Solution

Section A

1. **(a)** C

   Explanation:

   Figure C show section of a plant stem. Plant stem has pits, non-nucleated cells, thick cell walls are characteristics.

2. **(c)** Over the Ribosomes

   Explanation:

   The Rough Endoplasmic Reticulum (RER) has ribosomes attached to its surface. Ribosomes are the sites of protein manufacture. They are associated with the synthesis of proteins from amino acids.

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

   Explanation:

   - While the nucleic part of the cell had been observed by Leeuwenhoek in 1682, it was Robert Brown who named it the “cell nucleus”.
   - In 1839, Johann Evangelist Purkinje coined the term 'protoplasm' for the fluid substance of a cell.
   - Robert Hooke observed the microscopic structure of the bark of a cork tree and in doing so, discovered and named the cell – the building block of life.
   - The 'Cell theory' was proposed by Matthias Jakob Schleiden and Theodor Schwann.

4. **(b)** Apical and intercalary meristems are permanent tissues.

   Explanation:

   - Parenchyma serves as a packing tissue in plants therefore they have intercellular spaces.
   - Collenchymatous tissues are mechanical tissues in the plants and are characterized by the deposition of cellulose at the corners of the cell, which leads to localized thickenings of the cell wall.
   - Apical and intercalary meristem bring primary growth (increase in height) and secondary growth (increase in diameter) respectively and are classified under meristematic tissues.
   - Meristematic tissue is dividing units of the plants and contains dense cytoplasm and large nucleus with few or no vacuoles at all.

   So, statements A, B, and D are a correct statement and statement C is an incorrect statement.

5. **(d)** A is false but R is true.

   Explanation:

   The cells of sclerenchyma tissue are dead. They are long and narrow as the walls are thickened due to the deposition of lignin. The walls of cells are so thick that there is no internal space inside the cell.

6. **(b)** Macro-nutrients

   Explanation:

   Macro-nutrients

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

   Explanation:

   Though the nucleus is regarded as the brain of the cell although mitochondria and chloroplast are independent cell organelle.

8. **(a)** Nitrogen

Explanation:

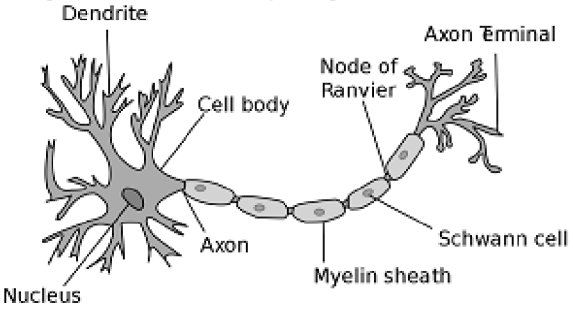
Leguminous plants are grown in between crops to restore the fertility of soil. Rhizobium is present in the root nodules of the leguminous plants and it fixes atmospheric nitrogen into usable forms. So, it increases the amount of usable nitrogen in the soil and increases the fertility of soil.

9. **(a)** River lift

Explanation:

When it is not possible to supply enough water through a normal canal system, then a river lift system is utilized to ensure a steady supply. This can happen in areas with uneven topography, or in areas which are far from a water reservoir.

10. The plant cell wall is mainly composed of cellulose. Cellulose is a complex substance and provides structural strength to plants.

11. 

A neuron consists of a cell body with a nucleus and cytoplasm, from which thin hair-like parts arise. It has a single long part called the axon and many short, branched parts called dendrites. The nerve endings receive the impulses.

OR

Meristematic tissue	**Permanent tissue**
1. The cells of meristematic tissues are small.	1. The cells of permanent tissues are large.
2. The cell walls are thin.	2. The cell walls are either thin or thick.
3. The cells are rich in cytoplasm.	3. Cytoplasm is present as a layer along the cell wall.
4. Intercellular spaces are absent.	4. Intercellular spaces are often present.
5. They have the power of cell division.	5. They lack the power of cell division.
6. They are always made up of living and active cells.	6. They may be living cells or dead cells.

12. Insect – pests damage / harm the plants in following ways-

a) They cut root, stem and leaf.

b) They suck the cell sap from various plant parts.

c) They bore into stems and fruits.

d) They form galls.

e) They destroy stored grains.

