

c) Displacement and velocity as ball B.

d) Velocity and acceleration as ball B

4. Which of the following is micro-nutrient?

[1]

a) Boron

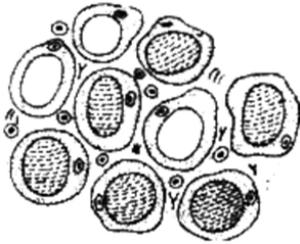
b) Nitrogen

c) Potassium

d) Phosphorus

5. The tissue shown here is _____.

[1]



a) Adipose tissue

b) Striated muscle tissue

c) Ciliated columnar epithelial tissue

d) Areolar tissue

6. Rough endoplasmic reticulum helps in the synthesis of:

[1]

a) steroids

b) proteins

c) starch

d) glycogen

7. Which of the following elements are present in Quick lime?

[1]

A. Calcium, Oxygen

B. Sodium, Hydrogen, Oxygen

C. Calcium, Bromine

D. Calcium chloride

a) (B)

b) (D)

c) (C)

d) (A)

8. You are viewing a prepared slide of striated muscle fibres from a cockroach leg. When you focus the microscope, the striations appear pale and indistinct. To make the striations clearly visible, you would:

[1]

a) remove the mirror to cut out light

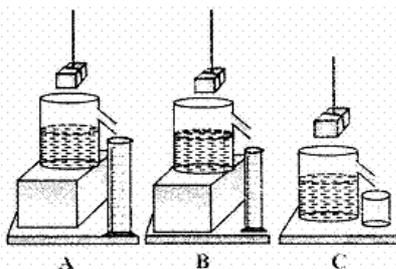
b) change the eyepiece to increase magnification

c) replace the objective to decrease the magnification

d) slowly close the diaphragm to reduce the light

9. Three students A, B and C determined the volume of a solid by immersing it in water in the overflow cans are set up as shown. The result obtained will be wrong for :

[1]



a) Student A

b) All of these

c) Student B

d) Student C

10. Which of the following is the characteristic of displacement of an object? [1]
- a) Displacement has only magnitude and no specific direction b) The magnitude of the displacement is greater than the distance travelled by a moving object
- c) Displacement has magnitude as well as specific direction d) Displacement cannot be zero
11. Which of the given pairs of atoms contain(s) the same number of neutrons? [1]
- i. ${}_{48}^{114}\text{Cd}$ and ${}_{50}^{119}\text{Sn}$
 ii. ${}_{27}^{59}\text{Co}$ and ${}_{28}^{59}\text{Ni}$
 iii. ${}_{55}^{133}\text{Cs}$ and ${}_{54}^{132}\text{Xe}$
 iv. ${}_{29}^{63}\text{Cu}$ and ${}_{29}^{65}\text{Cu}$
- a) iii only b) iv only
 c) i and iv only d) i and III only
12. Choose the chemical compound with which the specimen is temporarily mounted. [1]
- a) Water b) Glycerine
 c) Alcohol d) Salt solution
13. Amoeba acquires its food through: [1]
- a) Exocytosis & Endocytosis b) Exocytosis
 c) Plasmolysis d) Endocytosis
14. Which of the following are physical changes? [1]
- i. Melting of iron metal
 ii. Rusting of iron
 iii. Bending of an iron rod
 iv. Drawing a wire of iron metal
- a) (i), (ii) and (iii) b) (ii), (iii) and (iv)
 c) (i), (ii) and (iv) d) (i), (iii) and (iv)
15. Which one of the following will form a translucent solution in water? [1]
- a) Soil b) Sand
 c) Starch d) Sugar
16. The poultry birds groomed for obtaining meat are called _____. [1]
- a) Pork b) Growers
 c) Broilers d) Poultry
17. **Assertion (A):** The speed of the car is constant, its velocity is not constant because the direction of the car is changing continuously. [1]
Reason (R): The direction of velocity is the same as the direction of displacement of the body.
- 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.
18. **Assertion (A):** During evaporation of liquids, the temperature remains unaffected. [1]
Reason (R): Kinetic energy of the molecules is directly proportional to absolute temperature.
- 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.
19. **Assertion (A):** Vascular or conductive tissue is a distinctive feature of complex plants. [1]
Reason (R): Vascular tissue has made survival of complex plants possible in the terrestrial environments.
- 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. **Assertion (A):** Isobars are identical in chemical properties. [1]
Reason (R): Isobars have same atomic number.
- 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.

