Class IX Session 2025-26
Subject - Science
Sample Question Paper - 7

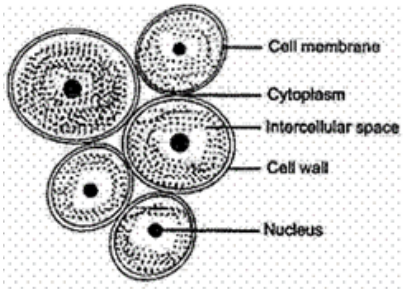
Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This question paper consists of 39 questions in 3 sections. Section A is Biology, Section B is Chemistry and Section C is Physics.
2. 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. Given below is the diagram showing the structure of Parenchyma cell **[1]**



Which marking are wrong?

a) Intercellular space and cytoplasm
b) Cell wall and cell membrane
c) Nucleus and cell wall
d) Cell membrane and nucleus

2. The only cell organelle seen in prokaryotic cell is **[1]**

a) ribosomes
b) plastids
c) lysosomes
d) mitochondria

3. Match the following with the correct response**:** **[1]**

(a) Genes	(i) Gases
(b) Diffusion	(ii) Loss of water by plant cells
(c) Osmosis	(iii) Movement of water molecular
(d) Plasmolysis	(iv) Hereditary units

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

4. Identify the CORRECT option for sclerenchyma tissue. **[1]**

a) Unspecialized cells with thin cell walls
b) regularly thickened at the corners

c) Lignified
d) Irregularly thickened at the corners

5. Which one of the following is not an exotic breed of cow? **[1]**

a) Brown swiss
b) Holstein-Friesian
c) Sahiwal
d) Jersey

6. **Assertion (A):** 1-day Vinita went to see his brother's competition and he saw his brother in pain and not able to run comfortably. **[1]**

Reason (R): Two bones can be connected to each other by another type of connective tissue called the ligament. This tissue is very elastic. It has considerable strength.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

7. **Assertion (A):** Plasma membrane is selectively permeable. **[1]**

Reason (R): Plasma membrane allows some molecules to pass through it more easily than others.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but 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. Which one of the following fishes is a surface feeder? **[1]**

a) Common carps
b) Rohus
c) Mrigals
d) Catlas

9. The enrichment of water bodies with nutrients leading to excessive growth of phytoplankton is known as:- **[1]**

a) Ammonification
b) Nitrification
c) Phyto-enrichment.
d) Eutrophication

10. What would happen if the plasma membrane ruptures or breaks down? **[2]**

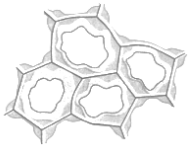
11. Define the process of differentiation. **[2]**

OR

Why is the epidermis present as a thick waxy coating of cutin in desert plants?

12. What are the constituents of a balanced diet? **[2]**

13. i. Identify the tissue given in the following figure. **[3]**
ii. Mention the characteristic features of the cells.
iii. Specify the function of this tissue.
iv. Name any one part of the plant, where these cells are present.



[3]

14. 

Answer the following questions:

i. How can we genetically modify crops?

ii. What is a various factor that is essential for good quality crops?

iii. Enlist the abiotic stresses to bear by crops.

15. **Read the following text carefully and answer the questions that follow:** **[4]**

Leeuwenhoek discovered the free-living cells in pond water for the first time. Robert Brown discovered the nucleus in the cell. A single cell may constitute a whole organism as in Amoeba. These organisms are called unicellular organisms. On the other hand, many cells group together in a single body and assume different functions in it to form various body parts in multicellular organisms. The shape and size of cells are related to the specific function they perform. Each living cell has the capacity to perform certain basic functions that are characteristic of all living forms. Each kind of cell organelle performs a special function, such as making new material in the cell, clearing up the waste material from the cell and so on.

i. Who first discovered cells? (1)

ii. Is Chlamydomonas a unicellular or multicellular organism? (1)

iii. Who suggested that all cells arise from pre-existing cells? (2)

OR

Identify the given cell. (2)

16. Draw a plant cell and label the parts which **[5]**

i. determines the function and development of the cell

ii. packages materials coming from the endoplasmic reticulum

iii. provides resistance to microbes to withstand hypotonic external media without bursting

iv. is site for many biochemical reactions necessary to sustain life.

v. is a fluid contained inside the nucleus

OR

Describe the structure and function of different types of epithelial tissues. Draw the diagram for each type of epithelial tissue.