13. i. The tissue shown is collenchyma tissue.

The labelling of the collenchyma tissue is as follows:

A. - Wall thickenings

B. - Nucleus

C. - Vacuole

D. - Cell wall

ii. Yes, the collenchyma tissue is flexible. This is so because collenchyma cells don't have lignin in their cell wall.

iii. The function of collenchyma tissue are as follows:

a. Collenchyma tissue provides flexibility to the plant.

b. It also provides mechanical support to plants.

14. i. Long term use of fertilizers destroys soil fertility because the organic matter in the soil is not replenished and microorganism is also harmed.

ii. Fertilizers are used for good vegetative growth and give rise to healthy plants.

iii. Fertilizer gets washed away due to excessive irrigation and leads to water pollution.

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. (a) Plasma membrane – The cell membrane separates the cell from its external environment, and is selectively permeable (controls what gets in and out). It protects the cell and provides stability. Proteins are found embedded within the plasma membrane, with some extending all the way through in order to transport materials.

(b) Cell wall – The cell wall is a rigid organelle composed of cellulose and lying just outside the cell membrane. The cell wall gives the plant cell it's box-like shape. it also protects the cell. The cell wall contains pores which allow materials to pass to and from the cell membrane

(c) Ribosome – Ribosomes are small particles which are found individually in the cytoplasm and also line the membranes of the rough endoplasmic reticulum. Ribosomes produce protein. They could be thought of as "protein factories" of the cell.

(d) Lysosome –Lysosomes are small sac-like structures surrounded by a single membrane and containing strong digestive enzymes which when released can break down worn out organelles or food. The lysosome is also known as a suicide sac.

(e) Nucleolus – It synthesizes ribosome

(f) Endoplasmic Reticulum – Produces lipids and proteins and also in intracellular transport of substances.

OR

There are five types of connective tissues:-

(i) **Areolar connective tissue:** It is a loose and cellular connective tissue. It joins skin to muscles, fills spaces inside organs, and is found around muscles, blood vessels, nerve and in the bone marrow.

Functions:

(a) It acts as a supporting and packing tissue between organs lying in the body cavity.

(b) It helps in repair of tissues after an injury.

(c) It also helps in combating foreign toxins.

(d) It fixes skin to underlying muscles.

(ii) **Dense regular connective tissue:** It is a fibrous connective tissue. It is characterised by ordered and densely packed collection of fibres and cells. Dense regular connective tissue is the principal component of tendons and ligaments.

Functions:

(a) Tendons: Tendons are cord-like, strong, inelastic structures that join skeletal muscles to bones.

(b) Ligament: They are an elastic structure which connects bones to bones.

(iii) **Adipose tissue:** Adipose tissue is an aggregation of fat globules. The cells that primarily compose adipose tissue are called adipocytes or lipocytes or fat cells. The adipose tissue is abundant below the skin, between the internal organs and in the yellow bone marrow.

Functions:

(a) It serves as a reservoir of fat.

(b) It provides shape to the limbs and the body.

(c) It keeps visceral organs in position. It forms shock-absorbing cushions around kidneys and eyeballs.

(d) It acts as an insulator and reduces heat loss from body, i.e. it regulates body temperature.

(iv) **Skeletal tissue:** The skeletal or supporting tissue includes bone and cartilage which form the endoskeleton of vertebrate body.

(a) Cartilage: The cartilage is a specialised connective tissue which is compact and less vascular. Cartilage can be found in ear, nose tip, epiglottis, inter-vertebral discs, end of long bones, lower ends of ribs and rings of trachea. There are three varieties of cartilage - hyaline, elastic, and fibro-cartilage. The most abundant type is hyaline, found as supportive tissues in the nose, ears, trachea, larynx, and smaller respiratory tubes.

(b) Bone: Bone is very strong and non-flexible tissue. Bone cells are embedded in a hard matrix. Like cartilage, bone is a specialised connective tissue.

Functions:

(a) Cartilage provides support and flexibility to body parts such as ears and nose. It smoothens bone surfaces at the joints.

(b) Bone provides shape and skeletal support to body.

(c) Bone supports and protects vital body organs such as brain, lungs, etc.

(d) Bone anchors the muscles.