Section B

21. If the power of a motor is 40 kW, at what speed can it raise a load of 20,000 N? [2]
OR
- Calculate the work done in lifting 200 kg of a mass through a vertical distance of 6 m. Assume $g = 10 \text{ m/s}^2$.
22. When heat is being supplied to a solid, then what does the heat energy do to the particles of solid? [2]
23. When a sound is reflected from a distant object, an echo is produced. Let the distance between the reflecting surface and the source of sound production remains the same. Do you hear echo sound on a hotter day? [2]
24. Why are gases highly compressible? [2]
25. Describe balanced forces with the help of two examples. [2]

OR

A javelin throw is marked foul if an athlete crosses over the line marked for throw. Explain why the athletes often fall to stop themselves before the line.

26. Explain why chlorine, whether as the element or its compounds, always has a relative atomic mass of about 35.5. [2]

Section C

27. How do stethoscope and megaphone work on the principle of multiple reflections of sound? [3]
28. The following data represents the distribution of electrons, protons and neutrons in atoms of four elements A, B, C, D. [3]

Element	Protons	Neutrons	Electrons
A	10	10	10
B	11	12	11
C	12	12	12
D	13	14	13

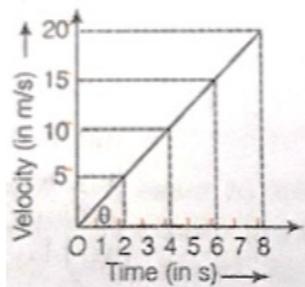
Solve the following questions.

- i. Write the electronic distribution of atoms of elements A and D.
 - ii. Element A is an inert gas. Why?
 - iii. What is the valency of element C?
29. An electron moving with a velocity of $5 \times 10^4 \text{ ms}^{-1}$ enters into a uniform electric field and acquires a uniform acceleration of 10^4 ms^{-2} in the direction of its initial motion. [3]
- i. Calculate the time in which the electron would acquire a velocity double of its initial velocity.
 - ii. How much distance the electron would cover in this time?

OR

State which of the following situations are possible and give an example for each of these.

- (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.
30. An automobile engine propels a 1,000 kg car A along a levelled road at a speed of 36 km h^{-1} . Find the power if the opposing frictional force is 100 N. Now, suppose after travelling a distance of 200 m, this car collides with another stationary car B of same mass and comes to rest. Let its engine also stop at the same time. Now, car B starts moving on the same level road without getting its engine started. Find the speed of the car B just after the collision. [3]
31. 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.
32. Differentiate between hypertonic and hypotonic solution. [3]

OR

Differentiate between rough and smooth endoplasmic reticulum. How is the endoplasmic reticulum important for membrane biogenesis?

33. Write a note on the protective tissue in plants. (Give appropriate diagram also). [3]

Section D

34. From a cliff of 49 m high, a man drops a stone. One second later, he throws another stone. They both hit the ground at the same time. Find out the speed with which he threw the second stone. [5]

OR

Derive an expression for the force of attraction between two bodies and then define gravitational constant.

35. What is membrane biogenesis? How is plasma membrane formed during this process? [5]

OR

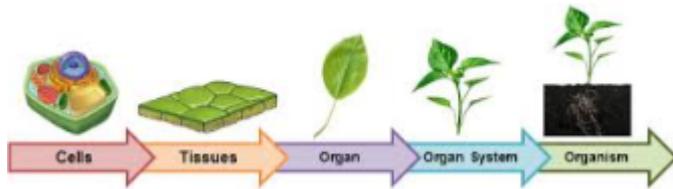
Write a note on Golgi apparatus and the functions it performs.

36. i. Under which category of mixtures will you classify alloys and why? [5]
ii. Whether a solution is always liquid or not. Comment.
iii. Can a solution be heterogeneous?

