Class IX
SCIENCE FULL SYLLABUS – 1

Time : 3 Hrs **M.M – 80 Marks**

Q1. Area under v-t graph represents a physical quantity, which has the unit: **[1]**
(A) m^2 (B) m (C) ms^{-2} (D) ms^{-1}

Q2. In case of negative work, the angle between the force and displacement is? **[1]**
(A) 0° (B) 45° (C) 90° (D) 180°

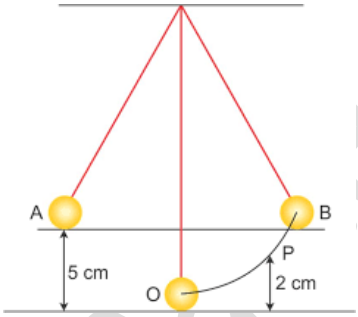
Q3. Assertion (A): On Moon, humans feel lighter than on Earth. **[1]**
Reason (R): It is due to more gravitational force exerted by Moon on man.
(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(B) Both Assertion (A) and Reason (R) are true but 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. The table below shows the speed of a bus in three hours of its travel. **[2]**

Time	First hour	Second hour	Third hour
Speed of the bus	35 km/h	60 km/h	40 km/h

Calculate the average speed of the bus.

Q5. The following diagram shows a simple pendulum consisting of a bob of mass 100 g. Initially the bob of the pendulum is at rest at 'O'. It is then displaced to one side at A. The height of 'A' above 'O' is 5 cm.



What is the value of kinetic energy and potential energy of the bob at the position 'P' whose height above O is 2 cm ? **[2]**

OR

When an object is immersed in the fluid name the two forces acting on it?

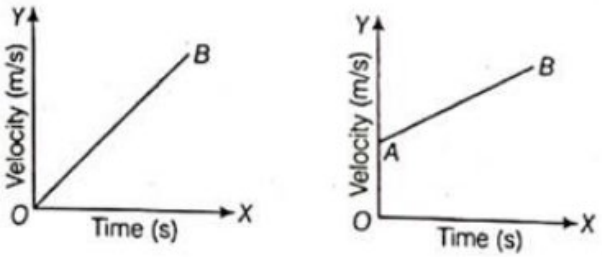
Q6. State the law of inertia. Why do we fall in forward direction if a moving bus stops suddenly and fall in the backward direction if it suddenly accelerates from rest? **[3]**

Q7. Name the physical quantities denoted by : **[3]**
(a) the slope of the distance–time graph
(b) the area under velocity–time graph
(c) the slope of velocity–time graph

Q8. In the musical instrument jal-tarang, the bowls contain different amounts of water **[3]**
(a) Which of the bowls produces a low pitch sound?

(b) Which of the bowls produces a high pitch sound?
(c) Which wave property determines the pitch?

Q9. (a) Give one similarity and one dissimilarity between the two graphs. **[5]**

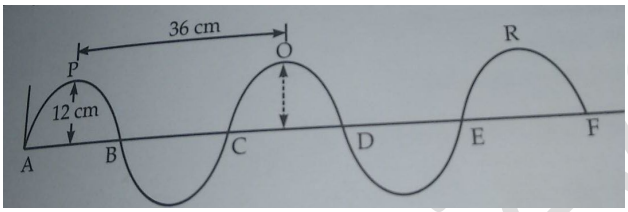


(b) What do you understand by the term acceleration? What is meant by its being positive or negative? Explain with example. Write its SI units.

OR

(a) Write the formula to find the magnitude of gravitational force between the Earth and an object on the Earth's surface.
(b) Derive how does the value of gravitational force 'F' change between two objects when the :
(i) distance between them is reduced to half, and
(ii) mass of one object is increased four times.

