SAMPLE PAPER - 7

Class 09 - Science

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

General Instructions:

1. This question paper consists of 39 questions in 5 sections.
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.
3. Section A consists of 20 objective type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

Section A

1. Diethyl ether evaporates faster than ethyl alcohol because of which factor? **[1]**

   a) The Vapour pressure of ether is greater than that of alcohol.

   b) Molar mass of ether is graters than that of ether.

   c) vapour pressure of alcohol is greater than that of ether

   d) Boiling point of ether is higher than that of alcohol.

2. Animal cell lacking nuclei would also lack in: **[1]**

   a) Chromosome

   b) Endoplasmic Reticulum

   c) Ribosome

   d) Lysosome

3. A ball is thrown up with a velocity of 20 ms^{-1}. What is the time of flight, neglecting air resistance? **[1]**

   a) 8 sec

   b) 1 sec

   c) 2 sec

   d) 4 sec

4. Which one of the following is broad leaf weed? **[1]**

   a) Chenopodium

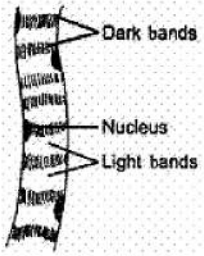
   b) Convolvulus

   c) Amaranthus

   d) All of these

5. On observing a permanent slide under the microscope a student found the structure without cell-wall. It had light **[1]**

and dark bands. The slide could be:



a) nerve cell
b) striated muscle
c) parenchyma
d) unstriated muscle

6. Silver nitrate solution is used to study **[1]**

a) Mitochondria
b) Golgi apparatus
c) Nucleus
d) Endoplasmic reticulum

7. Which of the two statement(s) is/are true? **[1]**

Statement A: Atomic mass of an element is not its actual mass but relative mass.

Statement B: With the help of STM, it is possible to take the photograph of some atoms.

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

8. The number of cellular layers keeps on changing in **[1]**

a) stratified epithelium
b) simple squamous epithelium
c) both simple and stratified epithelium
d) glandular epithelium

9. If the earth stops rotating the value of 'g' at the equator will **[1]**

a) none of these
b) remain same
c) decrease
d) increase

10. If the v-t graph is a straight line inclined to the time axis, then: **[1]**

a) $a \neq 0$
b) a = constant $\neq 0$
c) $a \neq$ constant $\neq 0$
d) a = 0

11. How many molecules are present in one gram molecular mass of a substance? **[1]**

a) 6.022×10^{23} molecules
b) $\frac{1}{6.022 \times 10^{23}}$ molecules
c) 2.3 atoms
d) 3.012×10^{23} atoms

12. Specimens of plants and animals are preserved in: **[1]**

a) acetone
b) methylated spirit
c) ethanol
d) formalin

13. The energy currency of the cell is**:** **[1]**

a) AMP
b) GTP
c) ATP
d) ADP

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

a) Sd

b) K

c) So

d) Na

15. Which of the following are chemical changes? **[1]**

a) Melting of ice

b) The cooking of vegetables.

c) Freezing of water

d) Drying of wet clothes in sun light

16. Kharif season extends from **[1]**

a) April to June

b) January to March

c) June to October

d) October to January

17. **Assertion (A):** If a particle is moving with constant velocity, then the average velocity for any time interval is equal to instantaneous velocity. **[1]**

Reason (R): If average velocity of a particle moving on a straight line is zero for a given time interval, then instantaneous velocity at some instant within this interval may be zero.

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):** Evaporation of spirit from the skin make the skin feel cool. **[1]**

Reason (R): It liberates latent heat of vaporisation from the skin.

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):** Cells of cork or bark are dead, acts as a protective covering. **[1]**

Reason (R): In leguminous plants, the root nodules harbor nitrogen-fixing bacteria which convert atmospheric nitrogen into nitrates.

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):** The size of the nucleus is very small as compared to the size of the atom. **[1]**

Reason (R): The electrons revolve around the nucleus of the atom.