Section E

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

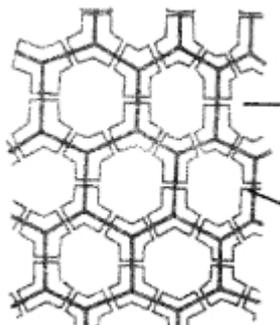
A few layers of cells beneath the epidermis are generally simple permanent tissue. Parenchyma is the most common simple permanent tissue. It consists of relatively unspecialized cells with thin cell walls. They are living cells. Collenchyma allows bending of various parts of the plant-like tendrils and stems of climbers without breaking. Sclerenchyma tissue makes the plant hard and stiff. We have seen the husk of a coconut. It is made of sclerenchymatous tissue. They are long and narrow as the walls are thickened due to lignin. The tissue is present in stems, around vascular bundles, in the veins of leaves and in the hard covering of seeds and nuts.



- i. The flexibility in plants is due to which tissue? (1)
ii. Is aerenchyma provides mechanical support? (1)
iii. Is apical and intercalary meristems permanent tissue? (2)

OR

Menion the function of the tissue which is shown in the below diagram? (2)



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

A farmer has grown wheat on his field consecutively two times but when the third time he grows wheat on the same field the quality of the wheat was not up to the desired level. To improve the quality of his crops he uses chemical fertilizer but the condition of the crop became worse. One of his friends told him to grow a different variety of crops after wheat so as to grow two or three crops in a year with good harvests and use biological manure in place of chemical fertilizers which he prepares by animal excreta and plant waste to get the good quality of crops. He also told him about the good storage of his grains to protect them from the biotic and abiotic losses as in agriculture storage losses are very high.

- i. What are the bases on which the next crop is decided to grow in the same field also name the process? (1)
ii. What is the advantage of using biological manure over chemical fertilizers? (1)
iii. Is it possible for the farmer to grow two crops at the same time if yes what is the requirement? (2)

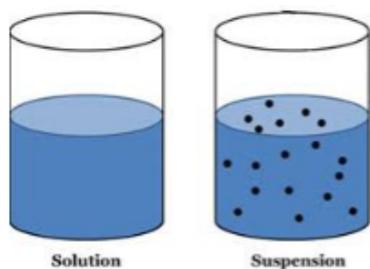
OR

Enlist the biotic and abiotic losses? (2)

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

A suspension is a heterogeneous mixture in which the solute particles do not dissolve but remain suspended

throughout the bulk of the medium. Particles of a suspension are visible to the naked eye. The particles of a suspension scatter a beam of light passing through it and make its path visible. Due to the relatively smaller size of particles, as compared to that of a suspension, the mixture appears to be homogeneous. The scattering of a beam of light is called the Tyndall effect. The components of a colloidal solution are the dispersed phase and the dispersion medium. The solute-like component or the dispersed particles in a colloid form the dispersed phase, and the component in which the dispersed phase is suspended is known as the dispersing medium.



- i. Differentiate between Dispersed phase and Dispersion medium? (1)
- ii. Differentiate between Homogeneous and Heterogeneous mixture? (1)
- iii. What is emulsion? (2)

OR

Give an example of solid sol? (2)

Solution

Section A

1. **(b) IV**
Explanation: Since ice and water in equilibrium, the temperature would be zero. When we heat the mixture, energy supplied is utilised in melting the ice and the temperature does not change till all the ice melts because of the latent heat of fusion. On further heating, the temperature of the water would increase.
2. **(b) Golgi apparatus**
Explanation: Lysosomes are manufactured and budded into the cytoplasm by the Golgi apparatus with hydrolytic enzymes inside. The enzymes that are within the lysosome are made in the rough endoplasmic reticulum, which are then delivered to the Golgi apparatus to synthesise lysosomes.
3. **(a) Position and acceleration as ball B**
Explanation: Position and acceleration of ball A is same as that of ball B at the instant when ball A passes ball B.
4. **(a) Boron**
Explanation: Boron is an essential micronutrient which means it is essential for plant growth and development but is required in very small quantities.
5. **(a) Adipose tissue**
Explanation: The figure shown here is of adipose tissue. It is primarily a fat storing tissue in which the matrix is packed with adipocytes. The tissue is found beneath the skin, in the covering of heart, around the blood vessels and kidneys, etc.
6. **(b) proteins**
Explanation: The ribosomes on the RER are synthesizing protein by definition, meaning that ribosomes do not exist in the cell unless they are synthesizing a protein from an mRNA template.
7. **(d) (A)**
Explanation: The chemical formula of the Quick lime is CaO. So, Calcium (Ca) and Oxygen (O) elements are present in Quick lime.
8. **(d) slowly close the diaphragm to reduce the light**
Explanation: To make the stations clearly visible slowly close the diaphragm to reduce the light. The reduction of light gives a better contrast.
9. **(b) All of these**
Explanation: The overflow can must always be filled upto its spout before using it to measure the volume displaced by the immersed solid.
10. **(c) Displacement has magnitude as well as specific direction**
Explanation: The shortest distance between the initial point and the final point is called displacement. Displacement has both magnitude and direction while distance has only magnitude.
11. **(a) iii only**
Explanation: Number of neutrons in
Cd = 66, Sn = 69; Co = 32, Ni = 31
Cs = 78, Xe = 78; $^{63}\text{Cu} = 34$, $^{65}\text{Cu} = 36$
12. **(b) Glycerine**

