Class IX
SCIENCE FULL SYLLABUS – 2

Time : 3 Hrs **M.M – 80 Marks**

Q1. Slope of a velocity-time graph gives : **[1]**

(A) Distance (B) Displacement (C) Acceleration (D) Speed

Q2. The gravitational force between two objects is F. If masses of both objects are halved without changing distance between them, the gravitational force would become: **[1]**

(A) F/4 (B) F/2 (C) F (D) 2F

Q3. Assertion (A): The effect of thrust on sand is larger while standing than while lying. **[1]**

Reason (R): Thrust is a force acting on an object perpendicular to the surface.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

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

(C) Assertion (A) is true but Reason (R) is false.

(D) Assertion (A) is false but Reason (R) is true.

Q4. Peter pours the same amount of four different liquids in separate cylinders.

The cylinders are of the same size.

He then drops a glass marble in each of the four cylinders.

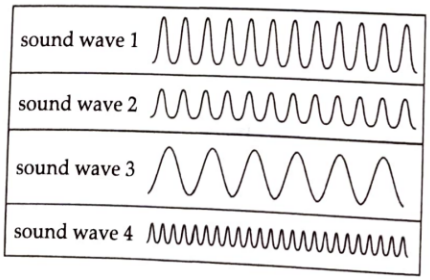
He also notes the time the marble takes to reach the bottom of each cylinder.

The table shows the results. **[2]**

Liquid	Time taken by the marble to reach the bottom of the cylinder (in seconds)
Liquid 1	1.8 s
Liquid 2	1.5 s
Liquid 3	0.8 s
Liquid 4	1.0 s

Which liquid exerted the most upward force on the marble? Justify your answer

Q5. The picture shows four sound waves.



Which two sound waves have almost the same loudness? **[2]**

OR

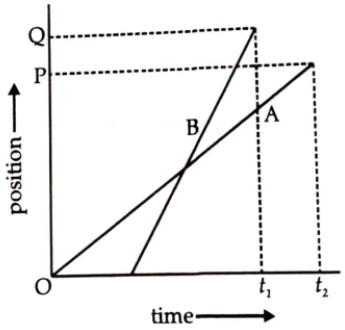
Name the positions on Earth where the value of 'g' is (i) maximum (ii) minimum? Justify your answer.

Q6. A body of mass 1000 kg moving at a speed of 10 m/s reaches the speed of 50 m/s in 20 s. Calculate the force required to do so. **[3]**

Q7. What happens to the magnitude of the force of gravitation between two objects if : **[3]**
(a) mass of one of the objects is tripled ?
(b) distance between the objects is doubled ?
(c) mass of both objects is doubled ?

Q8. The Jog falls in Karnataka state are nearly 20 m high. 2,000 tonnes of water falls from it in a minute. Calculate the equivalent power if all this energy can be utilised, ($g = 10\ ms^{-2}$) **[3]**

Q9. (a) Give four differences between distance and displacement. The position-time graph for children 'A' and 'B' returning from their school 'O' to their homes 'P' and 'Q' is shown in fig. From the graph find :
(i) Which of the two 'A' or 'B' lives closer to school ?
(ii) Which of the two 'A' or 'B' starts earlier from school ?
(iii) Which of the two 'A' or 'B' walks faster ?

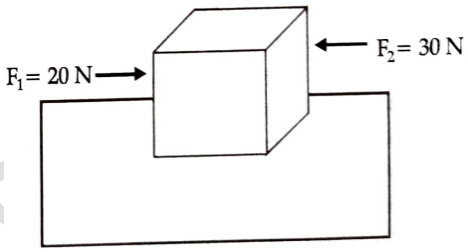


(b) The speed of a car increases from 18 km/h to 36 km/h in 10 seconds. Find its acceleration. **[5]**

OR

(a) A bar of metal has a mass 200 g and a certain weight. Mass remains the same when weighed at equator but weight decreases. Why ?
(b) Differentiate between mass and weight. Write any four differences.

