Class IX Session 2025-26
Subject - Science
Sample Question Paper - 2

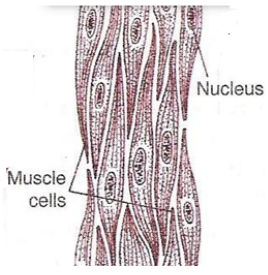
Time Allowed: 3 hours **Maximum Marks: 80**

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. Which type of muscles are shown in the image? **[1]**



a) Spindle-shaped, uninucleated
b) Cylindrical, unbranched
c) Both Spindle-shaped, uninucleated and Elongated, without striations
d) Elongated, without striations

2. The proteins and lipids, essential for building the cell membrane, are manufactured by **[1]**

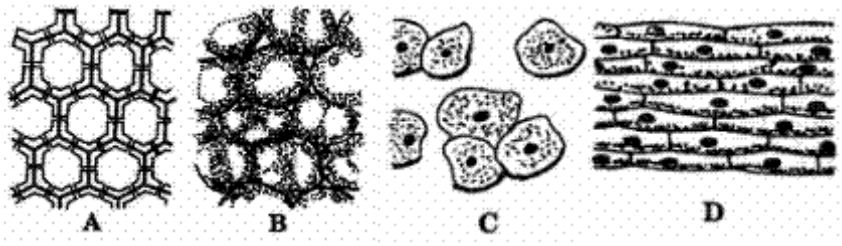
a) Golgi apparatus
b) Plasma membrane
c) Rough endoplasmic reticulum
d) Mitochondria

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

(1) Largest cell	(A) Mycoplasma
(2) Smallest cell	(B) Bacteria
(3) Single cell	(C) Amoeba
(4) Prokaryotic cell	(D) Ostrich egg

a) 1-C, 2-B, 3-D, 4-A
b) 1-D, 2-A, 3-C, 4-B
c) 1-B, 2-D, 3-A, 4-C
d) 1-A, 2-C, 3-B, 4-D

4. Identify the tissues in given diagrams and choose the correct sequence **[1]**



a) A : Parenchyma, B : Sclerenchyma, C : Onion peel, D : Cheek cells

b) A : Sclerenchyma, B : Parenchyma, C : Onion peel, D : Cheek cells

c) A : Parenchyma, B : Sclerenchyma, C : Cheek cells, D : Onion peel

d) A : Sclerenchyma, B : Parenchyma, C : Cheek cells, D : Onion Peel

5. Who is known as the 'Father of white revolution' in India? **[1]**

a) Prof M.S. Swaminathan

b) Shri Jai Prakash Narain

c) Mrs. Indira Gandhi

d) Dr.V. Kurein

6. **Assertion (A):** Animals of colder regions and fishes of cold water have a thicker layer of subcutaneous fat. **[1]**
Reason (R): The thick layer of subcutaneous fat acts as an insulator and prevents the heat of the body to escape out. The layer of fat acts as subcutaneous insulation of body for thermoregulation.

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):** The compost is rich in organic matter and nutrients. **[1]**
Reason (R): Compost prepared by using earthworms to hasten the process of decomposition of plant and animal for refuse is called vermicompost.

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. Describe the functions of epithelium tissue. **[2]**

9. i. Name the month during which Kharif crop is grown. **[2]**
ii. List any two factors for which crop variety improvement is done.

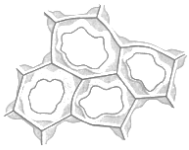
OR

Discuss the implications of the following statement:
"It is interesting to note that poultry is India's most efficient converter of low fibre food stuff (which is unfit for human consumption) into highly nutritious animal protein food."

10. Define the following statements :- **[2]**
(i) White revolution
(ii) Silver revolution
(iii) Blue revolution.

11. 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.

