sound wave has a frequency of 2 kHz and wavelength 35 cm. Find its velocity.

32. An 8000 kg engine pulls a train of 5 wagons, each of 2000 kg, along a horizontal track. If the engine exerts a force of 40,000 N and the track offers a frictional force of 5,000 N, then calculate: [3]

(a) Net accelerating force.

(b) Acceleration of the train.

(c) Force of the 1st wagon on the 2nd wagon

33. [3]

A runner runs 1.0 km south, then 2.0 km east, then 1.0 km north, and then 2.0 km west to return to its starting point. This trip takes 50 minutes. What was the runner's average speed, and what was the runner's average velocity?

OR

Draw a velocity-time graph for a body moving with an initial velocity u and uniform acceleration a. Use this graph to find the distance travelled by the body in time t.

SECTION - D

Question No. 34 to 36 are long answer questions.

34. Distinguish between true solution and colloid. [5]

OR

Answer the following questions: [5]

(a) Two sample were given to Aaryan as shown in below images:

Sample 1

Iron + Sand

Sample 2

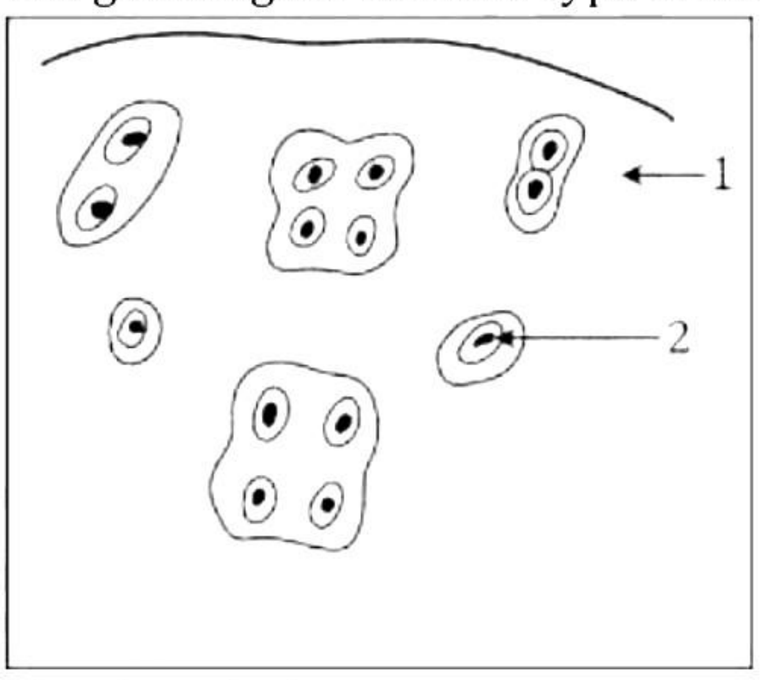
Sulphur + Sand

He was given a magnet and instructed to bring it close to both samples. He noted that iron from sample 1 was stuck to the magnet. He determined that the first sample is a mixture since he was able to remove iron from it, whereas the second sample is not a mixture, and nothing was separated. Is Aaryan's deduction, correct? If it is a mixture, then suggest a method to separate it.

(b) Write four characteristics of solid.

35. [5]

(a) The given figure shows a type of animal tissue.



(i) Identify the tissue.

(ii) Label parts 1 and 2.

(iii) State the characteristic features of this tissue.

(b) Give reasons:

(i) Intercellular spaces are absent in sclerenchymatous tissues.

(ii) Meristematic cells have a prominent nucleus and dense cytoplasm, but they lack vacuole.

OR

(a) Imagine you are a scientist studying the lining of the small intestine. You notice that it is composed of cells that are tall and narrow, with microvilli on their surface. What type of epithelial tissue is this, and what is the likely function of the microvilli?

(b) Suresh was studying a plant species that grows very rapidly. He noticed that it has a thick layer of actively dividing cells near the tips of its roots and shoots. What type of meristematic tissue is this, and what is its role in plant growth?

36.

a) Represent graphically in two separate graphs, the sound waves having same amplitude but different frequencies.

b) Sketch two waves X and Y such that the wave X have twice the wavelength and half the amplitude of wave Y. Label the wavelength and amplitudes of the waves.

OR

(a)

i. How does the sound propagate through a medium?

ii. Show a sound wave in graphic form and mention crest, trough, wavelength, and amplitude of the wave in it.

(b) Draw a graph for a wave representing wave disturbance and time for a sound changing from low pitch to high pitch keeping amplitude of the sound same.

(c)