Q10. Observe the diagram and answer the following below:



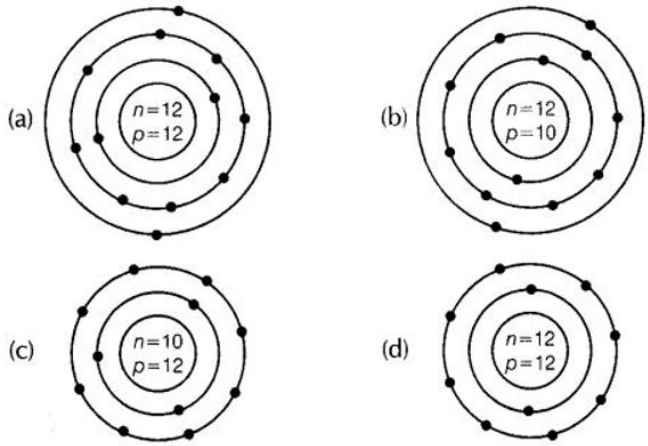
Two forces F_1 = 20 N and F_2 = 30 N are acting on an object as shown in figure:
(a) Find the net force acting on the object.
(b) State the direction of net force acting on the object.
(c) If the object still does not move under the application of these forces, what can be the possible reason for this? **[4]**

OR

Why no force is required to move an object with a constant velocity?

CHEMISTRY

Q1. Identify the Mg^{2+} ion from the figure where *n* and *p* represent the number of neutrons and protons respectively. **[1]**



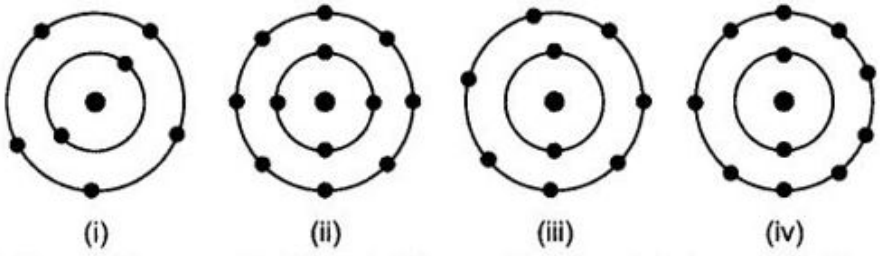
Q2. Which one of the following sets of phenomena would increase on raising the temperature? **[1]**

(A) Diffusion, evaporation, compression of gases
(B) Evaporation, compression of gases, solubility
(C) Evaporation, diffusion, expansion of gases
(D) Evaporation, solubility, diffusion, compression of gases

Q3. A mixture of sulphur and carbon disulphide is: **[1]**

(A) Heterogeneous and shows Tyndall effect
(B) Homogeneous and shows Tyndall effect
(C) Heterogeneous and does not show Tyndall effect
(D) Homogeneous and does not show Tyndall effect

Q4. Which of the following figures does not represent Bohr's model of an atom correctly?



[1]

(A) (i) and (ii) (B) (ii) and (iii) (C) (ii) and (iv) (D) (i) and (iv)

Q5. The chemical symbol for sodium is: **[1]**

(A) So (B) Sd (C) NA (D) Na

Q6. The property to flow is unique to fluids. Which one of the following statements is correct? **[1]**

(A) Only gases behave like fluids.
(B) Gases and solids behave like fluids.
(C) Gases and liquids behave like fluids.
(D) Only liquids are fluids

Q7. Which of these is an alloy? **[1]**

(A) Silver (B) Copper (C) Bronze (D) Aluminium

Q8. Assertion (A): A gas exerts pressure on the walls of the container. **[1]**
Reason (R): Rate of diffusion of gases is more than that of liquids.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(C) Assertion (A) is true but Reason (R) is false.
(D) Assertion (A) is false but Reason (R) is true.

Q9. List any two characteristics of colloid. **[2]**

Q10. After winters, people pack off their woollens by keeping naphthalene balls in them. With passage of time these balls become smaller in size. **[3]**
(a) Why does this happen?
(b) What type of change is involved during this process?
(c) How can you convert a saturated solution into an unsaturated solution?