Section B

17. Liquid A boils at 60^{o}C while liquid B boils at 80^{o}C which is more volatile? **[1]**

a) Liquid B
b) Neither A nor B
c) Both A and B
d) Liquid A

18. What information do we get from the molecular formula? **[1]**

a. It represents one molecule of the substance.
b. It does not tell the name of the substance.
c. It tells about the type of atoms.
d. It represents the formula mass unit of the substance.

a) All of these
b) (b) and (c) are correct
c) (a) and (b) are correct
d) (a), (c) and (d) are correct

19. **Assertion (A):** An unknown substance A on thermal decomposition produces B and C. **[1]**
Reason (R): Unknown substance A is an element because compounds and mixtures do not decompose.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

20. Match the following with the correct response: **[1]**

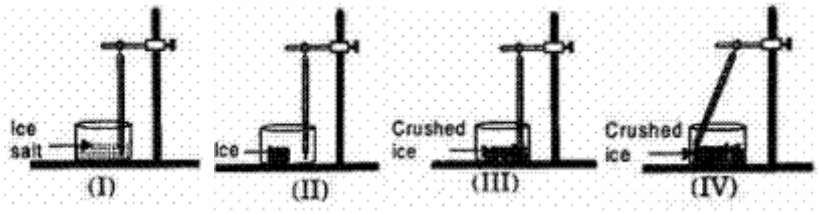
(a) α - particles	(i) Negligible mass
(b) Protons	(ii) Helium nucleus
(c) Electrons	(iii) Neutral
(d) Neutrons	(iv) 1 unit of positive charge

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

21. The chemical symbol for sodium is **[1]**

a) K
b) Na
c) Sd
d) So

22. Which one of the following is the correct set up to determine the melting point of ice? **[1]**



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

23. Which one of the following will result in the formation of a mixture? **[1]**

a) Agitating a detergent with water in a washing machine

b) Crushing of a marble tile into small particles

c) Breaking of ice cubes into small pieces

d) Adding sodium metal to water

24. **Assertion (A):** According to the Law of Constant Proportion, in a chemical substance, elements are always present in a definite proportion by mass. **[1]**

Reason (R): The proportion of hydrogen and oxygen is 1 : 8 by mass in a molecule of water.

a) Both A and R are true and R is the correct explanation of A.

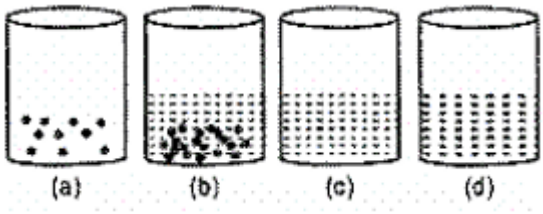
b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

25. Why is a cation so named? **[2]**

26. Which of the following is a true solution? **[3]**



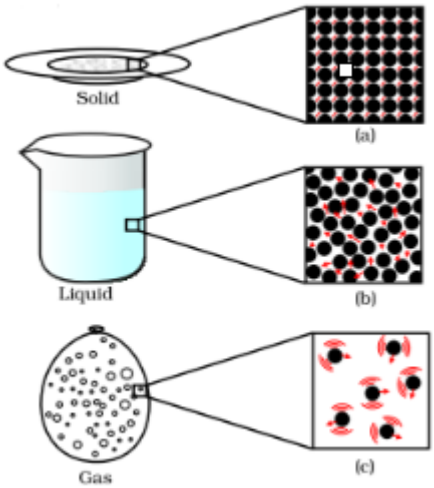
OR

The teacher instructed three students 'A', 'B' and 'C' respectively to prepare a 50% (mass by volume) solution of sodium hydroxide (NaOH). 'A' dissolved 50 g of NaOH in 100 ml of water, 'B' dissolved 50 g of NaOH in 100 g of water while 'C' dissolved 50 g of NaOH in water to make 100 ml of solution. Which one of them has made the desired solution and why?