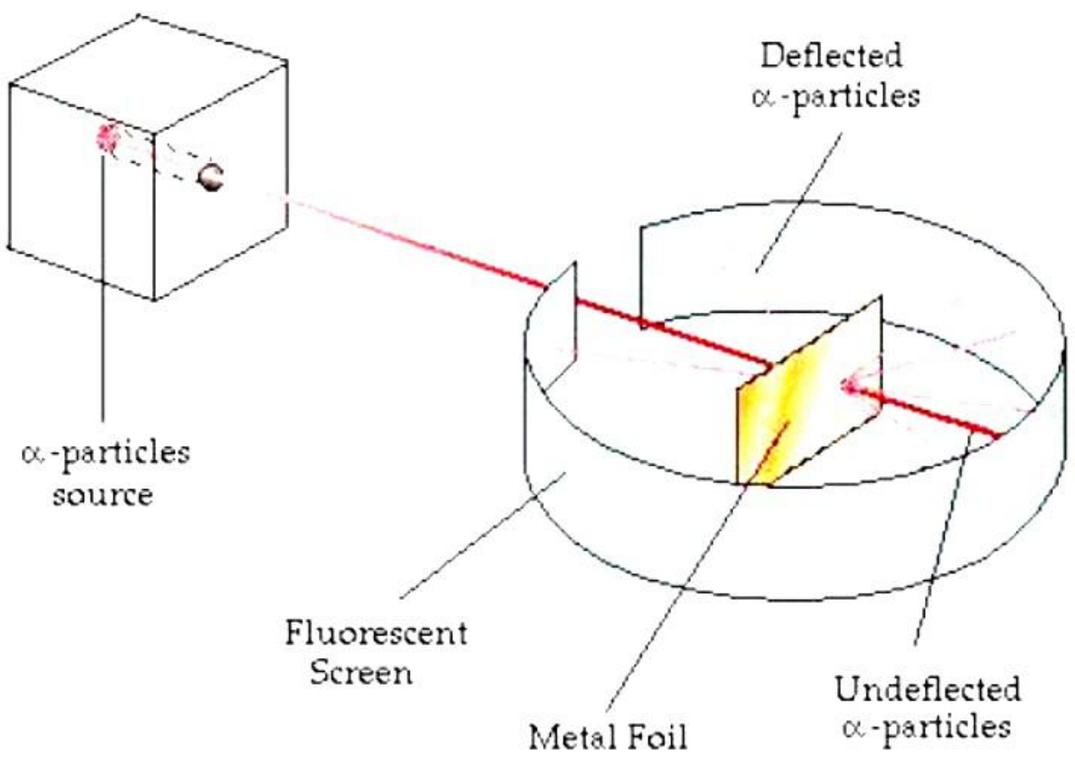
i. What is SONAR?

ii. A submarine emits a sonar pulse, which returns from an underwater cliff in 1.02 s. If the speed of the sound in salt water is 1531 m/s then, how far is the cliff from the ship?

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. In 1911, Earnest Rutherford, a scientist from New Zealand, overturned Thomson's atomic model by his gold foil experiment. Rutherford selected a gold foil as he wanted a very thin layer. The gold foil used by Rutherford was 0.004 millimetres in thickness. That is, the foil was about 1000 atoms thick. In his experiment, fast moving α-particles (alpha particles) were made to fall on a thin gold foil. The α-particles are helium ions with a +2 charge. Their atomic mass is 4 u. Hence, a high velocity beam of α-particles has a lot of energy. These particles were studied by means of flashes of light they produced on striking a zinc sulphide screen. The α-particles are much heavier than the sub-atomic particles present in gold atoms. Hence, he expected the α-particles to pass through the gold foil with little deflection and strike the fluorescent screen.



Rutherford's α-Particle Scattering Experiment

However, the observations he made were quite unexpected.

(a) Answer the following questions: [2]

(i) What are the alpha particles in Rutherford scattering experiment?

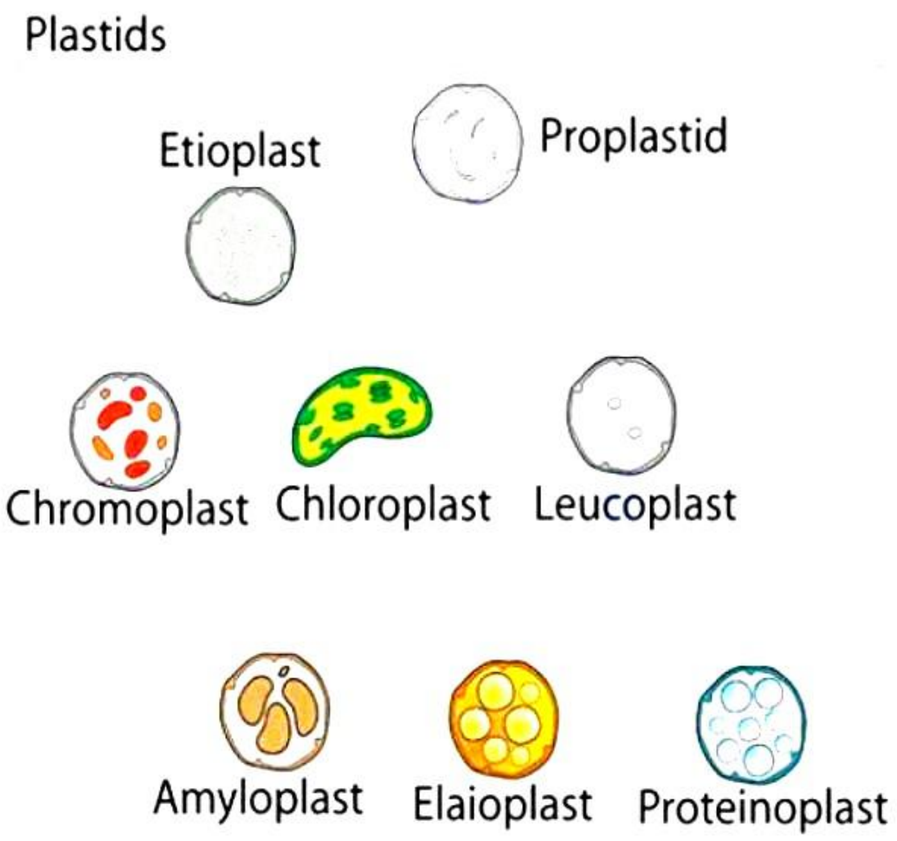
(ii) What happened to the particles that Rutherford used in his experiment?