Explanation: Glycerine is a good dehydrating agent. It avoids the drying of the specimen. Besides, glycerine tends to reflect light due to its refractive nature. As a result of it, the image appears clearer under the microscope. Due to these reasons, glycerine is used while preparing a temporary mount of leaf peel.

13.

(d) Endocytosis

Explanation: Amoeba acquires its food by the process of endocytosis with the help of finger-like projections called pseudopodia (Pseudo means false; podia means feet). The flexibility of the plasma membrane enables amoeba to use pseudopodia to engulf food and other material from its environment.

14.

(d) (i), (iii) and (iv)

Explanation: Melting of iron metal, bending of an iron rod and drawing wire of iron metal are all physical changes whereas rusting of iron is a chemical change.

15.

(c) Starch

Explanation: Starch forms a colloidal solution. Colloidal solutions are translucent and their particles can pass through filter paper to give a translucent filtrate.

16.

(c) Broilers

Explanation: An egg-laying poultry bird is called hen (layers) and the poultry birds groomed for obtaining meat are called chicken or broilers.

17.

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

Explanation: When a body does not cover equal distances in equal intervals of time, the velocity is said to be variable or non-uniform velocity. In this case, the speed of the body is not constant. Even if the speed of a body is constant but the direction is changing, the velocity will not be uniform.

18.

(d) A is false but R is true.

Explanation: During the evaporation of liquids, the temperature decreases due to the escape of molecules with high energy. The kinetic energy of the molecules is directly proportional to absolute temperature.

19.

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

Explanation: Xylem and phloem are vascular tissues that conduct water, minerals and food to various parts of plants. Vascular tissue is a distinctive feature of complex plants, one that has made their survival in terrestrial environments possible.

20.

(d) A is false but R is true.

Explanation: Isobars are not identical in chemical properties because they have same mass number and different atomic numbers.

Section B

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

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

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

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

OR

Given, Mass, $m = 200 \text{ kg}$, $g = 10 \text{ m/s}^2$ and Distance, $h = 6 \text{ m}$

Work in lifting the mass is done against gravity.

Therefore, the work done is $W = \text{Force} \times \text{Displacement} = mg \times h = mgh$

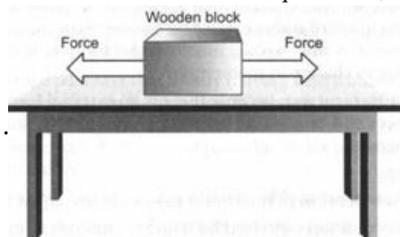
$$W = mgh = 200 \times 10 \times 6 = 12000 \text{ J.}$$

22. The heat supplied to the solid, helps the particles to overcome the forces of attraction between them and increases their kinetic energy, as a result of which particle break free the forces of attraction and changes to liquid state.

23. As the sensation of sound persists in our brain for about 0.1 s. To hear a distinct echo the time interval between the original sound and the reflected one must be at least 0.1s. Therefore the total distance covered by the sound from the point of generation to the reflecting surface and back should be at least $(344m/s) \times 0.1s = 34.4$ m. Thus, for hearing distinct echoes, the minimum distance of the obstacle from the source of sound must be half of this distance, that is, 17.2 m. Speed of sound will increase with increase in temperature. Therefore, on a hotter day speed of sound will be greater hence echoes may be heard more than once because of multiple reflections of sound.
24. Because the inter-particle empty spaces are very large. When a gas is compressed, these spaces decrease. The particles or molecules of gas come closer.
25. If the resultant of various forces acting on a body is zero, the forces are said to be 'balanced forces'. These forces do not change the speed but usually change the shape of an object. Examples:

a. Consider a wooden block lying on a table, the strings tied to its two opposite faces, as shown in the figure.