27. Helium atom has an atomic mass of 4 u and two protons in its nucleus. How many neutrons does it have? **[3]**

28. **Read the following text carefully and answer the questions that follow:** **[4]**

Gases are highly compressible as compared to solids and liquids. The liquefied petroleum gas (LPG) cylinder that we get in our home for cooking or the oxygen supplied to hospitals in cylinders is compressed gas. Compressed natural gas (CNG) is used as fuel these days in vehicles. The liquid takes up the shape of the container in which they are kept. Liquids flow and change shape, so they are not rigid but can be called fluid. Solids and liquids can diffuse into liquids. The aquatic animals can breathe underwater. The rate of diffusion of liquids is greater than solid.



i. Why Compressed natural gas (CNG) is used as fuel these days in vehicles? (1)

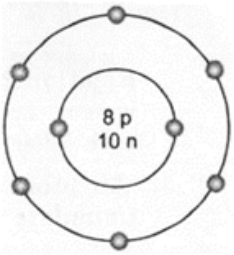
ii. How can we say that liquid do not have their fixed shape? (1)

iii. How do aquatic animals breathe under water? (2)

OR

What is diffusion? (2)

29. The given figure depicts the atomic structure of an atom of an element 'X'. Write the following information about the element 'X'. **[5]**



a. Atomic number of 'X'

b. Atomic mass of 'X'

c. Valence electrons

d. Valency of 'X'

e. 'X' should be metal or non-metal.

OR

What were the drawbacks of Rutherford's model of an atom?

Section C

30. Which effect of force is observed in the given image? **[1]**

a) A force can change the shape of the object

b) A force can stop a moving body

c) A force can move a stationary body

d) A force can change the speed of a moving body

31. To observe and compare the pressure exerted by solid iron cuboid on the sand, a student takes a cuboid of 5 kg and has a dimension of its base 30 cm ×15 cm and measures its pressure, then he mounts the cuboid on a cylinder having a radius of base 7 cm and weight equal to 1 kg. The pressure of the whole set-up on the sand is: **[1]**

a) can't say

b) remains same

c) increased by 3.5 times

d) decreased by 3.5 times

32. **Assertion (A):** Supersonic speed exceeds the speed of sound. **[1]**

Reason (R): Bullets, jet aircraft, etc. often travel at supersonic speeds.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

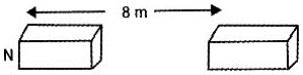
d) A is false but R is true.

33. How much momentum will a dumbbell of mass 10 kg transfer to the floor, if it falls from a height of 0.8 m? **[2]**

Take acceleration due to gravity as 10 ms^{-2}.

34. A force of 7N acts on an object. The displacement is say 8 m, in the direction of the force. Let us take it that the **[2]**

force acts on the object through the displacement. What is the work done in this case?



OR

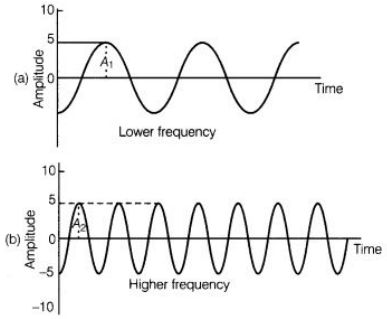
If the power of a motor is 40 kW, at what speed can it raise a load of 20,000 N?

35. State which of the following situations are possible and give an example for each of these. **[3]**

(a) An object moving with a constant acceleration but with zero velocity

(b) An object moving in a certain direction with an acceleration in the perpendicular direction.

36. Observe the following graphical diagram and answer the following questions: **[3]**

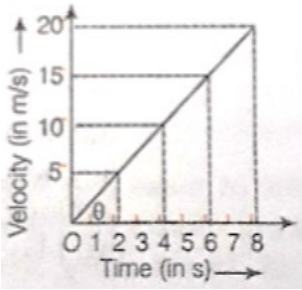


i. What is represented by the graphical diagram shown above?

ii. Which wave characteristic determine the pitch of sound?

iii. What is the relationship between pitch and frequency?