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. The velocity of a body moving in a straight line is increased by applying a constant force F, for some distance in the direction of the motion. Prove that the increase in the kinetic energy of the body is equal to the work done by the force on the body. **[2]**

OR

Calculate the power of an engine required to lift 10^5 kg of coal per hour from a mine 360 m deep. [Take g = 10 ms^{-2}]

22. Define latent heat of vaporization and latent heat of fusion. **[2]**

23. A boat at anchor is rocked by waves, whose consecutive crests are 100 m apart. If the wave velocity of moving crests is 20 ms^{-1}, calculate the frequency at which the boat will rock? **[2]**

24. Alka was making tea in a kettle. Suddenly she felt intense heat from the puff of steam gushing out of the spout of the kettle. She wondered whether the temperature of the steam was higher than that of the water boiling in the kettle. Comment. **[2]**

25. A man throws a ball of mass 0.4 kg vertically upwards with a velocity of 10 m/s. What will be its initial momentum? What would be its momentum at the highest point of its reach? **[2]**

OR

Why does a cricket player move his hands backward while catching the ball?

26. Which of the two will be chemically more reactive ; element X with atomic number 16 or element Y with atomic number 17 ? **[2]**

Section C

27. Flash and thunder are produced simultaneously. But thunder is heard a few seconds after the flash is seen, why? **[3]**

28. On the basis of the number of protons, neutrons and electrons in the samples given below identify **[3]**

i. the cation.

ii. the pair of isobars, and

iii. the pair of isotopes.

Sample	**Protons**	**Neutrons**	**Electrons**
A	17	18	16
B	18	19	18
C	17	20	17
D	17	17	17

29. Deduce the following equations of motion: **[3]**

i. $S = ut + \left(\frac{1}{2}\right)at^2$

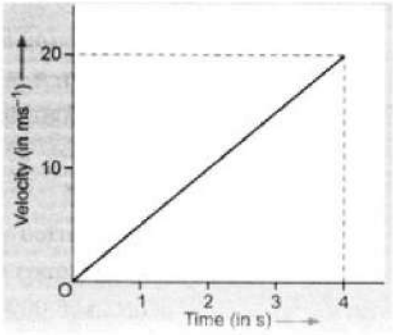
ii. $v^2 = u^2 + 2aS$

OR

A cheetah is the fastest land animal and can achieve a peak velocity of 100 kmh^{-1} up to distances less than 500 m . If a cheetah spots his prey at a distance of 100 m, what is the minimum time it will take to get its prey, if the average velocity attained by it is 90 kmh^{-1}?

30. A test tube loaded with lead shots weighs 50 gf and floats upto the mark 'X' in water. The test tube is then made to float alcohol. It is found that 10 gf of lead shots have to be removed, so as to float it to level 'X'. Find RD of alcohol. **[3]**

31. The velocity-time graph of a ball moving on the surface of floor is shown in the figure. Calculate the force acting on the ball, if the mass of the ball is 100 g. **[3]**



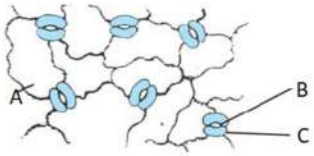
32. Fill in the gaps in the following table illustrating differences between prokaryotic and eukaryotic **[3]**

Prokaryotic Cell	Eukaryotic Cell
1. Size. Generally small (1 – 10 µm).	1. Size. Generally large (5 – 100 µm).
2. Nuclear Region ..... and known as	2. Nuclear Region. Well defined and surrounded by a nuclearmembrane.
3.Chromosomes. Single	3. Chromosomes. More than one Chromosome
4. Membrane Bound Cell Organelles. Absent.	4 .....

OR

Differentiate between chromatin and chromosome.

33. Observe the given below diagram and answer the following questions: **[3]**



i. What does A represent in the given diagram? How does cell 'A' of root hairs cells help in water absorption?

ii. How does B in the given diagram help the plants?

iii. Out of A, B, and C cells in the above diagram, which cell helps in the closing and opening of the stomata? Write the name of the cell.