If we pull at point P, it begins to move towards left. If we pull at point Q, it begins to move towards the right. But if we pull from both the sides with equal force, the block does not move. The two forces have now balanced each other



b. In a tug-of-war, the two teams pull the rope with equal effort; the rope is not moved in any direction. This is clearly because the forces exerted by the two teams are equal and opposite and thus get balanced.

OR

It is on account of inertia of motion. The athlete runs a considerable distance so as to build up momentum, which is helpful in throwing the javelin at a longer distance. However, sometimes the large momentum of athlete prevents him from stopping before the marked line therefore the throw is declared foul.

26. The relative atomic mass is the average mass of the naturally occurring stable isotopes of an element. Chlorine exist as two stable isotopes i.e. ^{35}Cl and ^{37}Cl in ratio 3:1 respectively. Therefore Relative atomic mass of chlorine is taken as average of both stable isotopes.

Natural chlorine always contains about $\frac{3}{4} \times ^{35}\text{Cl}$ and $\frac{1}{4} \times ^{37}\text{Cl}$

Therefore, relative atomic mass of chlorine = $\frac{3}{4} \times 35 + \frac{1}{4} \times 37 = 35.5$

Section C

27. i. A megaphone works on the principle of multiple reflections of sound. When a person speaks into the narrow end of the megaphone tube, the sound waves produced by his voice are prevented from spreading by successive reflections from the wider end of the megaphone tube. Due to this, the sound of the person can be heard over a longer distance.

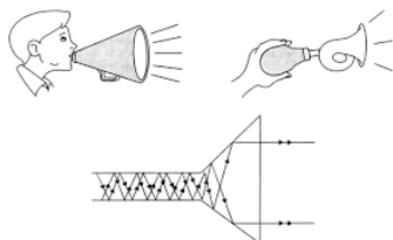


Figure- Multiple reflection sound in the megaphone.

- ii. The stethoscope is a medical instrument used by doctors for listening to the sounds produced within the human body, mainly in the heart and the lungs. The doctor puts the earpiece of the stethoscope into his ears and places the chest-piece above the part of the patient's body which is to be examined. The sound of heartbeats reaches the doctor's ears by the multiple reflections of the sound waves through the stethoscope tube. Thus, it works on the principle of multiple reflections of sound.

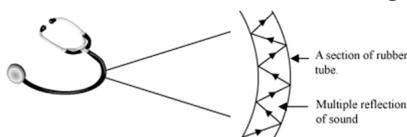


Figure- Multiple reflection sound in the stethoscope.

28. i. Electronic distribution of atoms of elements A and D.

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	k	L	M
A =	2,	8	
D =	2,	8,	3

ii. The number of electrons in the outermost shell of element A is 8.

The outermost shell of this element is complete and the element does not need to gain or lose electrons to complete its outermost shell. Hence, A is an inert gas.

iii. Valency of element C (2, 8, 2) is 2.

29. Given, initial velocity of electron, $u = 5 \times 10^4 \text{ ms}^{-1}$ and acceleration, $a = 10^4 \text{ ms}^{-2}$

i. Final velocity of electron = $v = 2 \times u = 2 \times 5 \times 10^4 \text{ ms}^{-1}$

We know that, $v = u + at$ or $t = \frac{v-u}{a} = \left(\frac{10 \times 10^4 - 5 \times 10^4}{10^4} \right) = \frac{5 \times 10^4}{10^4} = 5 \text{ s}$

ii. Using relation; $S = ut + \frac{1}{2}at^2$

Distance covered by electron in the given time, $S = (5 \times 10^4) \times 5 + \frac{1}{2}(10^4) \times (5)^2 = (25 \times 10^4 + \frac{25}{2} \times 10^4) = 37.5 \times 10^4 \text{ m}$

OR

(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 constant 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 object at a given instance. Hence, it is possible when an object moves in a circular path.

30. $m_A = m_B = 1000 \text{ kg}$. $v = 36 \text{ km/h} = 10 \text{ m/s}$

Frictional force = 100 N

Since, the car A moves with a uniform speed, it means that the engine of car applies a force equal to the frictional force.