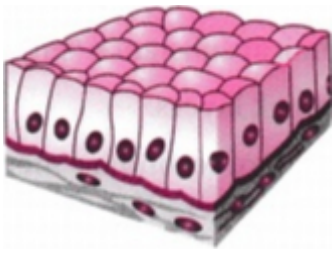


12. What is the difference between plasma membrane and cell wall ? Give the functions of each one. **[3]**

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

The covering or protective tissues in the animal body are epithelial tissues. Epithelium covers most organs and cavities within the body. It also forms a barrier to keep different body systems separate. Epithelial tissue cells are tightly packed and form a continuous sheet. The skin, which protects the body, is also made of squamous epithelium. Skin epithelial cells are arranged in many layers to prevent wear and tear. This columnar epithelium facilitates movement across the epithelial barrier. In the respiratory tract, the columnar epithelial tissue also has cilia, which are hair-like projections on the outer surfaces of epithelial cells. Cuboidal epithelium forms the lining of kidney tubules.

i. Identify the type of epithelial tissue shown in the following figure. (1)



ii. Which cell is present in the inner lining of the intestine? (1)

iii. Is excretion is the main function of the cuboidal epithelium? (2)

OR

Sometimes a portion of the epithelial tissue folds inward, and a multicellular gland is formed which is called a? (2)

14. Draw a neat labelled diagram of an animal cell. **[5]**

OR

Why are xylem and phloem called complex tissues? How are they different from one other?

Section B

15. Find the incorrect statement **[1]**

A. Cooling is caused during boiling

B. The normal room temperature is 298K

C. Evaporation is a surface phenomenon but boiling is not

D. Low boiling liquids evaporate faster than high boiling liquids.

a) C b) D

c) A d) B

16. Which of the following statements are true for pure substances? **[1]**

i. Pure substances contain only one kind of particles

ii. Pure substances may be compounds or mixtures

iii. Pure substances have the same composition throughout

iv. Pure substances can be exemplified by all elements other than nickel

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

17. A food sample turned blue-black after addition of a few drops of iodine solution. This sample contains: **[1]**

a) protein
b) fat
c) glucose
d) starch

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

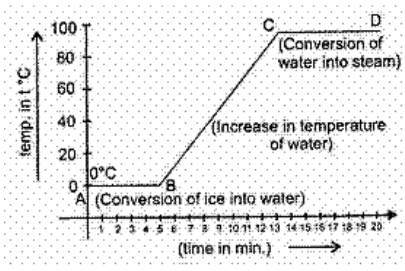
(a) Deuterium	(i) Radio carbon-dating
(b) Carbon-14	(ii) Treatment of cancer
(c) Isotope of Uranium	(iii) Nuclear reactors
(d) Cobalt-60	(iv) An isotope of Hydrogen

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

19. What mass of CO_2 will 3.011×10^{23} molecules contain? **[1]**

a) 4.4 g
b) 22.0 g
c) 11.0 g
d) 44.0 g

20. The inferences drawn by the temperature versus time graph are **[1]**



A. During the melting, temperature of substance does not change.
B. Temperature rises after all amount of ice melts.
C. At a specific temperature water starts boiling and temperature remains the same during the conversion of water into steam.

Which statement is correct regarding graph?

a) All (A), (B) and (C) are correct
b) Only (C) is correct
c) Only (A) is correct
d) Only (B) is correct

21. To observe starch granules in potato under a microscope, freshly cut surface of potato placed on a slide. The stain that will show starch granules clearly is: **[1]**

a) iodine
b) eosin
c) safranin
d) methylene blue

22. **Assertion (A):** A molecule is a group of two or more atoms chemically bonded together. **[1]**
Reason (R): A molecule is the smallest particle of an element or a compound.

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.

23. The mass of one molecule of a substance is 4.65×10^{-23} g. What is its molecular mass? What could this substance be? **[2]**

24. Liquids generally have low density as compared to solid. But you must have observed that ice floats on water. Find out why? **[3]**

OR

Why are gases compressible but not liquids?

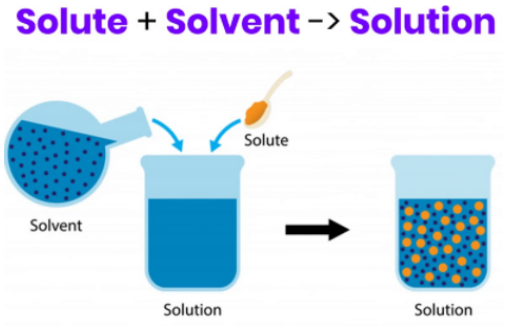
25. An element 'X' contains 6 electrons in 'M' shell as valence electrons**:** **[3]**

(a) What is the atomic number of 'X'?