(v) **Fluid connective tissue:** Fluid connective tissue links the different parts of the body and maintains continuity in the body. It includes blood and lymph.

(a) Blood: In this tissue, cells move in a fluid or liquid matrix or medium called plasma. Blood flows in blood vessels called arteries, veins, and capillaries which are connected together to form the circulatory system. Blood contains red blood cells (RBCs), white blood cells (WBCs) and platelets suspended in the plasma.

(b) Lymph: Lymph is a colourless fluid that has filtered out of the blood capillaries.

Functions:

(a) Blood flows and transports gases, nutrients, hormones and vitamins to the tissues, and transports waste products from the tissues to the liver and the kidney.

(b) Lymph transports the nutrients (oxygen, glucose) that may have filtered out of the blood capillaries back into the heart to be re-circulated in the body.

(c) Lymph brings CO_2 and nitrogenous wastes from tissues to the blood.

Section B

17.

(c) all temperatures

Explanation:

The process of changing a liquid into gases (vapour) even below its boiling point is called evaporation. The rate of evaporation increase with the increase in temperature, surface area, and wind speed.

18.

(d) 72

Explanation:

The valency of M in MCl_3 is +3 hence, the formula of the oxide of element M is M_2O_3.

Mass of element M in MCl_3 = 118.5 - 3(35.5) = 12

Molecular mass of M_2O_3 = $(2 \times 12) + (3 \times 16)$ = 72

19.

(d) A is false but R is true.

Explanation:

The interconversion of states is a physical change because these changes occur without a change in composition and no change in the chemical nature of the substance. Although ice, water, and water vapour all look different and display different physical properties, they are chemically the same.

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

Explanation:

(a) Electronic configuration of Carbon	(iv) 2,4
(b) Electronic configuration of Sodium	(i) 2,8,1
(c) Electronic configuration of Argon	(iii) 2,8,8
(d) Electronic configuration of Helium	(ii) 2

21.

(d) PSO_4 and $P_3(PO_4)_2$

Explanation:

Formula of oxide = PO

$\Rightarrow$ Valency of P = +2

$\therefore$ Formula of sulphate = PSO_4

and phosphate = $P_3(PO_4)_2$

22.

(b) Q

Explanation:

Q is correct arrangement of determination of melting point of Ice because its contains crushed ice cubes. In P ice cubes added in place of crush ice, so its not correct arrangement of determination of melting point of Ice.

23.

(c) visible with a powerful microscope

Explanation:

The size of particles of the colloidal solution lies between 10^{-7} cm to 10^{-4} cm in diameter. So, The particles of colloidal solutions are visible with a powerful microscope.

24.

(d) A is false but R is true.

Explanation:

An atom is very small in size and consists of subatomic particles protons, neutrons, and electrons. About one million atoms stacked up one over the other would roughly equal the thickness of a sheet of a paper.

25. A chemical equation has to be balanced in order to satisfy the law of conservation of mass. According to the law, there is no change in mass when the reactants change into the products. Therefore, the chemical equation has to be balanced.

26.

True solution	Colloid
1. A true solution is a homogeneous mixture of two or more substances. 2. The size of the particles is less than 1 nm. 3. It is always clear and transparent. 4. The particles cannot be seen even with a microscope. 5. It does not show Tyndall effect. 6. Example: Salt solution	1. A colloidal solution is a heterogeneous mixture of two substances. 2. The range of particle size is between 1 nm and 100 nm. 3. It is translucent. 4. The particles of a colloidal solution can be seen with the help of a microscope. 5. It shows Tyndall effect since a beam of light can be scattered by the particles. 6. Example: Milk

OR

	Homogeneous mixture	Heterogeneous mixture
(i)	Homogeneous mixtures have a uniform composition throughout the mixture.	Heterogeneous mixtures do not have a uniform composition throughout the mixture.
(ii)	Their components cannot be separated by filtration. Separation of constituents requiresmethods like distillation.	Their components can be separated by filtration.
(iii)	E.g. Salt & water solution, Sugar & water solution.	E.g. Amixture of sulphur powder and iron fillings, A mixture of kerosene oil and water.