(b) What information does it give about the structure of the atom? [2]

OR

(b) How did Rutherford detect where the particles were strike at the gold foil? [2]

38. Plastids are an important cell organelle found only in plant cells. There are different types of plastids each with a varied characteristic and function. Some provide colour to the flowers and fruits, some assist in food production while some store starch and proteins. [4]



(a) What is the function of leucoplasts?

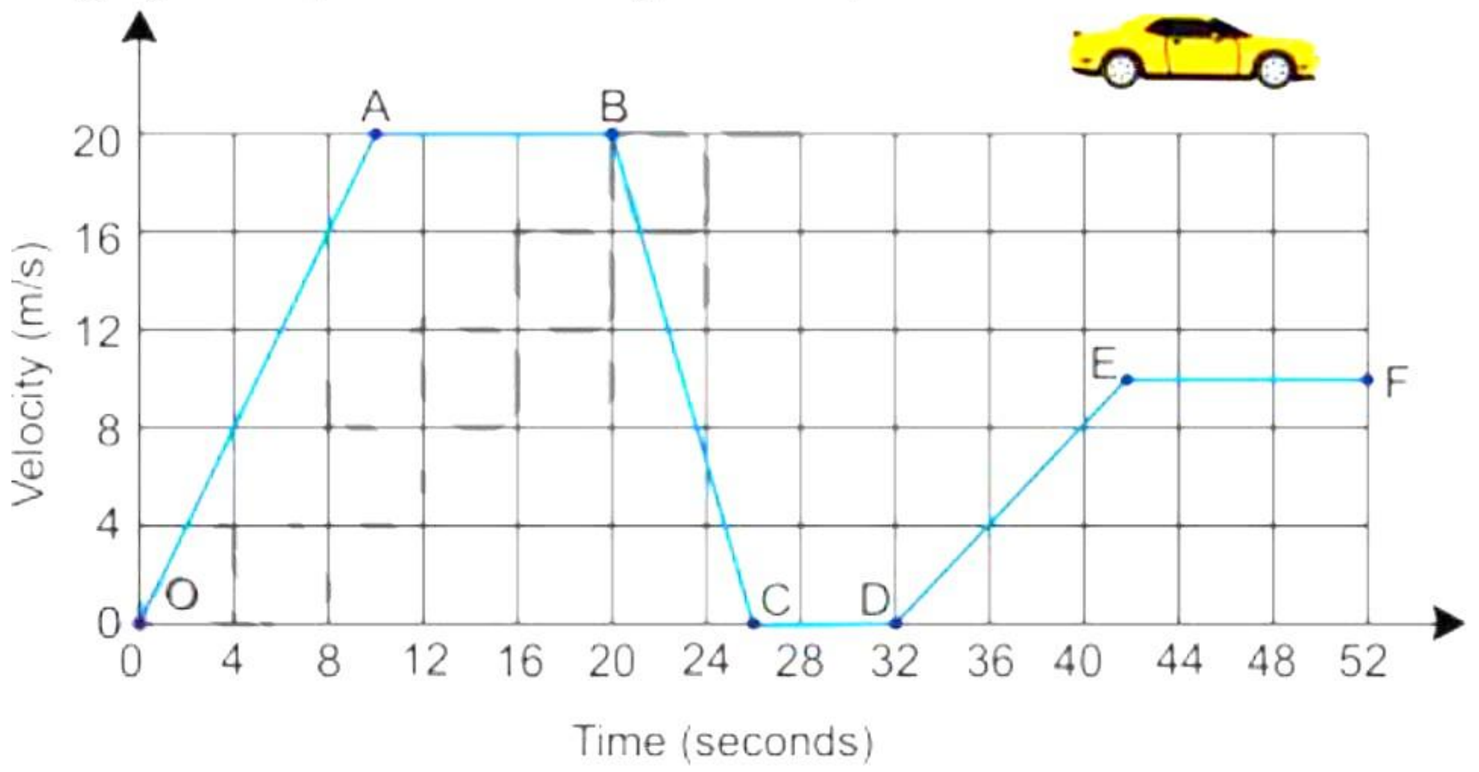
(b) Which plastid provides colour to flowers and fruits?

(c) What is chloroplast? State its function.

OR

(c) Explain what are amyloplasts, elaioplasts and proteinoplasts.

39. Assume Raj is driving a taxi from point O to point F on a straight road, and the velocity of the car was measured every 4 seconds with a device. Now, consider the velocity vs. time graph was plotted for the given case, as shown below. [4]



Answer the following questions based on the given information.

(a) During which part of the journey was the car moving fastest?

(b) During which part of the journey did the car have the greatest acceleration?

(c) During which part of the journey was the car moving with zero acceleration? Calculate the acceleration between points D and E.

OR

(c) What is the quantity which is measured by the area occupied below the velocity-time graph? If sudden brakes are applied between point B and C then, find the rate of deceleration of car if it stops after 6 seconds after applying the brakes.

Solution

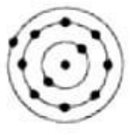
SECTION – A

1. Correct option – c: It does not explain the stability of the atom.
The major drawback of Rutherford's model of the atom is that it does not explain the stability of the atom.

2. Correct option – b: Sol
A colloid with a solid dispersed phase and liquid dispersing medium is called sol.

3. Correct option – c: 1 kg of solid into its liquid state at its melting point
The heat energy required to convert 1 kilogram of solid into liquid at the atmospheric pressure, at its melting point is known as the latent heat of fusion. When we supply heat energy to water, the particles start moving even faster. At a certain temperature, a point is reached when the particles have enough energy to break free from the forces of attraction of each other. At this temperature, the liquid starts changing into a gas.