(b) Identify whether 'X' is a metal or non-metal.

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

Mixtures are constituted by more than one kind of pure form of matter. Sodium chloride is itself a pure substance matter. The solution is a homogeneous mixture of two or more substances. Lemonade, soda water etc. are all examples of solutions. Alloys are mixtures of two or more metals or a metal and a non-metal and cannot be separated into their components by physical methods. A solution has a solvent and a solute as its components. The component of the solution that dissolves the other component in it (usually the component present in a larger amount) is called the solvent. The component of the solution that is dissolved in the solvent (usually present in lesser quantity) is called the solute.



i. In a water-sugar solution: Identify solute and solvent? (1)

ii. What is the size of the particles of a solution? (1)

iii. What is pure substance? (2)

OR

What do you mean by Alloy? (2)

27. Describe valency by taking the examples of silicon and oxygen. **[5]**

OR

For the following statements, write T for True and F for False and give a reason:

a. J.J Thomson's proposed that the nucleus of an atom contains only nucleons.

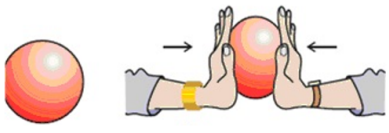
b. A neutron is formed by an electron and a proton combining together. Therefore it is neutral.

c. The mass of an electron is about $\frac{1}{2000}$ times that of a proton.

d. An isotope of iodine is used for making a tincture of iodine, which is used as a medicine.

Section C

28. When we press a rubber ball with both the hands, it **[1]**



a) changes composition

b) changes its Mass

c) becomes light

d) changes its shape

29. Statement A: Any physical or mental activity is termed as work done in physics. **[1]**

Statement B: Work is said to be +ve work done when the body is displaced in the direction of applied force.

Which of the two statements is true?

a) neither A nor B

b) Statement A and B

c) Statement B

d) Statement A

30. Match the following with correct response. **[1]**

Column A	Column B
(1) Velocity	(A) m/s^2
(2) Displacement	(B)m/s
(3) Acceleration	(C) $-m/s^2$
(4) Retardation	(D) m

a) 1-C, 2-B, 3-D, 4-A

b) 1-A, 2-C, 3-B, 4-D

c) 1-B, 2-D, 3-A, 4-C

d) 1-D, 2-A, 3-C, 4-B

31. If cross - sectional area of an object is more than the pressure applied by the external force is :- **[1]**

a) Remains same

b) None of the above.

c) Less

d) More

32. **Assertion (A):** Compression and rarefaction involve changes in density and pressure. **[1]**

Reason (R): When particles are compressed, the density of medium increases and when they are rarefied, the density of medium decreases.

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. A hammer of mass 500 g, moving at 50 ms^{-1}, strikes a nail. The nail stops the hammer in a very short time of 0.01 s. What is the force of the nail on the hammer? **[2]**

34. A balloon of volume 50 m^3 is filled with hot air of density 0.4 kgm^{-3}, if the weight of the fabric of balloon is 12 kgf and equipment 'P' is attached to it, such that balloon is in the state of equilibrium. Calculate:i) Weight of hot air,ii) Weight of hot air, balloon and equipmentiii) Upthrust,iv) Weight of equipment. **[2]**

OR

A boy of mass 40 kg runs up flight of 50 steps each 10 cm high in 5 second. Find

i) the work done by the boy ii) the power developed. (g = 9.8 ms^{-2})

35. Gravitational force acts on all objects in proportion to their masses. Why then, a heavy object does not fall faster than a light object? **[3]**

36. i. The potential energy of a freely falling object decreases progressively. What happens to its **[3]**

a. Kinetic energy,

b. total mechanical energy?