Q11. What do you mean by concentration of a solution? Mention two ways of expressing the concentration of a solution.

OR

Show the formation of chemical formulae of the following compounds using their ions:
(a) Ammonium sulphate
(b) Magnesium nitrate
(c) Aluminium sulphide **[3]**

Q12. (a) Out of boiling and evaporation which is a surface phenomenon? Explain.
In the absence of a refrigerator, butter is kept wrapped in a wet cloth during summer. Why?
(b) Why does ice-cream appear colder than water at the same temperature?

OR

Classify different types of pure substances. Differentiate them on the basis of their chemical properties giving examples of each. **[5]**

Q13. The following data represents the distribution of electrons, protons and neutrons in atoms of three elements A, B, C. Understand the data carefully and answer the following questions.: **[4]**

Element	Protons	Neutrons	Electrons
A	9	10	9
B	16	16	16
C	12	12	12

(a) What is the atomic number of element A?
(b) What will be the atomic mass number of element B?
(c) Atomic number of element C is 12. Identify the element and write its electronic configuration.

OR

What will be the valency of element A? Justify your answer.

BIOLOGY

Q1. Chromosomes are made up of: **[1]**

(A) DNA (B) Protein (C) DNA and protein (D) RNA

Q2. Which of the following tissues has dead cells? **[1]**

(A) Parenchyma (B) Sclerenchyma (C) Collenchyma (D) Epithelial tissue

Q3. If the tip of sugarcane plant is removed from the field, even then it keeps on growing in length. It is due to the presence of: **[1]**

(A) Cambium (B) Apical meristem

(C) Lateral meristem (D) Intercalary meristem

Q4. A person met with an accident in which two long bones of hand were dislocated. Which among the following may be the possible reason? **[1]**

(A) Tendon break (B) Break of skeletal muscle

(C) Ligament break (D) Areolar tissue break

Q5. Which of these options are not the functions of ribosomes?

(i) It helps in manufacture of protein molecules.

(ii) It helps in manufacture of enzymes.

(iii) It helps in manufacture of hormones.

(iv) It helps in manufacture of starch molecules. **[1]**

(A) (i) and (ii) (B) (ii) and (iii) (C) (iii) and (iv) (D) (iv) and (i)

Q6. Weeds affect the crop plants by: **[1]**

(A) Killing of plants in field before they grow.

(B) Dominating the plants to grow.

(C) Competing for various resources of crops (plants) causing low availability of nutrients.

(D) All of the above.

Q7. Which one is an oil yielding plant among the following? **[1]**

(A) Lentil (B) Sunflower (C) Cauliflower (D) Lotus

Q8. Assertion (A): Permanent tissue is composed of mature cells. **[1]**

Reason (R): Meristematic tissue is a group of actively dividing cells.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

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

(C) Assertion (A) is true but Reason (R) is false.

(D) Assertion (A) is false but Reason (R) is true.

Q9. Assertion (A): Nitrogen is a micronutrient.. **[1]**

Reason (R): Micronutrients are nutrients required in small quantity.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

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

(C) Assertion (A) is true but Reason (R) is false.

(D) Assertion (A) is false but Reason (R) is true.

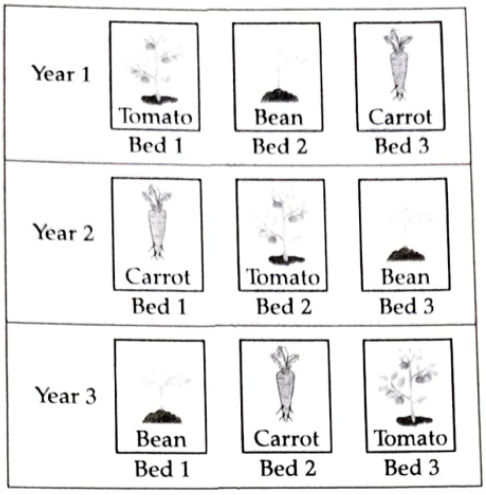
Q10. What is endoplasmic reticulum? Name the two types of endoplasmic reticulum. Write its main functions **[2]**

Q11. Cell size may range from a few micrometre to a metre. Support this statement with the help of examples. **[2]**

OR

Name the tissue which helps in transportation of oxygen that we inhale to various parts of our body. Write the composition of this tissue.