4. Correct option – d:



The atomic number of sodium is 11. Its electronic configuration is 2, 8, 1.

5. Correct option – c:24 g
According to the law of constant proportions, the elements of a compound combine in a definite proportion by mass. Since, the ratio given is 1:8 therefore, mass of oxygen will be 3×8 = 24 g

6. Correct option- a: A solution is a homogenous mixture.
The statement "a solution is a homogenous mixture" is correct, rest all the statements are incorrect.

7. Correct option- b: Isobars
Atoms of different elements with different atomic numbers and the same mass number are known as isobars.

8. Correct option – c: C
A – Nucleus, B – Rough Endoplasmic Reticulum, C – Smooth Endoplasmic Reticulum, D - Ribosomes
Smooth endoplasmic reticulum helps in detoxifying several poisons and drugs in a cell.

9. Correct option – b: 1-Dendrites, 2-Cell Body, 3-Axon, 4-Nucleus
The given diagram shows a nerve cell.
1 – Dendrites are hair-like structures arising from the cell body.
2 – Cell body contains the granular cytoplasm.
3 – Axon is a long, single, tube-like structure.
4 – Nucleus is present in the cell body.

10. Correct option – c: (iii)
(i) - Parenchyma, (ii) - Collenchyma, (iii) - Sclerenchyma, (iv) – Meristematic tissue
Sclerenchyma tissues are elongated and dead with thickened cell walls due to the deposition of lignin.

11. Correct answer – c: Distance
Independent variables are plotted along X-axis and dependent variables are plotted along Y-axis. In the distance-time graph, time is independent, and distance is a dependent variable; hence plotted along Y-axis.

12. Correct answer – a: Cochlea
The cochlea converts pressure variations into electrical signals inside the inner ear.

13. Correct answer – c: When the weight of the body is equal to the weight of the liquid displaced.
An object will float in a liquid if the weight of the body is equal to the weight of the liquid displaced by it.

14. Correct answer – c: Kinetic energy is zero.
The kinetic energy becomes zero. According to the law of conservation of energy kinetic energy is converted into potential energy. Potential energy is maximum at this height.

15. Correct option – a: Parenchyma cells
Parenchyma cells are unspecialised cells with thin cell walls. They have large vacuoles and are of various shapes. Nerve cells are branched. Sclerenchyma cells are thick walled. Collenchyma cells are elongated and thickened at the corners.

16. Correct option – a: I
I – Blue Revolution, II – White Revolution, III – Green Revolution, IV - Horticulture
Blue Revolution, also called the Neel Kranti Mission is aimed at enhancing the economic prosperity of the country by augmenting fisheries and fish farmers and contributing towards food and nutritional security.

17. A is false but R is true.

Elements with valency one are either metals or non-metals. Alkali metals and halogens which are non-metals have valency one.

18. Both A and R are true, but R is not the correct explanation of A.

The de-shelled egg when placed in a hypotonic solution swells up because the concentration of water molecules outside the egg is much higher than the concentration of water molecules inside the egg. As a result, endosmosis takes place and water from the surrounding medium enters inside the egg and causes it to swell. So, the assertion is true.

An egg is rich in proteins. An average-sized egg contains about 6–7 grams of protein. So, the reason is also true.

However, the reason does not explain the given assertion.

19. Both A and R are correct, and R is the correct explanation of A.

When we walk on the ground our foot pushes the ground in the backward direction (action) and the ground pushes our foot in the forward direction (reaction). This reaction helps us to move forward. But, when our footfalls are on a peel of banana, the peel cannot push the ground in the backward direction. Consequently, no reaction force acts on our foot, and we lose balance.

Hence, we can conclude that both A and R are correct, and R is the correct explanation of A.

20. Both A and R are true, and R is the correct explanation of A.

Most of the plant tissues are dead because dead cells in plant tissues provide mechanical strength more easily than living cells and require less maintenance due to the sedentary existence of plants. So, both assertion and reason are true, and the reason correctly explains the given assertion.

SECTION - B

21.

(a) Naphthalene easily undergoes sublimation, i.e., change of state of naphthalene from solid to gas without the intervening liquid state. Thus, naphthalene balls form naphthalene vapour which disappears into the air with time without leaving any solid residue.

(b) Gaseous particles possess high speed and move very rapidly in all directions.
When perfume is sprayed, its particles diffuse into the particles of air at a very fast rate and reach our nostrils. This enables us to smell the perfume from a distance.

22.

(a) A → Dendrites
B → Cyton
C → Axon

(b) Part A or dendrites receive electrical signals from other neurons, process these signals and transfer the information to the soma of the neuron.