Section D

34. i. Write the formula to find the magnitude of the gravitational force between the earth and an object on the earth's surface. **[5]**

ii. Derive how does the value of gravitational force F between two objects change when

a. distance between them is reduced to half and

b. mass of an object is increased four times.

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

Differentiate between

i. Cell wall and cell membrane.

ii. Nuclear region of a bacterial cell and nuclear region of an animal cell.

iii. Prokaryotic cell & eukaryotic cell.

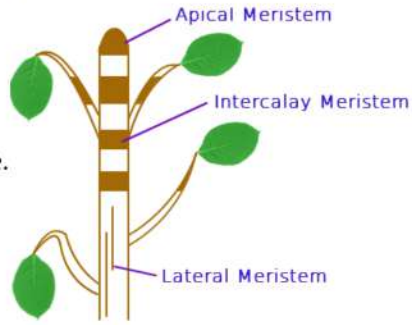
36. i. What factors affect the solubility of solvent and solute? **[5]**

ii. State the differences between compounds and mixtures

Section E

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

The tissue is a group of cells having similar origin, structure& function. Study of tissues is called Histology. In unicellular organism (Amoeba) single cell performs all basic functions, whereas in multi-cellular organisms (Plants and Animals) shows division of labour as Plant tissue & Animal tissues. Plant tissues are two types: Meristematic & Permanent tissue.



Meristematic tissue: The meristems are the tissues having the power of cell division. It is found on that region of the plant which grows.

Following are the types of Meristems:

The Apical meristems- It is present at the growing tip of the stem and roots and increases the length.

The lateral meristems- It present at the lateral side of stem and root (cambium) and increases the girth.

The intercalary meristems- It present at internodes or base of the leaves and increases the length between the nodes.

(i) Which tissue help in the secondary growth of the plant?

(ii) In what region of the plant does intercalary meristematic growth occur?

OR

Where does meristematic tissue mostly found in a plant?

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

The practice of keeping or rearing, caring, and management of honey bee on a large scale for obtaining honey and wax is called apiculture. The place where bees are raised is called an apiary. Bee-keeping requires low investment and generates additional income, hence it is done by farmers along with agriculture.

Following are the Honey bee varieties that are used for bee-keeping as follows:

Indigenous varieties	**Exotic varieties**
Apis cerana indica (Indian bee)	Apis mellifera (Italian bee)
Apis dorsata (Rock bee), Apis florae (Little bee)	Apis adamsoni (South African bee)

(i) Why bee keeping should be done in good pasturage?

(ii) Does honey bee help in pollination? Which type of flowers attracts the honey bee?

(iii) Mention the products obtained from the honey bee.

OR

What is the best season to start beehive?

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

Sulphur dioxide is a colorless gas with a pungent odor. It is a liquid when under pressure, and it dissolves in water very easily. Sulphur dioxide in the air comes mainly from activities such as the burning of coal and oil at power plants or from copper smelting. In nature, sulphur dioxide can be released into the air from volcanic eruptions.

'SO_2 is an air pollutant released during the burning of fossil fuels and from automobile exhaust'.

(i) What are the valencies of sulphur in SO_2 and SO_3?

(ii) Find out the number of molecules in 5 moles of SO_2.

(iii) Calculate the number of moles in 320 g of SO_2 gas.

OR

Calculate the molar mass of 10 moles of sodium sulphite.

[Given, atomic masses of S = 32 u, O = 16 u, Na = 23 u and $N_A = 6.022 \times 10^{23}$ per mol]

Solution

SAMPLE PAPER - 7

Class 09 - Science

Section A

1. **(a)** The Vapour pressure of ether is greater than that of alcohol.
   Explanation: Being lower vapour pressure ether starts evaporating faster than alcohol. Diethyl ether evaporates faster than that of ethyl alcohol because the vapour pressure of ether is greater than that of alcohol.