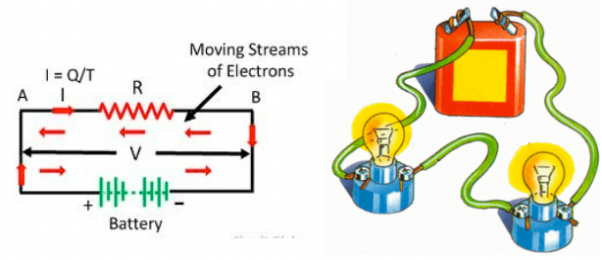
State the law on which your answer is based.

ii. A household consumes 1 kWh of energy per day. How much energy is this in joules?

37. The driver of a car travelling along a straight road with a speed of 72 Km/h observes a signboard which give the speed limit to be 54 Km/h. The signboard is 70 m ahead, when the driver applies the brakes. Calculate the acceleration of the car which will cause the car to pass the signboard at the stated speed limit. **[3]**

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

Electrical energy is energy derived as a result of the movement of electrically charged particles. When used loosely, electrical energy refers to the energy that has been converted from electric potential energy.



i. When 1 Joule of work is said to be done? (1)

ii. An electric oven is rated 5000 W. How many units of electrical energy does it use in 2 hours? (1)

iii. When a carpet is beaten with a stick, dust comes out of it. Explain. (2)

OR

A lamp consumes 1000 J of electrical energy in 10s. What is its power? (2)

39. Two identical bullets are fired one by a light rifle and another by a heavy rifle with the same force. Which rifle will hurt the shoulder more and why? **[5]**

OR

A body of mass 2 Kg is at rest at the origin of a frame of reference. A force of 5 N acts on it at t = 0. The force acts for 4 s and then stops.

i. What is the acceleration produced by the force on the body?

ii. What is the velocity at t = 4 s

iii. Draw the vt graph for the period t = 0 to t = 6 S.

iv. Find the distance travelled in 6 s.

Solution

Section A

1.

(c) Both Spindle-shaped, uninucleated and Elongated, without striations

Explanation:

The image shows non-striated muscles or smooth muscles. The cells are spindle-shaped, uninucleated, elongated, and have no striations.

2.

(c) Rough endoplasmic reticulum

Explanation:

The proteins and lipids, essential for building the cell membrane, are synthesized by the rough endoplasmic reticulum (RER). The ribosomes attached to the RER help in this process.

3.

(b) 1-D, 2-A, 3-C, 4-B

Explanation:

Mycoplasma is a genus of bacteria that lack a cell wall around their cell membrane. Without a cell wall, they are unaffected by many common antibiotics that target cell wall synthesis. **Mycoplasma** species are the smallest free-living organisms. **Prokaryote** is a unicellular organism that lacks a membrane-bound nucleus (karyon), mitochondria, or any other membrane-bound organelle.

(1) Largest cell	(D) Ostrich egg
(2) Smallest cell	(A) Mycoplasma
(3) Single cell	(C) Amoeba
(4) Prokaryotic cell	(B) Bacteria

4.

(d) A : Sclerenchyma, B : Parenchyma, C : Cheek cells, D : Onion Peel

Explanation:

A. Sclerenchyma: Sclerenchyma cells are the permanent tissues present in the plants. They provide hardness and stiffness to the plant and are composed of dead cells.
B. Parenchyma: Parenchyma serves as a packing tissue in plants therefore they do not have intercellular spaces.
C. Figure show Cheek cells.
D. Figure show Onion peel.

5.

(d) Dr.V. Kurein

Explanation:

Dr.V. Kurein is called as the 'Father of white revolution' in India because of his initiatives and immense contribution to the dairy sector.

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

Explanation:

Animals of colder regions and fishes of cold water have a thicker layer of subcutaneous fat. The thick layer of subcutaneous fat acts as an insulator and prevents the heat of the body to escape out. The layer of fat acts as subcutaneous insulation of the body for thermoregulation.

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

Explanation:

The compost is rich in organic matter and nutrients. Compost prepared by using earthworms to hasten the process of decomposition of plant and animal for refuse is called vermicompost. Composting done with the help of earthworms is called vermicomposting.