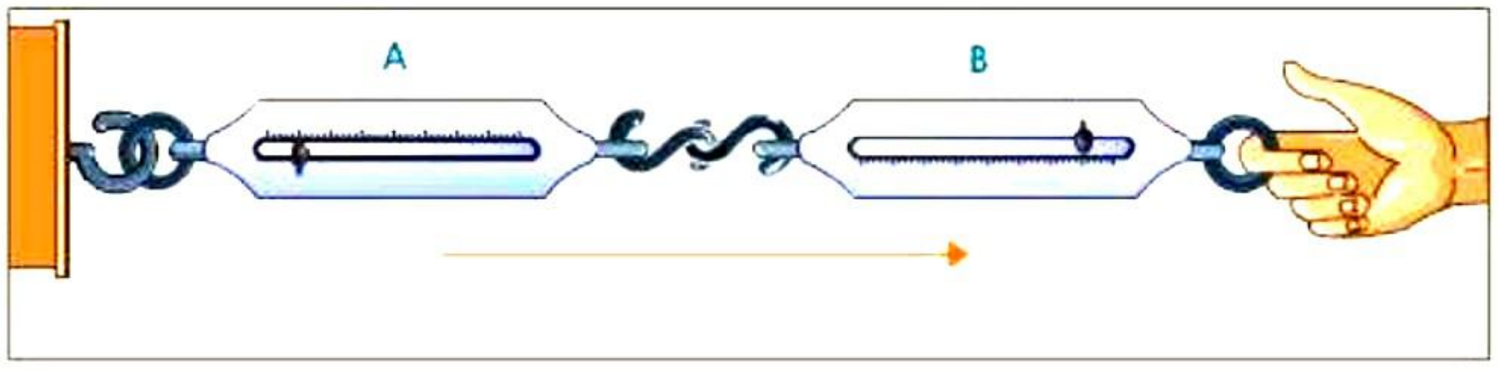
23. The plasma membrane forms the boundary of the cell and keeps the cell components i.e., cytoplasm, nucleus, and organelles within the cell. If the plasma membrane ruptures, these cell components will leak out of the cell and the cell will lose its integrity. None of the functions of plasma membrane will be carried out. Ultimately the cell will die.

OR

Generally, we add salt to the vegetables during the cooking process so that the vegetables release water due to exosmosis. In exosmosis, water moves from higher concentration to lower concentration through the semipermeable membrane. As the concentration of water inside the cell (in vegetables) is greater than the outside environment (hypertonic salt solution), the cell releases water in the outside environment and shrinks. Adding salt to the vegetables during cooking also fastens the boiling of vegetables.

24. Scalar quantities are expressed by
i) Magnitude or numerical value of measured quantity
ii) Unit in which the physical quantity is measured

25. Couple two spring balances A and B as shown in the figure. When we pull the balance B, both the balances show the same reading indicating that both the action and reaction forces are equal and opposite. In this case, the pull of either of the two spring balances can be regarded as action and that of the other balance as the reaction.



OR

$$F = ma = m\frac{(v-u)}{t} = 0.5 \times \frac{(0-50)}{0.01} = -2500N$$

Force of the nail on the hammer = - 2500 N

Here, negative sign indicates that the force of nail on hammer is opposite to the force of hammer on nail.

26. As far as possible, farmers should avoid the excessive use of chemical fertilisers and pesticides. They not only cause health hazards but also cause pollution. Instead, farmers should use biological methods to control pests. These methods are safe, cost-effective and environment friendly. They can even make use of organic farming technique to improve crop yield.

SECTION – C

27.

(a) Both fog and smoke use gas as the dispersion medium. The only difference is that the dispersed phase in fog is liquid, and in smoke, it is solid.

(b) It is a pure substance because the chemical composition of sucrose (sugar) crystals is the same irrespective of its source.

(c) In 'Tincture of Iodine', Solute- Iodine and Solvent – Alcohol.

28. Properties of compound:

(a)A compound cannot be separated into its components by physical methods.

(b)The properties of a compound are entirely different from those of its constituent elements.

(c)Energy is usually either given out or absorbed during the preparation of a compound.

(d)The composition of a compound is fixed.

(e)A compound has a fixed melting and boiling point.

(f)A compound is a homogeneous mixture.

OR

	Solid	**Liquid**	**Gases**
1	Particles have definite shape and volume.	Particles have definite volume but do not have definite shape.	Particles do not have definite shape and volume both.
2	Particles are rigid as well as incompressible.	Particles are not rigid but are compressible to certain extent.	Particles are not rigid and are compressible.
3	Examples: stone, wood	Examples: liquid water, milk	Examples: oxygen, steam

29.

(a) The given figure shows cardiac muscle tissue because the cells are striated, uninucleated and branched.

(b) Cardiac muscles are found in the walls of the human heart.

(c) Cardiac muscles contract and relax continuously. We do not have control over their working. Hence, they are involuntary in nature.

30. Large-sized birds require more feed. Summer adaptation is connected with egg laying. Less summer adaptation reduces egg laying.

Small-sized poultry birds are preferred for:

- Lower requirement of feed
- Higher egg laying capacity
- Lower requirement for space

In order to get small-sized poultry birds having summer adaptability, it is desirable to:

- Introduce the required exotic birds from the outside.
- Cross breed the local birds with exotic birds from outside

31.

(a) Pitch, Loudness, Speed characterizes sound waves.

(b)

(i) B has higher pitch because it has higher frequency.

(ii) A has more loudness because it has larger amplitude.

(c)

$v = \nu\lambda$

$= 2000 \times 0.35 = 700 \text{ m/s}$

32.

(a) The track offers a frictional force on each wagon.

Thus,

Net accelerating force = Total force exerted - Frictional force on each wagon

= 40000 – (5 × 5000) N = 15000 N

(b) Acceleration of the train:

Total mass = Mass of 5 wagons + Mass of engine = 5 x 2000 kg + 8000 kg = 18000 kg

F = m a→ Acceleration = F/m = 15000 N/18000 kg = 0.83 m/s^2

(c) Force F exerted by the first wagon is opposite to the friction force of 2nd wagon.

Thus, the net force is F –5000 N.

Now, the 2nd wagon is moving with an acceleration of 0.83 m/s^2.

Thus, we have

F –5000 = 2000 × 0.83F = 5000 + 1660F = 6660 N

33.