27. i. Valency = 0 [∵ number of valence electrons = 8]
ii. Valency = 5 [∵ number of valence electrons = 3]
iii. Valency = 2 [∵ number of valence electrons = 6]

28. i. The substance that occupies space , have some mass and volume are called matter. ex - air,water,stone etc.
ii. Take a glass of water, add sugar and stir. You will observe that there is no rise in the water level. This shows that particles of matter have spaces between them. When sugar is added to the water, the sugar the particles adjust themselves in the space between the water particles.
iii. Solid usually have the strongest intermolecular forces when compared to liquids and gases. In solids, the particles are closely packed and this is why they are incompressible and have high density.

OR

the intermolecular space between the molecules in solids is negligible. In the case of liquids, it is more than that in solids, while in the case of gases**,** it is highest.

29. i. **Atomic number:** It is the number of protons present inside nucleus of the atom. It is represented by (Z). E.g. Atomic number of hydrogen Z = 1, because the number of protons in a hydrogen atom is 1.

ii. **Mass number:** It is the total number of **protons and neutrons** (nucleons) present inside the nucleus of an atom. The mass number is represented by A. A = Z + N where Z is the atomic number and N is the number of neutrons. E.g. Mass number of carbon is 12 because it has 6 protons and 6 neutrons inside the nucleus. A = 6 + 6 = 12. The atomic number (Z) of carbon is 6.

iii. **Isotopes:** They are atoms of the same element having the same atomic number (Z) but different mass numbers/atomic mass (A). For example- Carbon has 2 isotopes, ${}^{12}_{6}C$ and ${}^{14}_{6}C$.

iv. **Isobars:** They are atoms of different elements having the same mass number (A) but a different atomic number (Z). For example- Calcium (Atomic number 20) and Argon (Atomic number 18). The number of protons (Z) in these atoms is different, but the mass number (A) of both these elements is 40. The number of neutrons in the atoms of this pair of elements is the same.

Two uses of isotopes are as follows:-

a. An isotope of uranium is used as a fuel in nuclear reactors.

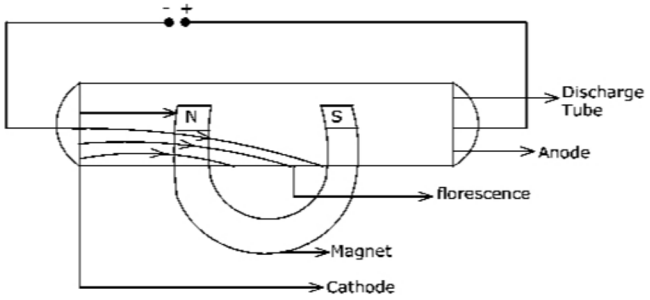
b. An isotope of cobalt is used in the treatment of cancer.

OR

An experiment to show that cathode rays are deflected by magnetic fields is as follows**:-**

1. Take a discharge tube with a fluorescent material coated on its inside.
2. Place a horseshoe magnet at the centre of the discharge tube.
3. When cathode rays are produced, they travel through the discharge tube in a straight line and get deflected by the magnet towards the anode.

This shows that cathode rays are deflected by a magnetic field. This also shows that cathode rays are negatively charged.



Section C

30.

(b) Frictional force

Explanation:

The force which always opposes the motion of one body over another body is called frictional force or friction. The force of friction always acts on all the moving objects and its direction is always opposite to the direction of motion.

31.

(b) power

Explanation:

Power is defined as the rate of doing work or the rate of transfer of energy.

32.

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

Explanation:

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

33. Here, m = 0.4 kg, u = 10 m/s

Initial momentum of the ball = mu = 0.4 $\times$ 10 = 4 kg m/s

At the highest point, velocity of ball is zero,

Therefore,the momentum of the ball at the highest point of flight = 0 $\times$ 4 = 0.

34. Suppose a body of mass m is lifted vertically upwards against the gravity (g) through a distance h.

Here, the force (F) required to lift the body = weight of the body, mg (where m is mass and g is acceleration due to gravity).

Now, Work done (W) in lifting a body =Force $\times$ displacement = Weight of body $\times$ Vertical distance

W = mg $\times$ h = mgh.