Q10. Waves of frequency 200 Hz are produced in a string as shown in the figure. Answer the following questions as given: **[4]**



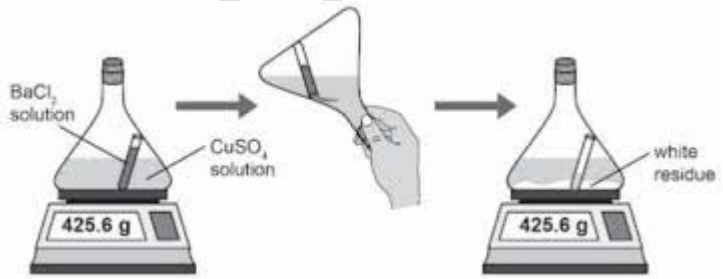
(a) Find amplitude of the wave.
(b) Find velocity of the wave.
(c) Find wavelength of the wave.

OR

What is the frequency of a sound wave?

CHEMISTRY

Q1. Alia mixed $BaCl_2$ solution and $CuSO_4$ solution in a closed conical flask. **[1]**



What can be concluded from the result of the experiment?
(A) Total mass of the chemicals remains the same. (B) Total volume of the chemicals remains the same.
(C) State of matter of the chemicals remains the same.
(D) Composition of the chemicals remains the same.

Q2. During summer, water kept in an earthen pot becomes cool because of the phenomenon of: **[1]**
(A) Diffusion (B) Transpiration (C) Osmosis (D) Evaporation

Q3. Which of the following are chemical changes? **[1]**

(i) Decaying of wood (ii) Burning of wood (iii) Sawing of wood

(iv) Hammering of a nail into a piece of wood

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

Q4. The picture shows the symbol for sodium. **[1]**

$^{23}_{11}NA$

What can be concluded about sodium from the symbol?

(A) It contains 11 neutrons (B) It contains 12 protons

(C) It contains 12 neutrons (D) It contains 34 electrons

Q5. Rutherford's alpha particles scattering experiment resulted into the discovery of: **[1]**

(A) Electron (B) Proton (C) Nucleus in the atom (D) Atomic mass

Q6. Which condition out of the following will increase the evaporation of water? **[1]**

(A) Increase in temperature of water (B) Decrease in temperature of water

(C) Less exposed surface area of water (D) Adding common salt to water

Q7. The boiling points of diethyl ether, acetone and n-butyl alcohol are 35°C, 56°C and 118°C, respectively. Which one of the following correctly represents their boiling points in Kelvin scale? **[1]**

(A) 306 K, 329 K, 391 K (B) 308 K, 329 K, 392 K

(C) 308 K, 329 K, 391 K (D) 329 K, 392 K, 308 K

Q8. Assertion (A): We prefer to wear cotton clothes during summer. **[1]**

Reason (R): Cotton clothes are good absorber of water.

(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. Write the chemical formula for: **[2]**

(a) Zinc phosphate (b) Lead carbonate

Q10. (a) Why path of light is not visible in a solution when a beam of light is passed through it? **[3]**

(b) Classify each of following as solution, colloid or suspension:

(i) A mixture whose particles are big enough to scatter a beam of light passing through it.

(ii) A mixture whose particles settle down when it is left undisturbed.

Q11. What is the effect of change of pressure on physical state of matter? Explain with an example of a gas.

OR

There are two elements A^{26}_{13} and B^{26}_{14}. Find the number of sub-atomic particles in each of these elements. What is the relationship between the two elements? **[3]**

Q12. (a) State two ways by which you can change a saturated solution to unsaturated solution.

(b) Distinguish between homogeneous and heterogeneous mixture by giving one example of each.

OR

When a solid melts the temperature of the system does not change after the melting point is reached even when we continue to supply heat. Give reason. **[5]**

Q13. In the following table the mass number and the atomic number of certain elements are given. Study the given data and answer the following questions: **[4]**

Elements	Mass No.	Atomic No.
A	1	1
B	7	3
C	14	7
D	40	18
E	40	20

(a) Which of the elements A, B, C, D will tend to form a cation?
(b) Which of the above elements is a noble gas?
(c) Which of the elements A, B, C, D will tend to form an anion?

OR

Which two elements are isobars of each other?