8. **Functions of the various epithelial tissues are as follows:**

(i) Epithelial cells protect the underlying cells from drying, injury and chemical effects. They also protect the body from viral or bacterial infections. E.g. Skin epithelial cells which are arranged in many layers prevent wear and tear.

(ii) They help in the absorption of water, nutrients and gases. E.g. Inner lining of the small intestine, lung alveoli, blood vessels, etc.

(iii) Columnar epithelium facilitates movement across the epithelial barrier.

(iv) Cuboidal epithelium provides mechanical support to the kidney tubules and ducts of the salivary glands.

(v) Glandular epithelium secretes useful chemicals like sweat, saliva, enzymes from the food, etc. in the body.

9. i. Kharif crop is grown during the months from June to October.

ii. Two factors for which crop variety improvement is done are:

a. **Higher yied-** To increase the productivity of crop per acre.

b. **Improved quality-** The definition of quality is different for different crops, e.g. baking quality is important in wheat, protein quality in pulses, etc.

OR

The poultry birds are fed on agricultural waste material and broken grains etc which are not useful for humans but the birds consuming such waste provide us with eggs and meat. It is highly nutritious animal protein food hence the statement made is quite appropriate.

10. White Revolution – Increased production of milk is known as white revolution. It involved use of new improved high milk – yielding cross breeds of milch animals.

Silver revolution – Tremendous increase in egg production is known as silver revolution.

Blue revolution – It refers to the increased production of fish.

11. 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.

12. 1. Plasma Membrane is the phospholipid layer, found in all types of cells; it helps in protecting the protoplasm and checks the passage of molecules inside the cell, Though cell wall is found in the plant cell, fungi, bacteria only and protects the cell from external shocks, and provide rigidity and shape to the cell.

2. The cell wall is the outermost boundary of the cell (if present), and plasma membrane is present in the inner lining of the cell. The plasma membrane is delicate thin layer while cell wall is the thick and rigid layer. Plasma Membrane is selectively permeable membrane allowing small molecules entry only; their layer is made up of lipids and proteins and few carbohydrates, while Cell wall constituents may vary from chitin, peptidoglycon, and cellulose.

3. Plasma membrane is the living membrane made up of lipids and proteins, whereas cell wall is non-living made up of cellulose.

Function of Plasma membrane: It acts as semi permeable membrane which allows only selective substances to pass through it.

Function of Cell Wall: It provides rigidity and protection to cell.

13. i. Columnar.

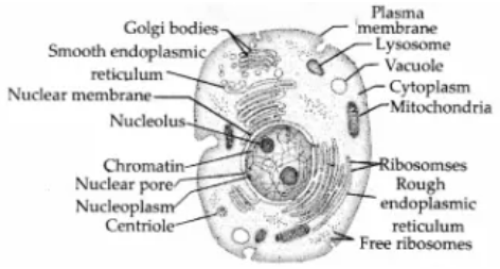
ii. columnar epithelial.

iii. No, providing mechanical support is the main function of the cuboidal epithelium.

OR

Glandular epithelium.

14. **Diagram of an animal cell is given below:**



OR

Both xylem and phloem consist of more than one type of cells, which coordinate to perform a common function.

Xylem	Phloem
Is composed of tracheids, vessels, xylem parenchyma and xylem fibres.	Is composed of sieve tubes, phloem parenchyma, phloem fibres and companion cells.
Only xylem parenchyma is composed of a living cell in xylem tissue.	Only phloem fibre is composed of the dead cell is in the phloem.
Transports water and minerals.	Transports food.
Movement of materials is in one direction.	Movement of materials is in both directions.

Section B

15. **(c)** A

Explanation:

Cooling is not caused during boiling. Evaporation is a surface phenomenon but boiling is a bulk phenomenon. Evaporation causes cooling because when a liquid evaporates, it draws the latent heat of evaporation from anything which it touches or from the environment. Evaporation takes place at a temperature below the boiling point. Thus evaporation causes cooling but boiling causes heating.