Q12. The diagram shows the crop harvesting pattern followed by a farmer. Bed 1, Bed 2 and Bed 3 are different parts of the farm . **[2]**



(a) What is the common term used for this pattern of crop harvesting?

(b) What is the advantage of the crop harvesting pattern shown in the diagram?

Q13. What is the energy currency of the cell? Write it in expanded form. Which cell organelle is related to the currency? **[3]**

Q14. What are the small pores observed in the epidermis of the leaf called? Write its two main functions.. **[3]**

Q15. Identify the following tissues: **[5]**

(a) The epithelial tissue which has pillar like tall cells ?

(b) The cells of this tissue are filled with fat globules.

(c) The movement of this tissue pushes the mucus forward to clear respiratory tract.

(d) It gives buoyancy to lotus to help it stay afloat.

(e) Tissue present in lung alveoli.

OR

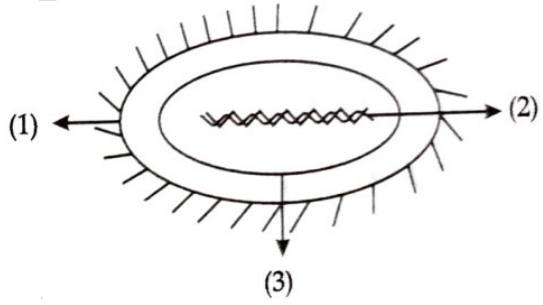
(a) Explain the terms:

(i) Endocytosis, (ii) Plasmolysis.

(b) What will happen if the organisation of a cell is damaged due to certain physical or chemical reasons ?

(c) How do substances like CO_2 and water move in and out of the cell ?

Q16. Study the given diagram of bacterial cell and answer the following questions. **[4]**



(a) The bacterial cell shown in the diagram does not have well defined nucleus. What type of cell it is?

(b) Identify and name the part numbered as (1) in the diagram.
(c) Identify the parts numbered as (3) in the diagram. What is its function?

OR

Identify the part shown by number (2). What does it contain?

Class IX
SCIENCE FULL SYLLABUS – 2
SOLUTIONS
PHYSICS

1. **(C)**
   Explanation: Slope of velocity-time graph gives acceleration. It is because,
   slope of the curve = u / t where u / t = acceleration

2. **(A)**
   Explanation: We know that, gravitational force, $F = \frac{Gm_1m_2}{r^2}$
   (G = Gravitational constant)

   where m_1 and m_2 are the masses of two objects respectively. And r is the distance between the two masses. Now, according to the question, if masses of both objects are halved. i.e.,
   $m_1' = \frac{m_1}{2}$ and $m_2' = \frac{m_2}{2}$
   New force,
   $F' = \frac{Gm_1'm_2'}{r^2} = \frac{G\left(\frac{m_1}{2}\right)\left(\frac{m_2}{2}\right)}{r^2} = \frac{1}{4}\frac{Gm_1m_2}{r^2}$
   $= \frac{F}{4}$ where $\frac{Gm_1m_2}{r^2} = F$
   So, new force, $F' = \frac{F}{4}$
   Thus, the new gravitational force will become $\frac{1}{4}$ times of its original gravitational force.

3. **(B)**
   Explanation: When you stand on loose sand, the force is acting on the area equal to your feet. When you lie down, same force acts on the area equal to the whole body. Effect of the thrust depends upon the area on which it acts.

4. Liquid 1 exerted the most upward force on the marble. Due to this, the time taken by the marble dropped in liquid 1 to reach the bottom was more, as it had to overcome more force than other ones.

5. Sound wave 1 and sound wave 3 will have almost the same loudness as they have almost same amplitude.
   OR
   On Earth value of g is maximum at poles and minimum at the equator. We know,
   $g = \frac{GM}{R^2}$
   At poles radius of Earth is less so value of g is more, at equator radius of Earth is more so value of g is less.