37. The motion of a body of mass 5 kg is shown in the velocity-time graph. **[3]**



Find from the graph

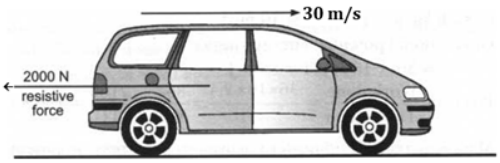
i. The acceleration.

ii. The force acting on the body.

iii. The change in momentum of the body in 2 s after the start.

38. **Read the following text carefully and answer the questions that follow:** **[4]**

A car of mass 900 kg is travelling at a steady speed of 30 m/s against a resistive force of 2000 N, as illustrated in figure.



i. Calculate the kinetic energy of the car. (1)

ii. Calculate the energy used in 1.0 s against the resistive force. (1)

iii. What is the minimum power that the car engine has to deliver to the wheels? (2)

OR

What form of energy is in the fuel, used by the engine to drive the car? (2)

39. The weight of any person on the moon is about 1/6 times that on the earth. He can lift a mass of 15 kg on the **[5]**

earth. What will be the maximum mass, which can be lifted by the same force applied by the person on the moon?

OR

A stone is allowed to fall from the top of a tower 100 m high and at the same time another stone is projected vertically upwards from the ground with a velocity of 25 ms^{-1}. Calculate when and where the two stones will meet.

Solution

Section A

1. **(a)** Intercellular space and cytoplasm
   Explanation:
   Cytoplasm lies inside the cell and intercellular space lies in between two cells.
2. **(a)** ribosomes
   Explanation:
   Unlike eukaryotic cell, a prokaryotic cell lacks membrane-bound organelles like plastids, mitochondria and endoplasmic reticulum but smaller and randomly scattered ribosomes are seen.
3. **(b)** (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)
   Explanation:
   - Genes are functional units of heredity that determine the characters of organisms.
   - Diffusion is the process of passage of fluid from a region of high concentration to a region of low concentration. It plays an important role in the gaseous exchange between the cells as well as the cell and its external environment. Water also obeys the law of diffusion.
   - The passage of water from a region of higher water concentration to a region of lower water concentration through a semi-permeable membrane is called osmosis. The movement of water across the plasma membrane is affected by the amount of substance dissolved in water.
   - Plasmolysis is a plant cell that refers to the contraction of protoplast as a result of the loss of water from the cell. The shrinkage of cytoplasm occurs due to exo-osmosis in a hypertonic medium. A hypertonic solution is one that has a lesser concentration of water as compared to that inside the cell. During the process, there is a higher external osmotic pressure and a net flow of water from the cell.
4. **(c)** Lignified
   Explanation:
   Sclerenchyma tissues are greatly thickened due to the deposition of lignin. Thus, they are lignified.
5. **(c)** Sahiwal
   Explanation:
   Jersey, Brown Swiss, Holstein-Friesian all are Exotic breeds of cow. Sahiwal, Gir, Red Sindhi, Tharparkar are Indigenous breeds and Karan Swiss, Karan Fries, Frieswal are Cross-breeds.
6. **(b)** Both A and R are true but R is not the correct explanation of A.
   Explanation:
   Two bones can be connected to each other by connective tissue called the ligament. Vinita's brother might be suffering from a ligament tear due to which he has pain in the knee while running.
7. **(a)** Both A and R are true and R is the correct explanation of A.
   Explanation:
   Each cell is bound by an extremely delicate, thin, elastic, selectively permeable, living membrane called plasma membrane. It is selectively permeable as it allows some molecules to pass through more easily than others.
8. **(d)** Catlas

Explanation:

Catlas are surface feeders, Rohus feed in the middle-zone of the pond, Mrigals and Common Carps are bottom feeders, and Grass Carps feed on the weeds.

9. **(d)** Eutrophication

Explanation:

The enrichment of water bodies with nutrients leading to excessive growth of phytoplankton is called **Eutrophication**. **Eutrophication** or more precisely **hypertrophication**, is the enrichment of a water body with nutrients, usually with an excess amount of nutrients. This process induces the growth of plants and algae and due to the biomass load, may result in oxygen depletion of the water body.