2. **(a)** Chromosome
   Explanation: An animal cell that does not contain nuclei will also lack chromosomes. Chromosomes are present inside the nucleus of a cell. Chromosomes contain information for the inheritance of features from parents to the next generation in the form of DNA (Deoxyribose Nucleic Acid) molecules.

3. **(d)** 4 sec
   Explanation: Using kinematic equation, $v = u + a \times t$, when ball reaches to top of its trajectory, it's velocity becomes zero. Ball is thrown against gravity of earth, therefore $a = -g$, $u = 20$ m/s, we can find time of ascend as
   $0 = 20 - 10 \times t$
   $20 = 10 \times t$
   $t = \frac{20}{10} = 2$ sec
   Time of ascend is same as time of descend = 2 sec.
   Time of flight = time of ascend + time of descend
   Therefore time of flight = 4 sec.

4. **(d)** All of these
   Explanation: Amaranthus, Chenopodium, Convolvulus are all broad-leaf weed.

5. **(b)** striated muscle
   Explanation: Given figure show striated muscle. Striated muscles/skeletal muscles/voluntary muscles are cylindrical, un-branched and multinucleated. They have dark bands and light bands.

6. **(b)** Golgi apparatus
   Explanation: Silver nitrate is an inorganic, irritant, colourless, water-soluble, poisonous, clear, crystalline compound. It is used in photography and silver plating. Silver nitrate solution is used to study Golgi apparatus. Golgi apparatus is an organelle in eukaryotic cells.

7. **(a)** Both A and B
   Explanation: The atomic mass of an element is not its actual mass but relative mass compared to the mass of a carbon-12 atom.
   Photographs of some atoms can be taken by using an STM (Scanning Tunneling Microscope). The scanning tunneling microscope (STM) is a type of electron microscope that shows three-dimensional images of a sample. In the STM, the structure of a surface is studied using a stylus that scans the surface at a fixed distance from it.

8. **(a)** stratified epithelium
   Explanation: The stratified epithelium contains more than one layer of cells i.e. 2 to 20 or more layers. Skin is an example of stratified epithelium. Stratification of layers prevents wear and tear. The number of cellular layers keeps on changing in the stratified epithelium.

9. **(d)** increase
   Explanation: The value of 'g' will slightly increase because if the earth stops rotating then it will be more spherical.

10. **(a)** $a \neq 0$
    Explanation: The negative value of acceleration signifies deceleration or in other words, the velocity is decreasing.

11. **(a)** 6.022×10^{23} molecules
    Explanation: Gram molecular mass is the mass in grams of one mole of a molecular substance.
    One mole contains 6.022×10^{23} molecules. This is known as the Avogadro number.
    Therefore, one gram molecular mass of a substance has 6.022×10^{23} molecules.

12. **(d)** formalin

Explanation: Specimen preservation means “longterm preservation of organisms either plant or animal in the best possible condition. So that it can be accessed in the future as a reference collection for scientific purposes”. Formalin is the best preservative for plants and animals.

13. **(c)** ATP

Explanation: Adenosine triphosphate (ATP) is called as the energy currency of the cell. The energy produced by a cell during internal respiration is stored in the form of ATP molecules. ATP breaks into ADP and phosphate to produce energy during cellular processes.

14. **(d)** Na

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

15. **(b)** The cooking of vegetables.

Explanation: The cooking of vegetables is a chemical change because a new substance is formed having new properties and heat is used to change the state. The cooked vegetable cannot be reversed back as a raw vegetable.

16. **(c)** June to October

Explanation: Kharif crops are the crops grown in rainy season extending from June to October hence are also called as monsoon crops. These crops are totally rain dependent crops. Kharif crops include paddy, soybean, sugarcane.