$\frac{\text{Force} \times \text{distance}}{\text{time}}$ Power =

= F.v

= $100 \text{ N} \times 10 \text{ m/s} = 1000 \text{ W}$

after collision,

$m_A u_A + m_B u_B = m_A v_A + m_B v_B$

$1000 \times 10 + 1000 \times 0 = 1000 \times 0 + 1000 \times v_B$

$v_B = 10 \text{ ms}^{-1}$.

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

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

ii. The force acting on the body is given by

$$F = ma = 5 \times 2.5 = 12.5 \text{ N}$$

iii. \therefore Change in momentum = $mv - mu$ [$\because u = 0$ and $v = 5 \text{ m/s}$]

$$= 5 \times 5 - 5 \times 0$$

$$= 25 \text{ kg-m/s}$$

32. Hypertonic solution – If the medium surrounding the cell has higher solute concentration than the cell, then the solution is called hypertonic solution.

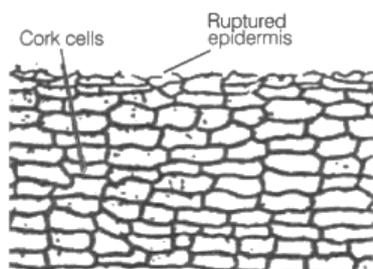
Hypotonic solution – If the medium surrounding the cell has lower solute concentration than the cell, then the solution is called hypotonic solution.

OR

Rough Endoplasmic Reticulum	Smooth Endoplasmic Reticulum
Ribosomes are present on the surface.	Ribosomes are absent.
Involved in the synthesis of protein.	Involved in the synthesis of fat and lipid.

ER makes lipid and protein which are the two important constituents of the plasma membrane. The biogenesis of the plasma membrane is dependent on the endoplasmic reticulum.

33. The protective tissue or the outermost covering of cells in plants is known as the epidermis, which performs protective function (protecting plants from adverse conditions). It is usually made up of a single layer of cells. In dry habitats, epidermis gets thicker to protect the plant from undue loss of water.



On aerial parts of the plant, epidermal cells often secrete a waxy, water-resistant layer on their outer surface. This waxy covering aids in protecting the plant against loss of water, mechanical injury and invasion by parasitic fungi. The cells of epidermal tissue are present in a continuous layer without intercellular spaces.

Small pores are present on the epidermis of the leaf. These pores are called stomata. They are enclosed by two kidney-shaped cells called guard cells. They help in gaseous exchange and transpiration.



As the plant grows older, a strip of secondary meristem replaces the epidermis of the stem. This forms several layers thick cork or bark of the tree in which cells are dead and compactly arranged without intercellular spaces.

Section D

34. **For the first stone :**

Initial velocity, $u = 0 \text{ ms}^{-1}$, Height of cliff, $h = 49 \text{ m}$, $g = 9.8 \text{ m/s}^2$

As we know, $S = ut + \frac{1}{2}at^2$.

We, have, $h = ut + \frac{1}{2}gt^2$

$$\therefore 49 = 0 \times t + \frac{1}{2} \times 9.8 \times t^2$$

$$\Rightarrow t^2 = \frac{9.8}{9.8} = 10$$

$$\Rightarrow t = \sqrt{10} = 3.16 \text{ s}$$

i.e., first stone would take 3.16 s to reach the ground.

For the second stone:

The time taken by the second stone to reach the ground is one second less than that taken by the first stone as both the stones reach the ground from the same height, $h = 49 \text{ m}$.

That is, for the second stone, time, $t = (3.16 - 1) \text{ s} = 2.16 \text{ s}$

\therefore For the second stone,

$g = 9.8 \text{ ms}^{-2}$, $h = 49 \text{ m}$, $t = 2.16 \text{ s}$, $u = ?$

Using, $S = ut + \frac{1}{2}at^2$.

We have, $h = ut + \frac{1}{2}gt^2$

$$\Rightarrow 49 = u \times 2.16 + \frac{1}{2} \times 9.8 \times (2.16)^2$$

$$\Rightarrow 49 - 22.86 = 2.16u \text{ or } 26.14 = 2.16u$$

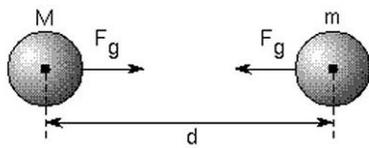
$$\Rightarrow u = \frac{26.14}{2.16} = 12.1 \text{ ms}^{-1}$$

Therefore, the speed with which he threw the second stone = 12.1 ms^{-1}

OR

Newton's Law of universal gravitation: Everybody in the universe attracts every other body with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

Let us consider two bodies A and B of masses m_1 and m_2 which are separated by a distance d .