BIOLOGY

Q1. Girth of stem increases due to: **[1]**
(A) Apical meristem (B) Lateral meristem
(C) Vertical meristem (D) Intercalary meristem

Q2. The undefined nuclear region of prokaryotes is also known as: **[1]**
(A) Nucleus (B) Nucleolus (C) Nucleic acid (D) Nucleoid

Q3. The proteins and lipids, essential for building the cell membrane, are manufactured by: **[1]**
(A) Endoplasmic reticulum (B) Golgi apparatus
(C) Plasma membrane (D) Mitochondria

Q4. Which muscles act involuntarily? **[1]**
(i) Striated muscles (ii) Smooth muscles (iii) Cardiac muscles (iv) Skeletal muscles
(A) (i) and (ii) (B) (ii) and (iii) (C) (iii) and (iv) (D) (i) and (iv)

Q5. Which of these properties qualifies *Amoeba* as eukaryote? **[1]**
(A) It is unicellular (B) It needs food for energy
(C) It has a membrane bound nucleus (D) It is surrounded by a plasma membrane

Q6. Which one of the following nutrients is not available in fertilisers? **[1]**
(A) Nitrogen (B) Phosphorus (C) Iron (D) Potassium

Q7. The quality of honey differs from sample to sample. Which of these decides the quality of a honey sample? **[1]**
(A) Time of the day when the bees collect nectar.
(B) Time taken by the bees to build the beehive.
(C) Type of flower from which the bees collect nectar.
(D) Size of the beehive from which the honey is collected.

Q8. Assertion (A): Mitochondria are semi-autonomous cell organelles. **[1]**
Reason (R): Mitochondria generate energy.
(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): Cattles are fed with roughage and concentrates. **[1]**
Reason (R): Roughage provides fibres while concentrates provide proteins and other nutrients.
(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.

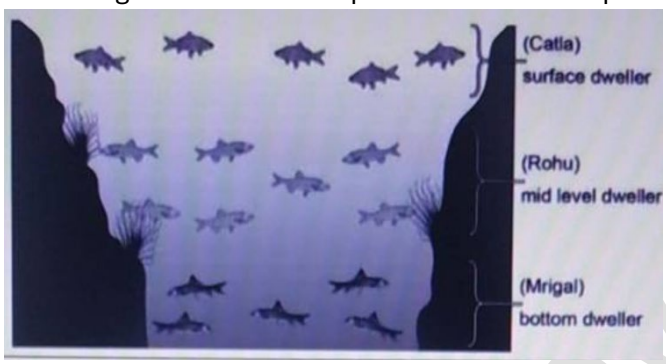
Q10. Distinguish between cell wall and cell membrane. **[2]**

Q11. Why is the plasma membrane called a selectively permeable membrane? **[2]**

OR

Differentiate between voluntary and involuntary muscles. Give one example of each type.

Q12. The diagram shows a composite – fish culture pond. **[2]**



(a) What is composite fish culture?
(b) What is the advantage of such composite fish culture?

Q13. Write three differences between prokaryotic and eukaryotic cells. **[3]**

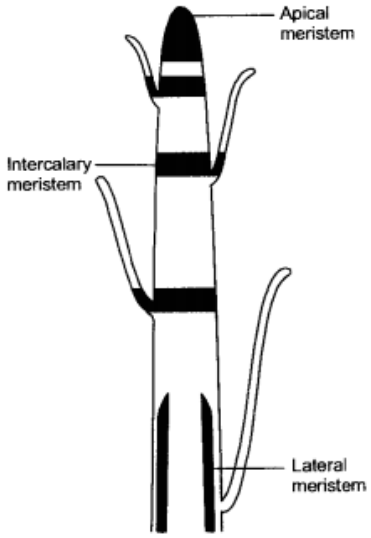
Q14. Explain in brief any three roles of epidermis in plants. **[3]**

Q15. (a) What are the consequences of the following conditions? **[5]**
(i) A cell having higher water concentration than the surrounding medium.
(ii) A cell having lower water concentration than the surrounding medium.
(iii) A cell having equal water concentration to its surrounding medium.
(b) Name the materials of which the cell membrane and cell wall are composed of.

OR

The growth of plant occurs only in specific regions:
(a) Name the tissue which is responsible for this growth.
(b) State the different types of this tissue.
(c) Write one function of each of the above mentioned tissue.

Q16. Observe the following diagram which shows some localised tissues and answer the questions: **[4]**



(a) Identify the diagram.