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

Explanation: Average velocity V_{av}

$= \frac{\text{Total displacement}}{\text{Total elapsed time}} = \frac{Vt}{t}$ = V

= Instantaneous velocity

Hence, assertion is correct. If a particle is in a round trip on a straight line, then average velocity is zero but at the instant at which the particle reverses its direction of motion, velocity is zero. So, reason is correct. But reason is not the correct explanation of assertion.

18. **(c)** A is true but R is false.

Explanation: Evaporation of spirit from skin make the skin feel cool because it absorbs latent heat of vaporisation from the skin.

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

Explanation: Cells of cork or bark are dead, compactly arranged without intercellular spaces, and have a chemical called subering in their walls that makes them impervious to gases and water. In this way, it acts as a protective tissue.

20. **(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.

Section B

21. If a body of mass changes its velocity from "u" to "v" with an acceleration, "a"due to the application of a constant force, "F" in the direction of motion, then the displacement of the body, " S" is given by

$v^2 = (u^2) + 2as$

$s = \frac{v^2-u^2}{2a}$

but the work done in changing the velocity of the body from u to v is

W = F.s

$W = \frac{ma(v^2-u^2)}{2a}$

$\Rightarrow W = \frac{m(v^2-u^2)}{2}$

$W = \frac{mv^2}{2} - \frac{mu^2}{2}$

But it is change in kinetic energy

Hence verified.

OR

The work needed in lifting a mass m to a height h against the gravitational force. W = mgh

Power P = $\frac{W}{t}$

Given : m = 10^5 kg, g = 10 ms, h = 360 m, t = 1 h = 60 $\times$ 60s = 3600s

$p = \frac{10^5 \times 10 \times 360}{3600} = 10^5\ w$

22. Latent heat of vaporization is the amount of heat energy that is required to change 1 kg of a liquid into gas at atmospheric pressure at its boiling point, i.e. without changing its state.

    Latent heat of fusion is the amount of heat energy that is required to change 1 kg of a solid into liquid at atmospheric pressure at its melting point, i.e. without changing its state.

23. Given: Distance between two consecutive crests = Wave length = 100 m

    Wave velocity = 20 ms^{-1}

    Using the expression V = v × λ we have

    $v = \frac{V}{\lambda} = \frac{20}{100}$ = 0.2 Hz

24. The temperature of both boiling water and steam is 100°C, but steam has more energy because of latent heat of vaporisation. Latent heat of vapourisation makes it much more hotter than hot boiling water.

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

    Initial momentum of the ball = mu = 0.4 × 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 × 4 = 0.

    OR

    The player does so as to decrease the rate of change of momentum by increasing the time.In doing so,the entire momentum of the ball is reduced to zero in a long time interval.In other words,the rate of change of momentum is small.As a result,according to Newton's second law of motion,the player has to apply a small force on the ball.In reaction,the ball also applies less force and the palms of the player are not injured.If the ball is stopped suddenly,then the entire momentum of the ball will be reduced to zero in a very short time which will cause a larger rate of change of momentum resulting in greater action and reaction forces.Thus the palms of the player will be hurt.

26. The electronic configuration of the two elements are as follows :

    X (Z = 16) : K (2), L(8), M(6) = (2,8,6)

    Y(Z = 17) : K(2), L(8), M(7) = (2,8,7)

    To complete its octet, X will gain 2 electrons and Y will gain only 1 electron, therefore element Y will be more reactive than element X.

Section C

27. Since speed of thunder (sound) is much less (332 m/s) as compared to speed of flash (light) which is about 3 × 10^8m/s therefore light travels faster than sound hence thunder is heard a few seconds after the flash is seen.

28. i. Sample A has more protons than electrons. Hence, it is a cation.

    ii. Sample B and C have same mass number (Mass number = Number of protons + number of neutrons = 37) but different atomic numbers (i.e. 18 and 17respectively). Hence, they are a pair of isobars.

    iii. Samples C and D have same atomic number but different mass numbers. Hence, they are a pair of isotopes.

29. i. Consider the linear motion of a body with initial velocity 'u'. Let the body accelerate uniformly and acquire a final velocity 'v' after time 't'.