Then the force of gravitation (F) acting on the two bodies is given by

$$F \propto m_1 \times m_2 \dots\dots\dots(1)$$

$$\text{and } F \propto \frac{1}{d^2} \dots\dots\dots(2)$$

Combining equations (1) and (2), we get

$$F \propto \frac{m_1 \times m_2}{d^2}$$

$$F = k \frac{m_1 \times m_2}{d^2}$$

Where, k= proportionality constant, known as universal gravitational constant, G having value = $6.67 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$.

Therefore, $F = G \times \frac{m_1 m_2}{d^2}$, Which is required expression for force of attraction between two bodies.

Here, if the masses m_1 and m_2 of the two bodies are of 1 kg and the distance (d) between them is 1 m, then putting $m_1 = 1 \text{ kg}$, $m_2 = 1 \text{ kg}$ and $d = 1 \text{ m}$ in the above formula, we get

$$F = G \times \frac{1}{1^2},$$

$$G = F$$

Definition of the gravitational constant G: Gravitational constant, G is numerically equal to the force of gravitation which exists between two bodies of unit masses kept at a unit distance from each other.



35.

The process of plasma membrane formation is called membrane biogenesis. Following organelles are involved in this process: The proteins and lipids are first synthesized in the rough endoplasmic reticulum and the smooth endoplasmic reticulum, respectively. These are then transported to the Golgi complex for their modification. After modification, these are transported to the cell surface through vesicles which bud off from the Golgi complex to fuse with the cell membrane and form a part of the membrane.

OR

Golgi apparatus or Golgi bodies or Golgi complex is composed of membrane-bound fluid-filled vesicles, vacuoles and cisternae. In animal cells they are larger and only one or two in number, while in plants they are smaller and more in number. Also, in plant cells, they are distributed throughout the cytoplasm and are called dictyosomes.

Functions:

1. It is involved in the transport and modification of protein, lipids as well as carbohydrates.
2. It helps in the formation of cell plate during cell division.
3. It is also involved in the formation of lysosomes and peroxisomes.
4. The material synthesised near endoplasmic reticulum is packaged and dispatched to various targets and outside the cell through the Golgi apparatus.

36. i. Alloys are a homogeneous mixture of metals or non-metals because

- a. It shows the properties of its constituents, and
- b. It has variable composition, e.g. brass is considered a mixture because it shows the properties of its constituents, copper and zinc; and it has a variable composition.

ii. No, a solution is not generally a liquid always. For e.g. alloys are known to be solid solutions.

iii. The term solution is generally used for 'true solution'. In this case, the solution is always homogeneous.

In the case of 'colloidal solution', that is not a true solution i.e. the solution is heterogeneous.

Section E

37. i. Collenchyma.

ii. No, aerenchyma helps aquatic plants to float.

iii. No, apical and intercalary meristems are not permanent tissue.

OR

Provides strength to the plant parts.

38. i. The availability moisture and irrigation facilities decide the chose the crop to be cultivated after one harvest and the process knows as crop rotation.
- ii. Biological manure help in improving soil structure, enriching the soil with nutrient also reduce the risk of water pollution which is a major problem with chemical fertilizers.
- iii. Yes, it is possible to grow two crops simultaneously at the same but the two crops are chosen to grow should have a different nutrient requirement.

OR

Biotic losses caused by - insects, rodents, fungi, mites, and bacteria and abiotic losses are inappropriate moisture and temperature in place of quality.

39. i. Dispersion medium is a continuous medium in which the dispersed phase is distributed throughout. Dispersed phase is the phase that is composed of particles that are distributed through another phase.
- ii. Homogenous mixtures generally have a uniform composition throughout the mixture whereas Heterogeneous mixtures have composition which may vary from point to point. In Homogenous mixtures, the whole mixture is in the same phase whereas in Heterogeneous mixture, substances can be of two phases and layers may separate.
- iii. An emulsion is a mixture of two or more liquids that are usually immiscible but under specific transforming processes will adopt a macroscopic homogeneous aspect and a microscopic heterogeneous one.

OR

Coloured gemstone.