16. **(a)** (i) and (iii)

Explanation:

- A pure substance contains only one type of particles which can either be atoms or molecules or elements or compounds.
- A pure substance cannot be separated into other kinds of matter by any physical process but a mixture can as they are impure substances because they contain more than one particle.
  For example, salt solutions.
- A pure substance has fixed composition as well as fixed melting and boiling points.
  For example, salt.
- Pure substances cannot be exemplified by all elements other than nickel because pure nickel is an element containing only one kind of particle.

17. **(d)** starch

Explanation:

Many different food groups contain a carbohydrate known as starch. Using an iodine solution, you can test for the presence of starch. When starch is present, the iodine changes from brown to blue-black or purple.

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

Explanation:

(a) Deuterium	**(iv)** An isotope of Hydrogen
(b) Carbon-14	**(i)** A radioactive isotope of carbon used in radiocarbon dating
(c) Isotope of Uranium	**(iii)** Used in nuclear reactors
(d) Cobalt-60	**(ii)** Used in the treatment of cancer

Deuterium is one of two stable isotopes of Hydrogen. It is also known as heavy hydrogen. The nucleus of deuterium, called a deuteron, contains one proton and one neutron. It has major applications in nuclear magnetic resonance studies. Radio carbon-dating (also referred to as carbon dating or carbon-14 dating) is a method for determining the age of an object containing organic material by using the properties of C14 - a radioactive isotope of carbon. Uranium is used in a nuclear reactor as a fuel. A controlled fission chain reaction is achieved and the heat generated by splitting the U-235 atoms is used to make steam. The steam spins a turbine to drive an electric generator thus producing electricity. Cobalt-60 is a synthetic radioactive isotope of cobalt produced artificially in nuclear reactors. Cobalt therapy or cobalt-60 therapy is the medical use of gamma rays from cobalt-60 for the treatment of cancer.

19. **(b)** 22.0 g

Explanation:

The molecular mass of CO_2 is 44 (12 + 26 $\times$ 2).

6.022 $\times$ 10^{23} molecules of carbon will contain 44 g.

Hence, 3.011 $\times$ 10^{23} molecules of CO_2 will contain a mass of 22 g.

20. **(a)** All (A), (B) and (C) are correct

Explanation:

A. During the change of state, given heat is used to change the state. So temperature remains same. AB and CD parts show constant temperature

B. BC part represents increase in temperature.

C. CD is water starts boiling and temperature remains the same during the conversion of water into steam.

21. **(a)** iodine

Explanation:

Place a slice of a potato on a paper towel at top of a paper plate and add a drop of the iodine solution to the potato slice. Note the color change. A change of color to blue-black or purple color suggests that starch is present. If there is no change in color, this suggests no starch is detectable.

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

Explanation:

A molecule is a group of two or more atoms chemically bonded together. A molecule is the smallest particle of an element or a compound which has properties of the element or the compound and can exist in a free state.

23. Mass of one molecule of substance = 4.65 $\times$ 10^{-23}

Mass of 6.022 $\times$ 10^{23} molecules of substance

6.022 $\times$ 10^{23} $\times$ (4.65 $\times$ 10^{-23}) = 28 g.

The substance can be carbon monoxide (CO) with molecular mass

= 12 + 16 = 28 u or 28 g

24. Ice (solid state) is expected to be heavier than water (liquid state). But it is lighter and floats over water. Actually, ice expands on cooling and has a cage like structure which means that vacant spaces are left when H2O molecules are linked in ice. The number of these spaces are comparatively less in water. Therefore, water is dense as compared to ice or ice floats over water.

OR

Gases are compressible because the inter-molecular space is very large and kinetic energy is higher in gases, whereas liquids are not compressible because in liquids, the inter-molecular space is less and kinetic energy is comparatively lesser.

25. (a) If 'X' contains 6 electrons in 'M' shell as valence electrons, then the K shell and L shell must be fully filled.An atom with three shells can accommodate a maximum of 2, 8 and 18 electrons respectively.The electronic configuration of element 'X' will be K = 2, L = 8, M = 6.

Therefore, the atomic number of the element is **16** (2 + 8 + 6)

(b) 'X' is a **non-metal** since it is electronegative in nature. It can accept 2 electrons to form an anion and achieve an octet.