6. Initial velocity (u) = 10 m/s
   Final velocity (v) = 50 m/s
   Time (t) = 20s
   Mass (m) = 1000 kg
   Force = ms = m(v – u)/t
   Or,
   F = 1000 (50 – 10) / 20
   = 2000 kgm/s^2 = 2000 N

7. The force between two objects is given by 'universal gravitation law'. It is numerically stated as,
   s,

$F = \frac{G(m_1 m_2)}{d^2}$

(a) Mass of one object is tripled:

$F' = \frac{G(3m_1)m_2}{d^2}$

$F' = \frac{3G(m_1 m_2)}{d^2} = 3F$

Force will be tripled.

(b) Distance between the objects is double:

$F' = \frac{G(m_1 m_2)}{(2d)^2}$

$F' = \frac{G(m_1 m_2)}{4d^2}$

$F' = \frac{1}{4}\left(\frac{Gm_1 m_2}{d^2}\right) = \frac{F}{4}$

Force will reduce to one-fourth of its previous value.

(c) Masses of both objects are doubled:

$F' = \frac{G(2m_1)(2m_2)}{d^2}$

$F' = \frac{4G(m_1 m_2)}{d^2} = 4F$

Force will be four times greater than its previous value.

8. (a) A lactometer is based on Archimedes principle.

   (b) It states that when a body is immersed fully or partially in a fluid, it experiences an upward force that is equal to the weight of the fluid displaced by it.

   (c) It is used in designing ships and submarines. It is also used in hydrometers used for determining density of liquids.

9. (a)

S. No.	Distance	Displacement
(i)	Distance is the length of the actual path covered by an object irrespective of its direction of motion.	Displacement is the shortest distance between the initial and final positions of an object in a given direction.
(ii)	Distance is a scalar quantity.	Displacement is a vector quantity.
(iii)	Distance covered can never be negative. It is always positive or zero.	Displacement may be positive, negative or zero.
(iv)	Distance between two given points may be same or different for different paths chosen.	Displacement between two given points is always the same.

(i) A (ii) A (iii) B

(b) Given,
u = 18 km/h = 5 m/s
v = 36 km/h = 10 m/s
t = 10 s
a = (10 − 5) / 10 = 0.5 m/s^2

OR

(a) Weight is dependent on gravitational force.
Since, on equator, gravitational force is less, so the weight of the bar of metal decreases.

(b) Difference between mass and weight

S. No.	Mass	Weight
(i)	Its value remains constant at all places.	Its value changes from place to place due to change in the 'g'.
(ii)	It is a scalar quantity.	It is a vector quantity.
(iii)	It is never zero.	It is zero far away from the Earth.
(iv)	Its unit is kg.	Its unit is N or kg-wt.

10. (a) Net force acting on the object = $F_2 - F_1$ = 30 N − 20 N = 10 N

    (b) Net force acts in the direction of force F_2. As F_2 is greater than F_1.

    (c) All forces acting on the object are balanced and that is why the object does not move. It needs unbalanced force for movement.

    OR

    We know, F = ma

    When velocity is constant, then acceleration, a = 0. Hence, F = 0. Hence, no force is required to move an object with constant velocity.

CHEMISTRY

1. **(D)**
   Explanation: Electronic configuration of Mg atom = 2, 8, 2 and that of Mg^{2+} ion = 2, 8
   Number of protons in Mg atom = 12
   Number of neutrons in Mg atom = 24 − 12 = 12 (as mass number of Mg atom = 24 and number of neutrons = mass number − number of protons).

2. **(D)**
   Explanation: Evaporation rate increases because on increasing temperature, kinetic energy of molecules increases, so the molecules present at the surface of the liquid leave the surface quickly and go into the vapour state. Diffusion and expansion of gases also increase as the molecules move more rapidly and try to occupy more space. As the temperature of the solution increase, the average kinetic energy of the solute molecules also increases. This causes the molecules to be less able to hold together and hence they dissolve more readily. Hence increase in temperature increases the solubility of solid states.