    Then, Average velocity of body = $\frac{\text{Initial velocity + Final velocity}}{2} = \frac{u+v}{2}$

    ∴ The distance covered by the body in time 't' = S = Average velocity × Time taken $\Rightarrow S = \frac{u+v}{2} \times t$

    We know that, v =u +at

    $\Rightarrow S = \frac{u+(u+at)}{2} \times t$

    or, S = $\frac{2ut+at^2}{2}$

    $\Rightarrow$ S = $ut + \frac{1}{2}at^2$ Which is required equation.

    ii. We know that, S = $ut + \frac{1}{2}at^2$ ..... (1)

    Also, a = $\frac{v-u}{t}$

    $\Rightarrow$ t = $\frac{v-u}{a}$

    Putting the value of t in (1), we have

    S = $u\left(\frac{v-u}{a}\right) + \frac{1}{2}a\left(\frac{v-u}{a}\right)^2$

    or S = $\frac{uv-u^2}{a} + \frac{v^2+u^2-2uv}{2a}$

    or 2aS = 2uv - $2u^2$ + v^2 + u^2 - 2uv

    or v^2 - u^2 = 2aS. Which is required equation.

    OR

Speed of the cheetah in ms^{-1} is $90 \times \frac{5}{18}$ $ms^{-1} = 25ms^{-1}$

Distance of the prey = 100 m

Therefore time to catch the prey = $\frac{Distance}{Speed} = \frac{100}{25} = 4S$

30. Weight of water displaced = 50 gf

Weight of alcohol displaced = (50 -10) gf = 40 gf

As volume of water displaced = Volume of alcohol displaced

RD of alcohol = $\frac{weight\ of\ alcohol\ displaced}{weight\ of\ equal\ volume\ of\ water\ displaced} = \frac{40}{50}$

31. The velocity-time graph shows that the velocity of the ball at t = 0, is zero. Initial velocity of ball, u = 0

Velocity of ball at t = 4s is $20ms^{-1}$

That is, final velocity, v = 20 ms^{-1}

Time, t = 4 s.

Acceleration of the ball, $a = \frac{v-u}{t}$

$\implies a = \frac{20\ ms^{-1} - 0\ ms^{-1}}{4\ s} \Rightarrow a = 5\ ms^{-2}$

Also, mass of ball,

$m = 100\ g = \frac{100}{1000}\ kg = \frac{1}{10}\ kg$

∴ Force acting on the ball, F = ma

$\implies F = \frac{1}{10}\ kg \times 5\ ms^{-2}$

$= 0.5kgms^{-2} = 0.5N\ [1kgms^{-2} = 1N]$

Therefore,the force acting on the ball is $0.5N$.

32.

Prokaryotic Cell	Eukaryotic Cell
1. Size. Generally small (1 – 10 µm).	1. Size. Generally large (5 – 100 µm).
2. Nuclear Region Poorly defined due to absence of nuclear envelope and known as Nucleoid	2. Nuclear Region. Well defined and surrounded by a nuclear membrane.
3.Chromosomes. Single	3.Chromosomes. More than one Chromosome
4. Membrane Bound Cell Organelles. Absent.	4. Membrane bound cell organelles are present.

OR

Chromatin	**Chromosome**
1.It is the nucleoprotein of chromosomes which stains strongly with basis dyes and is present inside the nucleus.	1.Thread - like, stainable, condensed chromatin, visible at cell division and containing hereditary information in the form of genes.
2. Chromatin Fibers are Long and thin. They are uncoiled structures found inside the nucleus.	2. Chromosomes are compact, thick and ribbon-like. These are coiled structures seen prominently during cell division.
3. Chromatin is unpaired.	3. Chromosome is paired.
4. Found throughout the cell cycle.	4. Distinctly visible during cell division (metaphase, anaphase) as highly condensed structures upto several thousand nm.