26. i. Water is solvent and sugar is solute.

ii. 1 nm in diameter

iii. Pure substances are substances that are made up of only one kind of particle and have a fixed or constant structure.

OR

The meaning of the term 'alloy' is a substance formed from the combination of two or more metals. Alloys can also be formed from combinations of metals and other elements. ex- steel.

27. The valency of an element is the combining capacity of that element. It is determined by the number of electrons present in the outermost shell (valence shell) of an atom of that element, if the number of valence electrons of an atom of an element is less than or equal to 4, then the valency of that element is equal to the number of valence electrons.

On the other hand, if the numbcr of valence electrons of the atom of an element is greater than 4, then the valency of that element is obtained by subtracting the number of valence electrons from 8.

Valency of Silicon (Si) : Atomic number of the element is 14. Its electronic distribution is; K(2), L(8), M(4).

As silicon atom has four valence electrons, it can lose four electrons to complete its octet. At the same time, it can also gain four electrons. Thus, the valency of silicon is 4.

Valency of oxygen (O) : Atomic number of the element is 8. Its electronic distribution is : K(2), L(6)

As oxygen atom has six valence electrons, it needs two electrons to complete its octet (8 - 6 = 2). Therefore, valency of oxygen is 2.

OR

a. (F) because in J.J Thomson's model, the nucleus was not present.

b. (F) Neutron is a fundamental particle (a subatomic particle) of the atom of an element, thus cannot be made by combining an electron and a proton. It is neutral, as it carries no charge.

c. (T) Mass of an electron is $\frac{1}{1840}$ times, which is nearly about $\frac{1}{2000}$ times that of a proton.

d. (T) Tincture of iodine is made by dissolving an isotope of iodine in alcohol (I-131).

Section C

28.

(d) changes its shape

Explanation:

When we press a rubber ball with both the hands, it changes its shape as the force is applied to it.

29.

(c) Statement B

Explanation:

In general, work represents any physical or mental activity. But work has a precise meaning in physics. Work is said to be done when a net force acts on a body and the body undergoes displacement. So statement A is false.

Work done by a force is positive if the applied force has a component in the direction of the displacement. So, statement B is true.

30.

(c) 1-B, 2-D, 3-A, 4-C

Explanation:

i. The SI unit of velocity is meter per second.

ii. The SI unit of acceleration is the metre per second square.

iii. The SI unit of displacement is the meter.

iv. Retardation is negative acceleration.Therefore its SI unit is metre per second squared with a negative sign.

31.

(c) Less

Explanation:

Pressure is inversely proportional to cross- sectional area.

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

Explanation:

Compression is a region of the medium in which particles are compressed i.e., particles come closer i.e., the distance between the particle becomes less than the normal distance between them. Thus there is a temporary decrease in volume and a consequent increase in density of the medium. Similarly, in rarefaction, particles get farther apart and a consequent decrease in density.

33. $Here, the\ mass\ of\ the\ hammer = 500\ g = \frac{500}{1000}\ kg = 0.5\ kg,$

Initial velocity, u = 50 ms^{-1}

Final velocity, v =0

Time taken, t = 0.01 s

From Newton's second law of motion, we have

$F = ma = \frac{m(v-u)}{t} = \frac{0.5\ kg(0\ ms^{-1} - 50\ ms^{-1})}{0.01\ s}$

$= \frac{-25\ kg\ ms^{-1}}{0.01\ s}$

= -2500 kg ms^{-2} = -2500 N

So, the force of the nail on the hammer is 2500 N. Negative sign indicates that the force is acting opposite to the motion.