Average speed =Total distance / Total time

Total distance = 1 + 2 + 1 + 2 = 6 km

Time taken = 50minutes =50/60 hours=5/6 hours

Average speed = (6km) / 50 minutes

= (6 km) / (5 / 6) hours

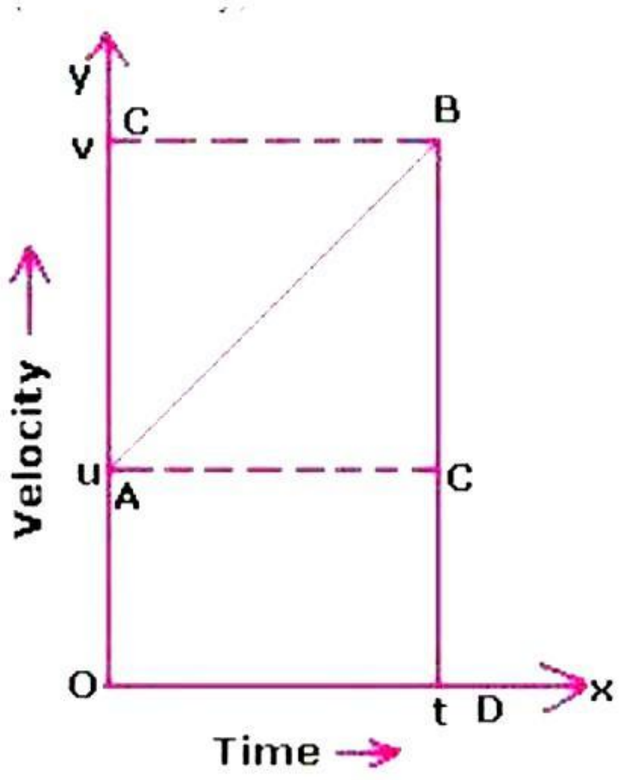
= 7.2 km/hour

Displacement is zero because the runner returns back to its starting point.

Total displacement = 0

Therefore, average velocity = 0

OR



In this graph, initial velocity = u

Velocity at time t = v

Let acceleration be 'a'

Time = t

Then, distance travelled by the body in t s = area between the v-t graph and X-axis

Or distance travelled by the body in t s = area of the trapezium OABD

= (1/2) × (sum of parallel sides) × (perpendicular distance between them)

= (1/2) × (u + v) × (t)

= (u + v)t /2

SECTION - D

34. Differences between true solution and colloid:

True Solution	Colloid
1. A true solution is a homogeneous mixture of two or more substances.	1. A colloidal solution is a heterogeneous mixture of two substances.
2. Size of the particles is less than one nanometre.	2. Range of particle size is from 1 to 100 nanometre.
3. It is always transparent.	3. It is translucent.
4. Particles cannot be seen even with a microscope.	4. Particles of a colloidal solution can be seen with a microscope.
5. It does not show Tyndall effect.	5. It shows Tyndall effect.

OR

(a) Both the samples are mixtures, but the method of separation is different. Iron from the mixture in sample 1 can be separated by using magnet but in sample 2 the mixture is made of two non-magnetic substances viz. sulphur and sand.
The method of separation of a mixture of sulphur powder and sand is as follows:
Carbon disulphide is added to the mixture of sulphur powder and sand. Sand is insoluble in carbon disulphide, but Sulphur powder is soluble in it. Sand can be separated by filtration. The filtrate contains sulphur dissolved in it which can be crystallised by heating.

(b) <u>Characteristics of solid:</u>
(i) They have fixed shape and volume.
(ii) They cannot be compressed much.
(iii) They are rigid.
(iv) They have high density.
(v) Some solids may change their shape when an external force is applied but when that force is removed, they can regain their original shape. This shows that some solids are elastic.

35.

(a)
(i) Cartilage (Connective tissue)
(ii) 1 - Matrix; 2 - Chondroblast/Chondrocyte
(iii) Cartilage supports the external ear, nose, etc. It is an elastic tissue.

(b)
(i) Sclerenchyma tissues are dead simple permanent tissues of the plant. The cells of sclerenchyma are closely packed without intercellular spaces, so that they can provide strength, rigidity, flexibility, and elasticity to the plant to withstand various strains. The presence of lignified cell walls makes the cells compact and leaves no intercellular spaces.

(ii) Meristematic cells are actively dividing cells. Therefore, they have a prominent nucleus, dense cytoplasm, and a thin cell wall. Vacuoles possess cell sap and provide rigidity and turgidity to the cell. The presence of vacuoles might pose a problem for cell division in meristematic cells. Hence, they lack vacuole.

OR

(a) The epithelial tissue in the small intestine is likely to be columnar epithelium. This type of epithelium is characterised by its tall, column-shaped cells, which are well-suited for absorption and secretion.

The microvilli on the surface of these cells significantly increase the surface area for absorption. This increased surface area allows for more efficient uptake of nutrients from the digested food. Therefore, the primary function of the microvilli is to enhance nutrient absorption in the small intestine.