33. i. In the given diagram of the epidermis, A represents the epidermal cells of the roots bear long hair-like parts called root hairs. With the help of these cells, root hairs greatly increase the total absorptive surface area and help in water absorption.

ii. B represents the stomata. Stomata are the pores present in the epidermis of the leaves. Stomata help in the exchange of gases with the atmosphere during photosynthesis and respiration. Also, the process of transpiration (loss of water in the form of water vapour) takes place through stomata.

iii. C cell that represents the guard cells. These cells are kidney-shaped that enclose the stomata and thus help in the opening and closing of stomata.

Section D

34. i. Formula to find the magnitude of gravitational force:

F = $\frac{GMm}{R^2}$.

where, M = mass of the earth

m = mass of the object

R = distance between centres of the earth and an object.

and universal gravitational constant, G = 6.67×10^{-11} N-m^2/kg^2

ii. a. Let gravitational force be F when the distance between them is R,

$F = \frac{GMm}{R^2}$ ....(i)

Now, when the distance reduces to half,

$F' = \frac{GMm}{\left(\frac{R}{2}\right)^2} = \frac{4GMm}{R^2} = 4F$

i.e. the force of gravitation becomes 4 times the original value.

b. When the mass becomes 4 times,

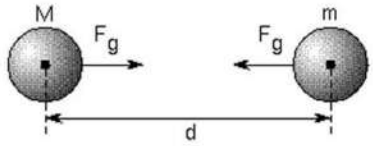
$F' = \frac{GM(4m)}{R^2} = 4F$

i.e. the force of gravitation becomes 4 times the original value.

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

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

and $F \propto \frac{1}{d^2}$ .....(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 = 6.67×10^{-11} Nm^2 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 kg, m_2 = 1 kg and d = 1m 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

i.

Cell wall	**Cell membrane**
It is present in bacteria, fungi, and plant cells. It is absent in animal cells and protozoans.	It is present in all cells.
There is no other name of the cell wall.	The cell membrane is also known as the plasma membrane or plasmalemma.
The cell wall is completely permeable.	The cell membrane is semi-permeable.

The cell wall is made up of cellulose.	The cell membrane is made up of lipids and proteins.

ii.

Nuclear region of bacterial cell	**Nuclear region of an animal cell**
Smaller in size.	Larger in size.
The nuclear membrane is absent, the nucleolus is absent. The nucleus is regarded as the nucleoid.	Nuclear membrane with nucleolus present.

iii.

Prokaryotic cell	**Eukaryotic cell**
The size of a cell is generally small.	The size of a cell is generally large.
The true nucleus is absent.	The true nucleus is present.
It contains a single chromosome.	Contains more than one chromosome.
Membrane-bound cell organelles absent.	Membrane-bound cell organelles present.

36. i. a. **Temperature:** For the majority of solutions of solid-in-liquid and liquid-in-liquid types, solubility increases with temperature. However, for solutions of gases-in-water type, solubility decreases with increase in temperature.
    b. **Pressure:** It is applicable to gas-in-liquid solutions. An increase in pressure increases the solubility of a gas. For example, aerated drinks contain carbon dioxide gas under pressure.
    c. **Mechanical Stirring:** Mechanical stirring increases solubility. For example, sugar dissolves faster on stirring with a spoon.
    d. **Size of Solute Particles:** Smaller the particle size of solute, greater is the solubility. For example, it is easier to dissolve powdered sugar than granules of sugar.

ii. **Compounds**

a. Compounds are pure substances.
b. They are made up of two or more elements combined chemically.
c. The constituents of a compound are present in a fixed ratio.
d. Compounds have fixed properties. For example, a particular compound will have fixed temperatures at which it melts and boils.
e. A compound can have properties different from its constituents, as a new substance is formed when the constituents are chemically combined.
f. The constituents of a compound can be separated only by chemical methods.