3. **(A)**
   Explanation: A mixture of sulphur and carbon disulphide is a heterogeneous colloid and shows Tyndall effect. In a colloidal solution, the particles are big enough to scatter light. This phenomenon of scattering of light by colloidal particles is known as Tyndall effect.

4. **(C)**
   Explanation: Figures (ii) and (iv) do not correctly represent the Bohr's model of an atom. It is because maximum number of electrons in K(I) shell is 2, not 4, so (ii) is wrong and maximum capacity of L(II) shell is 8 electrons, not 9. So, (iv) is also wrong.

5. **(D)**
   Explanation: The chemical symbol for sodium is 'Na' derived from latin word natrium.

6. **(C)**
   Explanation: Gases and liquids tend to flow due to less force of attraction between their particles. Solids do not flow.

7. **(C)**
Explanation: Bronze is an alloy made from copper and tin.

8. **(B)**
Explanation: In the gaseous state, the particles move randomly at certain speed. Due to this movement, they hit each other and also on the walls of the container. This force exerts pressure on the walls.

9. (i) It is a heterogeneous mixture.
(ii) Particles of colloids scatter a beam of light (Tyndall effect).

10. (a) With time, naphthalene balls sublime directly into vapour.
(b) It is a physical change and the process is known as sublimation.
(c) We can convert a saturated solution into an unsaturated solution by adding large quantities of the solvent into the solution.

11. The concentration of a solution is the amount of solute present in a given amount (mass or volume) of solution, or the amount of solute dissolved in a given mass or volume of solvent.
Two ways of expressing the concentration of a solution:

(i) **Mass by mass percentage of a solution**

$$= \frac{Mass\ of\ solute}{Mass\ of\ solution} \times 100$$

(ii) **Mass by volume percentage of solution**

$$= \frac{Mass\ of\ solute}{Mass\ of\ solution} \times 100$$

OR

(a) NH_4^+ SO_4^{2-} → $(NH_4)_2SO_4$

(b) Mg^{2+} NO_3^- → $Mg(NO_3)_2$

(c) Al^{3+} S^{2-} → $(Al)_2S_3$

12. (a) Evaporation is a surface phenomenon. Particles from the surface gain enough energy to overcome the forces of attraction present in the liquid and change into vapour state. Due to wet cloth, the temperature is comparatively lower than room temperature. So, butter does not melt when remain wrapped in wet clothes.
(b) It is because the fact that water has latent heat of fusion present in it. But ice-cream is in solid form; i.e. it has released its latent heat of fusion while coming in solid state. So due to less energy of ice-cream in comparison to that of water; ice-cream appears cooler to mouth than that of water at the same temperature.

OR

Two types of pure substances are elements and compounds.

Differences between elements and compounds are:

S. No.	Compound	Element
(1)	A compound contains atoms of different elements chemically combined together in a fixed ratio.	An element is a pure chemical substance made of same type of atom.
(2)	Compounds contain different elements in a fixed ratio arranged in a defined manner through chemical bonds.	Elements are distinguished by their atomic number (number of protons in their nucleus).
(3)	A compound can be separated into simpler substances by chemical methods/reactions.	Elements cannot be broken down into simpler substances by chemical reactions.
(4)	The list of compounds is endless.	There are about 117 elements that have been observed and can be classified as metal, non-metal or metalloid.
(5)	A compound is represented using a formula.	An element is represented using symbols.
(6)	e.g., Water (H_2O), sodium chloride (NaCl), sodium bicarbonate ($NaHCO_3$), etc.	e.g., Iron, copper, silver, gold and nickel, etc.

13. (a) 9
(b) 32
(c) Element magnesium has atomic number 12. So, element C is magnesium. Its electronic configuration will be 2, 8, 2.

OR

Valency of element A will be 1. This is because it will have electronic configuration: (2, 7). It will accept one electron. So its valency will be 1.

BIOLOGY

1. **(C)**
Explanation: Chromosomes are thread-like structures usually present in the nucleus which become visible only during cell division. Each chromosome is made up of DNA and proteins.