34. i) Weight of hot air = Volume × Density × g

= 50 × 0.4 × g

= 20 kgf

ii) Weight of hot air, balloon and equipment

= 20 +12 + P = (32 + P) kgf

iii) Upthrust = Weight of air displaced

= hdg

= 50 × 1.3 × g

= 65 kgf

By law of floatation we have,

32 + P = 65

P = 65 - 32 = 33 kgf

OR

The boy has to overcome the force of gravity. Hence force of gravity on the boy

F = mg = 40 × 9.8 = 392 N

Total distance covered s = 50 × 10 = 500 cm = 5 m

i) Work done by the body in climbing = force × distance = W = 392 × 5 = 1960 J

ii) Power developed = $\frac{W}{t} = \frac{1960}{5}$ = 392 W

35. All objects fall on ground with constant acceleration,acceleration due to gravity(in the absence of air resistance).It is constant and does not depend upon the mass of an object.Hence,heavy objects do not fall than lighter objects.

36. i. a. As potential energy decreases with decreasing height, the speed of the object will increase and hence its kinetic energy will increase.

b. Total mechanical energy will remain constant.

It is based on the law of conservation of energy which states that energy can neither be created nor be destroyed/. It can only be transformed from one form to another.

ii. 1 kWh = 3.6×10^6 J

37. Initial speed = u=72 km/hr

$= \frac{72 \times 5}{18} = 20 m/s$

Final speed = v = 54km/h

$= \frac{54 \times 5}{18} = 15 m/s$

Distance = s = 70 m

Now, $v^2 - u^2 = 2as$

$(15)^2 - (20)^2 = 2 \times a \times 70$

225 - 400 =140 a

- 175 =140 a

a = -1.25 m/s^2 (negative sign shows retardation)

38. i. When a force of 1 Newton causes a displacement of 1 m in its own direction, the work done is said to be one joule.

ii. p = 5000 W, t = 2 h

iii. Energy consumed = pt = 5000 × 2 = 10000 Wh = 10 kW = 10 units.

When a carpet is beaten with a stick, the dust comes out of it because of the law of inertia. Initially, the dust particles are at rest along with the carpet. Beating the carpet with the stick makes the carpet move but the dust particles remain at rest due to inertia at rest, thus the dust gets detached from the carpet.

OR

Given W = 1000J, t = 10s, P = ?

We know, P = $\frac{W}{t} = \frac{1000}{10}$ = 100W

39. According to law of conservation of momentum; the momentum of bullet forwad will be equal to the momentum of rifle backward . In case of light rifle; velocity will be more than the velocity of heavier rifle because of mass so that momentum (product of mass and velocity) for both shall not be equal. Due to this, the lighter rifle will hurt the shoulder more.In both cases it has been called recoied.

OR

Force,F = 5N

Mass,m = 2 kg

i. $F = m \times a$

$\implies 5 = 2 \times a$

$\implies a = 2.5\ m/s^2$

Therefore,acceleration produced by the body is 2.5 ms^{-2}

ii. Final velocity,v = 0

Initial velocity ,u = 0 (body starts from Rest)

Time,t = 4 s

From the relation,

$v = u + at$

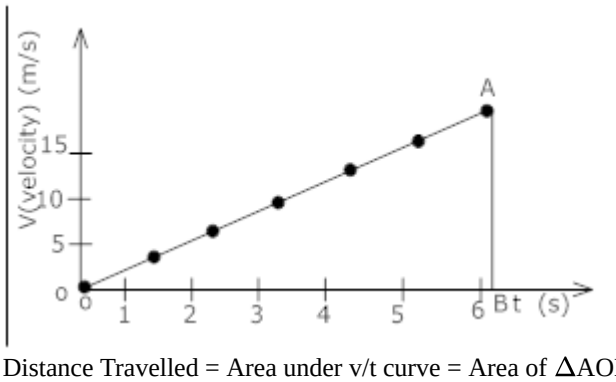
$\implies v = 2.5 \times 4$

$\implies v = 10\ m/s$

Therefore,the velocity at t=4 s is 10ms^{-1}

iii.

For t = 0	1	2	3	4	5	6
V = 0	2.5	5	7.5	10	12.5	15



iv. Distance Travelled = Area under v/t curve = Area of ΔAOB

$= \frac{1}{2} \times \text{Base} \times \text{Height}$

$= \frac{1}{2} \times OB \times AB$

$= \frac{1}{2} \times 6 \times 15$

$= 45\,m$

Therefore, distance travelled in 6 s is 45 m.