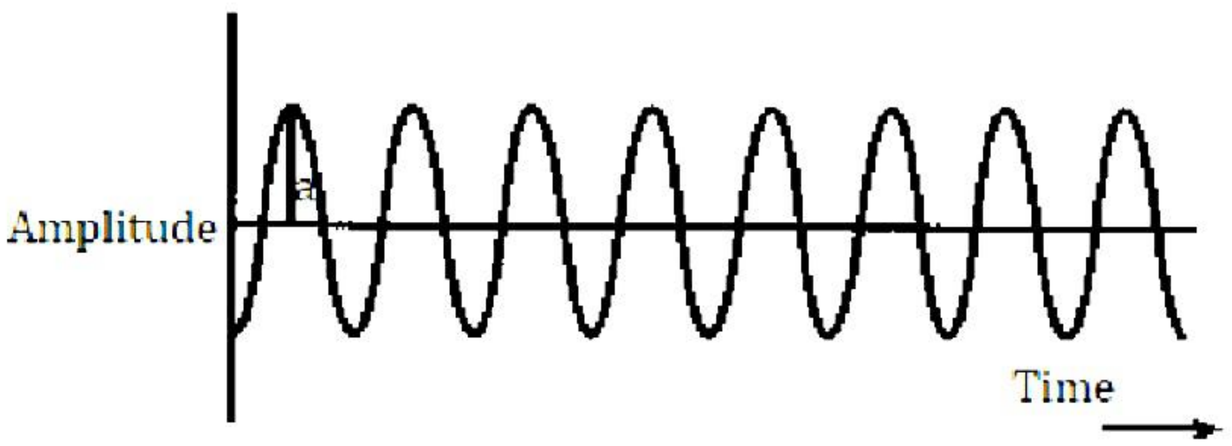
(b) The meristematic tissue found in the tips of roots and shoots is called apical meristem. This type of meristem is responsible for primary growth in plants.

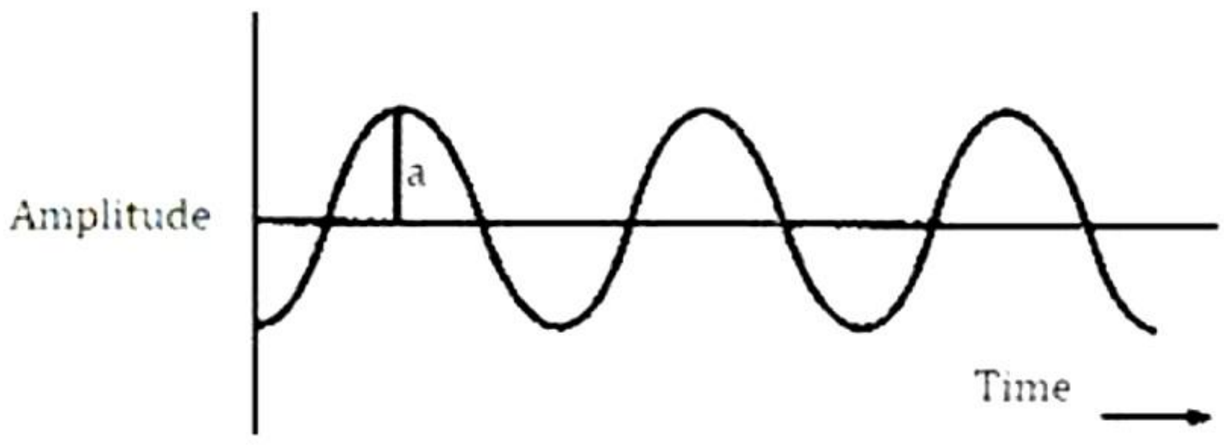
Apical meristems contain actively dividing cells that produce new cells, leading to the elongation of roots and shoots. This growth is essential for plants to access water, nutrients, and sunlight. Additionally, apical meristems contribute to the formation of new organs, such as leaves and flowers.

36.

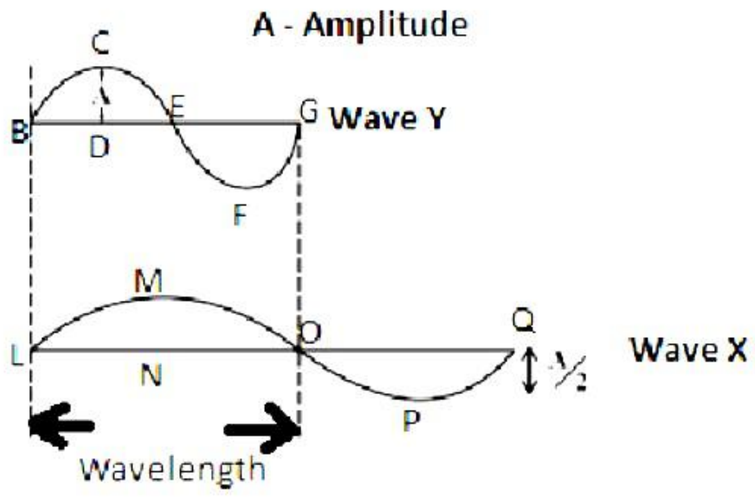
(a)

Here, 'a' in both graphs indicates the amplitude of sound waves. For both the sound waves, the amplitude is the same while frequencies are different.





(b)