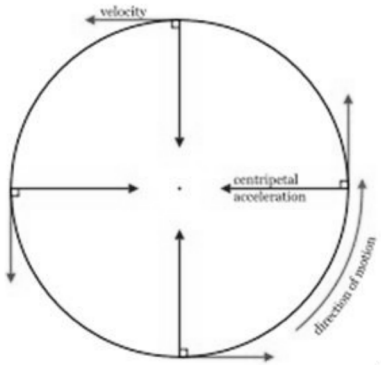
Therefore, Work done against the gravity = mgh

OR

Electric heater's power (p) = 1500 W = 1.5 kW

$Energy = power \times time = 1.5kW \times 10h$ = 15 kWh

35. When a body moves in a circle, it is called circular motion. When the velocity of an object changes, we say that the object is accelerating. The change in the velocity could be due to change in its magnitude or the direction of the motion or both.



If the athlete is running along a hexagonal shaped path ABCDEF, the athlete will have to change his direction six times while he completes one round. If the 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.

The motion of the athlete moving along a circular path is an example of an accelerated motion.

The circumference of a circle of radius r is given by $2\pi r$. If the athlete takes t seconds to go once around the circular path of radius r, the velocity v is given by

v = $\frac{2\pi r}{t}$

When an object moves in a circular path with uniform speed, its motion is called uniform circular motion.

36. a. To hear the sound of the coming train because sound travel within the rail track and get the idea of distance of incoming train.
    b. Copper.
    c. For safety as he cared for his friend.

37. i. Distance travelled by car in first 2 s = Area of $\Delta OAD = \frac{1}{2} \times 2 \times 15 = 15\ m$

    ii. Braking force, F = m $\times$ a

    Given, mass of the car, m = 1000 kg, initial velocity, u = 15 m/s, final velocity, v = 0, time, t = 1 s

    On appliying, $a = \frac{v-u}{t} \Rightarrow a = \frac{0-15}{1} = -15\ m/s^2$

    $\therefore$ F = m a = 1000 $\times$ (-15) = - 15000 N

38. i. **Potential Energy:** It is the energy possessed by a body by virtue of its position or shape.

    ii. In a toy car, the wound spring possesses potential energy. When spring is released, its potential energy changes into kinetic energy due to which the toy car moves.

    iii. Given, m = 50 kg, h_1 = 75 m, h_2 = 60 m

    At point A, $PE_1 = mgh_1 = 50 \times 10 \times 75$

    = 37500 J

    At point B, $PE_2 = mgh_2 = 50 \times 10 \times 60$

    = 30000 J

    Change in PE = PE_1 - PE_2 = 37500 - 30000 = 7500 J

    OR

    The kinetic energy of an object of mass m moving with a velocity v is given by the expression $\frac{1}{2}mv^2$. To bring the object to rest, an equal amount of work i.e. $\frac{1}{2}mv^2$ is required to be done on the object.

39. We have given that,

    Time taken , t = $\frac{1}{2}$ second

    Initial velocity, u = 0 ms^{-1}

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

    Acceleration of the car, a = + 10 ms^{-2} (downward)

i. speed v = at

v = 10 ms^{-2} × 0.5 s

= 5 ms^{-1}

Thus,

Its speed on striking the ground = 5 ms^{-1}

ii. Average spped = $\frac{u+v}{2}$

= $\frac{(0ms^{-1}+5ms^{-1})}{2}$

= 2.5 ms^{-1}

Thus,

Its average speed during the 0.5 s = 2.5 ms^{-1}

iii. Distance travelled, s = $\frac{1}{2}at^2$

= $\frac{1}{2} \times 10ms^{-2} \times (0.5s)^2$

= $\frac{1}{2} \times 10ms^{-2} \times 0.25s^2$

= 1.25m

Thus,

Height of the ledge from the ground = 1.25 m

OR

$F_{gravitation} = \frac{G \times M_e \times m_o}{r^2}$

$= \frac{6.67 \times 10^{-11} \times 6 \times 10^{24} \times 1}{(6.4 \times 10^6)^2}$

$= \frac{6.67 \times 6 \times 10^{-11+24}}{6.4 \times 6.4 \times 10^{12}}$

$= \frac{6.67 \times 6}{6.4 \times 6.4} \times 10^{-11+24-12}$

$= 0.9770 \times 10N = 9.770N$