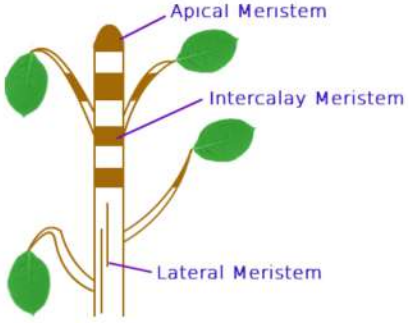
Mixtures

a. Mixtures are impure substances.
b. They are made up of two or more substances mixed physically.
c. The constituents of a mixture are present in varying ratios.
d. Mixtures do not have fixed properties. Their properties depend on the nature of their components and the ratios in which they are combined.
e. In mixtures, no new substance is formed. The properties of a mixture are the same as the properties of its constituents.
f. The constituents of a mixture can be separated easily by physical methods.

Section E

37. **Read the text carefully and answer the questions:**

The tissue is a group of cells having similar origin, structure& function. Study of tissues is called Histology. In unicellular organism (Amoeba) single cell performs all basic functions, whereas in multi-cellular organisms (Plants and Animals) shows division of labour as Plant tissue & Animal tissues. Plant tissues are two types: Meristematic & Permanent tissue.



Meristematic tissue: The meristems are the tissues having the power of cell division. It is found on that region of the plant which grows.

Following are the types of Meristems:

The Apical meristems- It is present at the growing tip of the stem and roots and increases the length.

The lateral meristems- It present at the lateral side of stem and root (cambium) and increases the girth.

The intercalary meristems- It present at internodes or base of the leaves and increases the length between the nodes.

(i) Cambium tissue help in the secondary growth of the plant.

(ii) Between mature tissue segments, intercalary meristematic growth occurs.

OR

Meristematic tissues are mostly found at the apices of root and shoot.

38. **Read the text carefully and answer the questions:**

The practice of keeping or rearing, caring, and management of honey bee on a large scale for obtaining honey and wax is called apiculture. The place where bees are raised is called an apiary. Bee-keeping requires low investment and generates additional income, hence it is done by farmers along with agriculture.

Following are the Honey bee varieties that are used for bee-keeping as follows:

Indigenous varieties	**Exotic varieties**
Apis cerana indica (Indian bee)	Apis mellifera (Italian bee)
Apis dorsata (Rock bee), Apis florae (Little bee)	Apis adamsoni (South African bee)

(i) Bees need quality nectar to produce honey. A good pasturage consists of plenty of flowers that can be used by bees to get quality nectar. This increase the quality as well as the quantity of the bees. If bees are confined to only a single variety of flowers for nectar honey quality will have a similar taste and consistency. Most farmers make honey obtained from single nectar.

(ii) Yes, honey bee helps in pollination. The bright-coloured flowers attract the honey bee.

(iii) Besides honey, other products of bee-keeping are bee wax, bee venom, propolis, and royal jelly.

OR

Spring season is best to start a beehive.

39. **Read the text carefully and answer the questions:**

Sulphur dioxide is a colorless gas with a pungent odor. It is a liquid when under pressure, and it dissolves in water very easily. Sulphur dioxide in the air comes mainly from activities such as the burning of coal and oil at power plants or from copper smelting. In nature, sulphur dioxide can be released into the air from volcanic eruptions.

'SO_2 is an air pollutant released during the burning of fossil fuels and from automobile exhaust'.

(i) Valency of sulphur in SO_2 = 4

Valency of sulphur in SO_3 = 6

(ii) 5 × Avogadros number = $5 \times 6.022 \times 10^{23}$

5 mole of $SO_2 = 3.011 \times 10^{23}$ molecules

(iii) Mass = 320 g, Molar mass (m) of

$SO_2 = 32 + 2 \times 16 = 64$ g/mol

$\Rightarrow n = \frac{m}{M} = \frac{320}{64} = 5$ moles

OR

Molar mass of 10 moles of Na_2SO_3

$= 10\ [23 \times 2 + 32 + 16 \times 3] = 1260$ g