Eutrophication is an enrichment of water by nutrient salts that causes structural changes to the ecosystem such as increased production of algae and aquatic plants, depletion of fish species, general deterioration of water quality, and other effects that reduce and preclude use. Eutrophication is almost always induced by the discharge of phosphate-containing detergents, fertilizers, or sewage into an aquatic system.

10. Plasma membrane is the selectively permeable membrane that surrounds the cell and allows the entry and exit of selected materials of the cell. If it ruptures, the contents of the cell will come in direct contact with the surrounding medium and not only unwanted material will be able to enter freely into the cell, but useful material will also find its way out of the cell easily. This will seriously disrupt the various metabolic activities of the cell and will result in its eminent death.
11. In a multicellular organism, the cells become specialized to perform different functions. The different functions are taken up by different group of cells. Accordingly, the cells become morphologically different. This phenomenon of taking up a permanent shape, size and function by a meristmatic tissue is known as differentiation. Permanent tissues lose the ability to divide.

    OR

    A waxy water-resistant coating of cutin (a chemical substance) is present in desert plants to prevent excessive loss of water during transpiration. Due to this water-proof coating, plants can survive in scarcity of water in deserts.
12. **Balanced diet:** The diet which contains adequate amount of all nutrients is known as balanced diet.

    Main constituents of a balanced diet are as follows:

    a. **Carbohydrate:** It provides 50-70% of total energy intake.
    b. **Fat:** For an adult, fat should provide 20% of total energy intake. Children require more fat to provide 50% of the total energy intake.
    c. **Proteins:** Protein intake should be about 15-20% of the total daily energy intake.
    d. Vitamins and minerals
    e. Water
    f. Roughage

    All these nutrients are necessary for the proper growth and development of an individual.
13. i. The tissue given in the figure is collenchyma.
    ii. The cells of collenchyma are living, elongated, thickened at the corners and have very little intercellular space.
    iii. It provides mechanical support and flexibility to the plant.
    iv. It is present in leaf stalks, below the epidermis.
14. i. Through the process of hybridization that is crossing between genetically dissimilar plants is used to genetically modify crops.
    ii. The factor essential for good quality of crops is the weather, soil quality, and availability of water.
    iii. Abiotic stresses are drought, salinity, waterlogging, heat, cold and frost.
15. i. Robert Hooke
    ii. Chlamydomonas is a unicellular green algae. Their single-celled body is in an oval or pear shape with a cup shaped chloroplast.
    iii. Cells arise from the pre-existing cells is the second postulate of cell theory. **Rudolf Virchow** proposed this.

    OR

    Fat cell
16. i. Nucleus
    ii. Golgi apparatus
    iii. Cell wall

iv. Cytoplasm

v. Nucleoplasm.

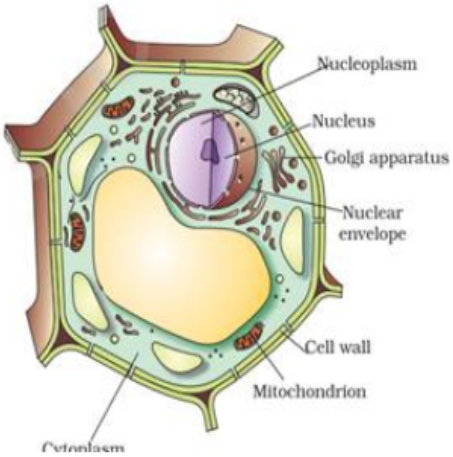
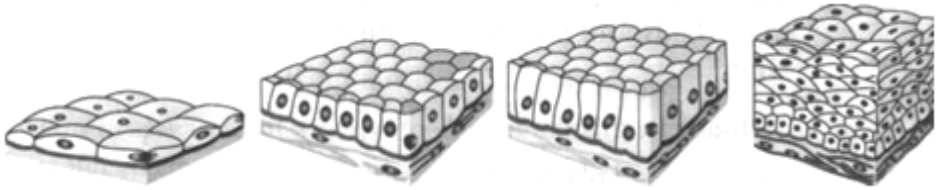