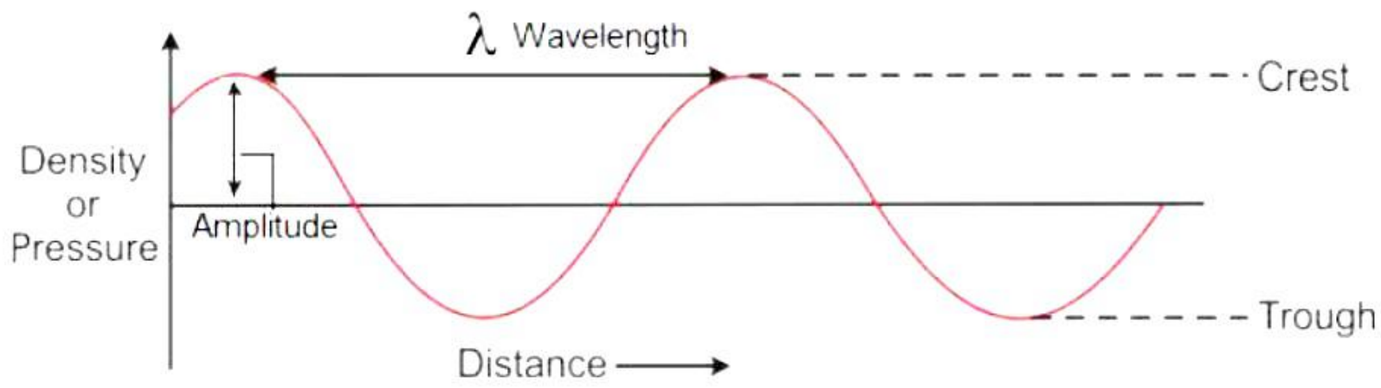


OR

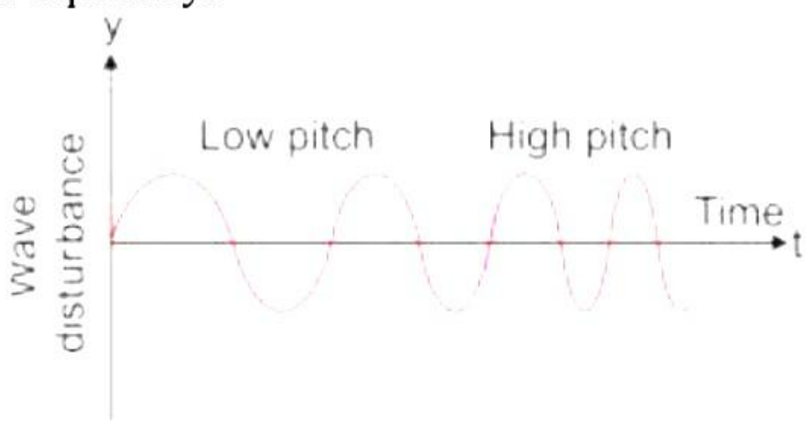
(a)

(i) Sound propagates through the medium as a series of compressions and rarefactions. When a vibrating object moves forward it pushes and compresses the air in front of it creating a region of high pressure (compression). When the vibrating object moves backwards it creates a region of low pressure (rarefaction)

(ii)



(b) A low-pitched sound has lower frequency, and a high-pitched sound has higher frequency.



(c)

(i) SONAR is a device used to locate the depth of the seabed or locate underwater things and enemy submarines.

(ii) The time taken by the ultrasonic sound to travel from the cliff to the ship is half the time taken by the total time, that is,

$$t = \frac{1.02}{2} = 0.51 \text{ s}$$

$$\text{Now, Speed} = \frac{\text{Distance}}{\text{Time}}$$

So, Distance = 1531 m/s × 0.51 s = 780.81 m

SECTION - E

37.

(a)

(i) The α-particles are helium ions with a +2 charge.

(ii) While the experiment Rutherford observed that few particles bounced back, some particles were deflected and most of them continued moving in a straight line.

(b) The Rutherford α-particle experiment shows that most of the α-particles pass through almost unscattered while some are scattered through large angles. This suggests that atom is hallow and the whole mass of the atom is concentrated in a small positively charged centre called nucleus.

OR

(c) To detect alpha particles after scattering, zinc sulphide screen was used. When alpha-particles strike the zinc sulphide screen, they produced flashes of light which were detected. By examining these flashes on different portions of screen, it was possible to determine proportions of alpha-particles which got deflected through various angles.

38.

(a) Leucoplasts are colourless plastids. They store starch, oil, and proteins.

(b) Chromoplasts provide colour to various flowers and fruits.

(c) Chloroplast is a type of plastid which contains a green pigment called chlorophyll. Chlorophyll traps light energy and converts it into chemical energy in the form of food during photosynthesis.

OR

(c) Leucoplasts are of three types - amyloplasts, elaioplasts and aleuroplasts also called proteinoplasts. Amyloplasts store starch, aleuroplasts store proteins and elaioplasts store fats.

39.

(a) From the given graph we can conclude that, the velocity will be maximum between point A and B. Hence, we can conclude that between points A and B the car will be moving fastest.

(b) As we know, from the given graph the slope of OA is maximum and since the slope of velocity vs time graph will be directly proportional to acceleration.

i.e., $Slope,\ m = \frac{\Delta v}{\Delta t} \ldots \left(\because m = \frac{y_2 - y_1}{x_2 - x_1}\right)$

Hence from the given graph we can conclude that, acceleration will be maximum between point O and A.

Note: From the image we can see that, the slope of AB is greater than OA but since between point A and B the velocity of the car will keep on decreasing as a result, we can say that the acceleration will be negative (Decelerating) or in other words car will be slowing down between point AB.

(c) Between point AB and EF, the car will be moving with zero acceleration since the change in velocity will be zero for the given case.

i.e., $a = \Delta v/t = 0 \ldots (\because \Delta v = 0)$

Also,

Given that

Velocity of car at point D, $v_D = 0$ m/s

The velocity of car at point E, $v_E \approx 10$ m/s

Now,

Acceleration between point DE, $a_{DE} = \frac{10-0}{42-32} = \frac{10}{10} = 1\ m/s^2$

OR

(c) The **distance** is measured by the area occupied below the velocity time graph.

Given that,

Initial velocity at point B, u = 20 m/s

Final velocity at point C, v = 0 m/s

Time, t = 6 sec

Now,

Rate of deceleration, $a = \frac{v - u}{t} = \frac{0 - 20}{6} = 3.33 m/s^2$