2. **(B)**
Explanation: Sclerenchyma provides hardness and stiffness to the plant and is composed of dead cells.

3. **(D)**
Explanation: Intercalary meristem divide and form new cells and add to the length of internodes. Thus, sugarcane can grow even when its tip is removed.

4. **(C)**
Explanation: Dislocation of joint occurs when there is an abnormal separation in joint, which are held together by ligament. Therefore ligament break and result in dislocation of bone.

5. **(C)**
Explanation: Ribosomes are involved in protein synthesis. Almost all enzymes are proteins. Hence, ribosomes make enzymes too. Chemical structure of hormones is diverse including steroid, amino acids derivatives, proteins and peptides. Hence, except proteinaceous hormones, all other types of hormones cannot be synthesised by ribosomes. Ribosomes are not involved in starch manufacture.

6. **(D)**
Explanation: Weeds are unwanted plants in the cultivated fields. They compete with main crop plants for nutrients and reduce the growth of crops in many ways.

7. **(B)**
Explanation: Sunflower is an oil yielding plant.

8. **(B)**
Explanation: Meristematic tissues are made up of actively dividing cells, present in the growing areas of

the plant body whereas permanent tissue is a well-differentiated plant tissue derived from meristematic tissue, which has lost its ability to divide.

9. **(D)**
Explanation: Nitrogen is a macronutrient. Macronutrients are nutrients required in large quantity while micronutrients are nutrients required in small quantity.

10. Endoplasmic reticulum is a membranous network enclosing a fluid-filled lumen. The two types of endoplasmic reticulum are Rough Endoplasmic Reticulum (RER) and Smooth Endoplasmic Reticulum (SER). RER has ribosomes attached to its surface. These ribosomes take part in protein synthesis. SER does not have any ribosomes on it and secretes lipids. Some proteins and lipids synthesised in ER are used for producing new cellular parts, specially the cell membrane, by biogenesis.

11. Cell size may range from few micrometers to a metre. This can be explained with the help of many examples like size of a bacterial cell is about 2–10 micrometer while cell of amoeba ranges from 10–100 micrometer. An ostrich egg is about 15 cm in length and a nerve cell of a giraffe is about 2 m long.

OR

The tissue which helps in transportation of oxygen that we inhale to various parts of our body is blood. It is composed of:
(i) RBC (red blood corpuscles),
(ii) WBC (white blood corpuscles) and
(iii) Platelets.

12. (a) Common term used for the pattern of crop harvesting shown in the diagram: **Crop rotation**.
(b) **Advantage of this method:** Different nutrients present in the farm soil are evenly used over time.

13. ATP is the energy currency of the cell. Its expanded form is Adenosine Triphosphate. Mitochondria is the organelle related to the currency.

14. The small pores in the epidermis of the leaf are stomata.
Two main functions of stomata are:
(i) They help in gaseous exchange.
(ii) They help in loss of water in the form of water vapours from the leaves thereby causing cooling of leaves (transpiration).

15. (a) Columnar (b) Adipose (c) Ciliated columnar (d) Aerenchyma
(e) Squamous

OR

(a)
(i) **Endocytosis:** The flexibility of the cell membrane enables the cell to engulf food and other materials from its external environment. Such process is known as endocytosis.
(ii) **Plasmolysis:** When a living plant cell loses water through osmosis, there is shrinkage or contraction of the contents of the cell away from the cell wall. This phenomenon is known as plasmolysis.
(b) When the organisation of a cell gets damaged, lysosomes will burst and their enzymes will eat up their own cell organelles. Therefore, lysosomes are also known as the "suicidal bags of the cell".
(c) Gases like CO_2 and O_2 move in and out of the cell by diffusion from their higher concentration to lower concentration. Water enters the cell by endosmosis through semi-permeable plasma membrane from its higher concentration to lower concentration. Similarly, water moves out of the cell by exosmosis when a cell is placed in a hypertonic solution.

16. (a) Prokaryotic cell (b) Cell wall
(c) Plasma membrane function: Protection and transport.

OR

Nucleoid: It contains chromosomes.