Figure: A plant cell

OR

Epithelial tissues can be (A) Squamous epithelium (Either simple squamous epithelium or stratified squamous epithelium) (B) Columnar epithelium (C) Cuboidal epithelium or (D) Glandular epithelium



The structure and function of different types of epithelial tissues are as follows:-

A. Squamous epithelium can be of two types:-

a. Simple squamous epithelium: Simple squamous epithelial cells are a simple flat kind of epithelium. They are extremely thin and flat. They form a delicate lining. They are present in the lining of the blood vessels or the alveoli (in lungs) where transportation of substances occurs through a selectively permeable membrane. They are also present in the esophagus and the lining of the mouth are also covered with this type of cells.

b. Stratified squamous epithelium: Stratified squamous epithelial cells are arranged in a pattern of layers. E.g. Skin epithelial cells are arranged in many layers to prevent wear and tear.

B. Columnar epithelium: Columnar epithelial cells are present where absorption and secretion occur as in the inner lining of the intestine. These cells are long or columnar (pillar-like). They facilitate movement across the epithelial barrier. In the respiratory tract, the columnar epithelial tissue has hair-like projections (cilia) on the outer surfaces of epithelial cells. The movement of the cilia pushes the mucus forward and clears it.

C. Cuboidal epithelium: Cuboidal epithelium is made up of cube-shaped cells which provide mechanical support. They form the lining of the kidney tubules and ducts of salivary glands.

D. Glandular epithelium: A multicellular gland or glandular epithelium is formed when a portion of the epithelial tissue folds inward and a multicellular gland is formed. An epithelial cell sometimes acquires additional specialisation as a gland cell. Gland cells can secrete substances at the surface of the epithelium.

Section B

17.

(d) Liquid A

Explanation:

Boiling Point of liquid A = 60^oC

Boiling Point of liquid B = 80^oC

Liquid A has a lower boiling point, so it is being more volatile and has a high vapor pressure at 80^oC Because vapour pressure has an inverse relation with the boiling point.

18.

(d) (a), (c) and (d) are correct

Explanation:

The molecular formula of a substance (an element or a compound) is a symbolic representation of the actual number of atoms present in one molecule of that substance. It represents the formula mass unit of the substance. It also conveys the name of the substance. Therefore, (a), (c) and (d) are correct.

19.

(c) A is true but R is false.

Explanation:

Unknown substance A should be compound as on thermal decomposition it produces B and C. Element and mixture do not decompose.

20.

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

Explanation:

Alpha decay is a radioactive process in which a particle with two neutrons and two protons is ejected from the nucleus of a radioactive atom. The alpha particle is identical to the nucleus of a helium atom. The nucleus of helium is composed of two protons and two neutrons. A neutron is a neutral particle. A proton is a positively-charged particle and has one unit of a positive charge. An electron (negatively-charged) has negligible mass as compared to that of a proton or a neutron.

(a) α - particles	(ii) Identical to Helium nucleus
(b) Proton	(iv) Has 1 unit of positive charge
(c) Electron	(i) Has negligible mass as compared to other sub-atomic particles
(d) Neutrons	(iii) Are neutral sub-atomic particles

21.

(b) Na

Explanation:

Sodium is a chemical element with the symbol **Na** (from Latin *natrium*) and the atomic number is 11.

22.

(b) III

Explanation:

The bulb of the thermometer should be dipped in crushed ice to determine the melting point of ice.

23. **(a)** Agitating a detergent with water in a washing machine

Explanation:

Detergent in water will form a mixture, others will not form a mixture.

24. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

According to the Law of Constant Proportion, in a chemical substance, elements are always present in a definite proportion by mass. For example, water obtained from any source will have the same two elements, namely hydrogen, and oxygen present in it.

2 grams of hydrogen and 16 grams of oxygen form a molecule of water. The proportion of hydrogen and oxygen is 1: 8 by mass. This proportion will always remain the same, irrespective of the source of water.

25. When an electric current is passed through the solution of salt like sodium chloride (NaCl), the positive ion (Na^+) migrates towards the cathode (negative electrode). It is, therefore, called cation.
    - Positive ion migrating towards cathode on passing electric current is known as a cation.
    - Negative ion migrating towards anode on passing electric current is known as an anion.
26. Alcohol is soluble in water. Therefore, it will form true solution. sand will form suspension. Milk and soap will form colloidal solution

OR

Student 'C' has made the desired solution.

Mass by volume% = $= \frac{\text{Mass of solute}}{\text{volume of solution}} \times 100$

$= \frac{50g}{100ml} \times 100 = 50\%$ mass by volume

27. Since the atomic number is equal to the number of protons and the atomic mass is the sum of the number of protons and neutrons, the number of **neutrons** present in a helium atom = Atomic mass (A) – Number of protons (Z) = 4 - 2 = 2
Thus, a helium atom has **2 neutrons**.

28. i. CNG is used as fuel these days in vehicles because they are less polluting ,easy to transport,cost effective and highly compressible also.
ii. When a liquid is poured into any container, it takes the shape of the container. Hence, it has no definite shape.
iii. Aquatic animals breathe due to the presence of oxygen dissolved in water like fish breathe through their gills , frog with their moist skin etc.

OR

The process of movement of a substance (solid, liquid, or gas) from the region of higher concentration to the region of lower concentration so as to spread uniformly is called diffusion.

29. a. Atomic number of 'X' = Number of protons in 'X' = 8
b. Atomic mass of 'X' = Number of protons in 'X' + Number of neutrons in 'X' = 8 + 10 = 18 u
c. Valence electrons = Electrons in outermost shell = 6
d. Valency = Number of valence electrons (for 4 or lesser valence electrons); Valency = 8 - Number of valence electrons (for more than 4 valence electrons)
Therefore, valency of 'X' = 8 - 6 = 2
e. 'X' should be non-metal because there are six valence electrons, hence it will tend to gain two more electrons to complete its outermost shell in order to achieve a noble gas configuration.

OR

Rutherford had proposed a model in which the electrons revolve around the nucleus in well-defined orbits. However, the orbital revolution of the electron was not expected to be stable. Any particle in a circular orbit would undergo acceleration and the charged particles would radiate energy. Thus, the revolving electrons would lose energy and finally fall into the nucleus. Revolution of electrons around the atom would make the atom highly unstable and the matter would not exist. But this is contrary to our common observations.

Section C

30. **(a)** A force can change the shape of the object
Explanation:
In the given image, when the softball is pressed in the palm with the help of fingers, the ball changes its shape. This shows that a force can change the shape of the object.

31.
(d) decreased by 3.5 times
Explanation:
P1 = $\frac{F_1}{A_1} = \frac{M_1 g}{A_1} = \frac{5\times\ 9.8}{0.30\times0.15}$ =1.09 $\times$ 10^3N/m^2
$P_2 = \frac{F_2}{A_2}$ = {tex}\;\frac{(M_1\;+\;M_2)g}{\mathrm{πr}^2}{/tex} =$\frac{(5\ +1)\times\ 9.8}{0.0154} = \frac{58.8}{0.0154}$ = 3.82 $\times$ 10^3N/m^2
$\frac{P2}{P_1} = \frac{3.82\ \times10^3}{1.09\ \times10^3} = 3.5$

32.
(b) Both A and R are true but R is not the correct explanation of A.
Explanation:
When the speed of any object exceeds the speed of sound it is said to be traveling at supersonic speed. Bullets, jet aircraft, etc. often travel at supersonic speeds.

33. Initial velocity (u) = 0, Final velocity (v) =?
Height (S) = 0.8 m, Acceleration (g) = 10 ms^{-2}
Using, $v^2 - u^2 = 2$ gS we have
$v^2 - (0)^2 = 2 \times 10 \times 0.8$

$v^2 = 16$ or $v = 4\ ms^{-1}$

Therefore, Momentum of dumbbell = m × v

$= 10\ kg \times 4\ ms^{-1} = 40$ N.

34. Force = 7 N

Displacement = 8 m

Work done = Force × Displacement

$= 7 \times 8 = 56$ J

OR

Given, Power of motor, $P = 40\ kW = 40 \times 10^3 = 40{,}000$ W

Here, Load to be lifted = Force applied (F) = 20,000 N

If v is the speed of load, then we know that, P = Fv

$\Rightarrow$ Speed, $v = \frac{P}{F} = \frac{40{,}000}{20{,}000} = 2$ m/s

35. (a)An object with a constant acceleration can still have the zero velocity. For example an object which is at rest on the surface of earth will have zero velocity but still being acted upon by the gravitational force of earth with an acceleration of 9.81 ms^{-2} towards the center of earth. Hence when an object starts falling freely can have contant acceleration but with zero velocity.

(b)When an athlete moves with a velocity of constant magnitude along the circular path, the only change in his velocity is due to the change in the direction of motion. Here, the motion of the athlete moving along a circular path is, therefore, an example of an accelerated motion where acceleration is always perpendicular to direction of motion of an objectat a given instance. Hence, it is possible when an object moves in a circular path.

36. i. The two graphical figure represents the same amplitude but different frequency.

ii. The pitch of the sound is determined by the frequency wave.

iii. Lower pitch indicates low frequency and higher pitch indicates the higher frequency that is $Pitch \propto Frequency$.

37. i. Acceleration = Slope of the line of the velocity-time graph,

$a = \frac{v_2 - v_1}{t - t_1} = \frac{5-0}{2-0} = \frac{5}{2} = \frac{10}{4} = \frac{15}{6} = 2.5\ m/s^2$

ii. The force acting on the body is given by

F = ma = 5 × 2.5 = 12.5 N

iii. ∴ Change in momentum = mv -mu [∵ u = 0 and v = 5 m/s]

= 5 × 5 - 5 × 0

= 25 kg-m/s

38. i. Kinetic energy = $\frac{1}{2}mv^2$

$= \frac{1}{2} \times 900 \times (30)^2 = \frac{1}{2} \times 900 \times 900$

= 4,05,000 J

ii. Energy used = Work done against resistive force

= Force × Distance

= 2,000 × 30 = 60,000 J = 60 kJ

A resistive force is one that inhibits or resists the motion of an object. It acts in a direction opposite to any motion or applied force that is trying to move the object.

iii. Minimum power = $\frac{\text{Energyused}}{\text{Timetaken}}$

$= \frac{60{,}000\ J}{\text{Is}}$

60,000 W = 60 W

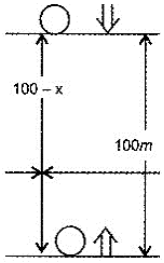
OR

Chemical energy. The fuel in your car provides chemical potential energy, which is converted to kinetic energy when it's combusted.

39. Since the weight of any person on the moon is about 1/6 times that on the earth, hence acceleration due to gravity at the moon is 1/6 of that on earth. This means that by applying the same force a person can lift six times heavier objects on the moon than what he could lift on the earth. So, the maximum mass which can be lifted by the same force applied by the person on the moon is 6 × 15 kg = 90 kg.

OR

Acceleration due to gravity (g) = 10 ms^{-2}



Initial velocity (u) = 0

Distance (S) = 100 - x

Time (t) = ?

$S = ut + \frac{1}{2}gt^2$

$\Rightarrow (100 - x) = 0 \times t + \frac{1}{2}10 \times t^2$

$\Rightarrow 100 - x = 5t^2$ ...(1)

For the stone moving vertically upward:

Initial velocity (u) = 25 ms^{-1}

Time (t) = ?

Acceleration due to gravity (g) = - 10ms^{-2}

[In upward direction g is -ve]

Distance (S) = x

We know: $S = ut + \frac{1}{2}gt^2$ a

$\Rightarrow x = 25 \times t + \frac{1}{2}(-10t^2)$

$\Rightarrow x = 25t - 5t^2$ ...(2)

Substituting the value of x from (2) in (1) we get,

$100 - (25t - 5t^2) = 5t^2$

$100 - 25t + 5t^2 = 5t^2$

25t = 100

t = 4 s

Put the value of t in (1)

$\Rightarrow 100 - x = 5(4)^2$

$\Rightarrow$ 100 - x = 80

x = 20 m

$\therefore$ the stones will meet at a height of 20 m from ground, after 4s.