(b) What is apical meristem? Where do we find it?

(c) Which type of meristem, is found at the base of leaves and internodes?

OR

Which part helps in growth and development of plant's girth?

Class IX

SCIENCE FULL SYLLABUS – 1

SOLUTIONS

PHYSICS

1. **(B)**
   Explanation: Area under v-t graph represents displacement whose unit is metre or (m).
   It is because, unit of velocity v= m/s and unit of time = s.
   Hence, unit of (v-t) graph = m/s × s = m.
   Hence, the unit of (v-t) graph is metre (m).

2. **(D)**

   Explanation: In case of negative work, the angle between the force and displacement is 180°.

3. **(C)**

   Explanation: On Moon, humans feel lighter than on Earth. It is due to less gravitational force exerted by Moon on man

4. Average speed = $\frac{\text{Total distance covered}}{\text{Total Time taken}}$ Here the total distance covered 35 km + 60 km + 40 km = 135 km Total time taken = 3 hours

   Therefore, Average speed = $\frac{135}{3} = 45$ km/hr

   Hence, the average speed of the bus is 45 km/hr.

5. We know that, potential energy P.E. is given by formula,

   P.E. = mgh

   Therefore, at height 5 cm

   P.E. = 0.1 kg × 10 m/s^2 × 0.05 m

   P.E. = 0.05 J

   Now, at point A,

   Total energy = P.E. + K.E.

   E = 0.05 + 0 = 0.05 J (As the bob starts from rest, K.E. will be zero.)

   Now, at point P (at height 2 cm),

   P.E. = 0.1 kg × 10 m/s^2 × 0.02 m

   P.E. = 0.02 J

   Now

   K.E. = Total energy − P.E.

   K.E. = 0.05 − 0.02 = 0.03 J

   OR

When an object is immersed in the fluid name the two forces acting on it are downward gravitational force and upward buoyant force

6. **Law of inertia:** An object remains in its state of rest or of uniform motion in a straight line until an external unbalanced force acts on it
When a moving bus stops suddenly, the bus slows down but our body tends to remain in the state of motion due to inertia of motion. Sudden start of bus brings motion to the bus as well as our feet but rest of the body still has inertia of rest due to which we fall backward.

7. (a) Speed
(b) Displacement
(c) Acceleration

8. (a) The bowl that contains the maximum quantity of water produces low pitch sound.
(b) The bowl that contains the least quantity of water produces high pitch sound.
(c) Frequency of sound waves determine the pitch.

9. (a) **Similarity:** Both the graphs show uniform acceleration.
Dissimilarity: In first graph the body starts from rest ($u = 0$) while in second graph the initial velocity is non-zero ($u \neq 0$).
(b) Acceleration of a body is defined as the rate of change of its velocity with time. Acceleration being positive means the velocity of the body is increasing while it being negative means the velocity is decreasing.
The SI unit of the acceleration is m/s^2.

OR

(a) $F = \frac{GMm}{R^2}$
(b) According to the law of gravitation, the force of attraction acting between two bodies is given by,
$F' = \frac{GMm}{R^2} = \frac{GMm}{(R/2)^2} = \frac{4GMm}{R^2} = 4F$
Thus, when the distance between the objects is reduced to half, the gravitational force increases by four times the original force.. $F' = GM \times \frac{4m}{R^2} = 4F$
So, as the mass of any one of the object is increased four times, the force is also increased by four times.

10. (a) Amplitude = Maximum displacement = 12 cm
(b) Frequency (n) = 200 Hz, Wavelength (λ) = 0.36 m,
Now,
v = nλ
v = 200 Hz × 0.36 m
v = 72 m/s
(c) Wavelength = Distance between two crests = 36 cm = 0.36 m

OR

The frequency of a sound wave is number of oscillations per second.

CHEMISTRY

1. **(A)**
Explanation: As per the law of conservation of mass, total mass of the chemicals remain the same.
2. **(D)**
Explanation: It is because of the phenomenon called evaporation. Earthen pot has a large number of tiny pores in its walls and some of the water molecules continuously keep seeping through these pores to outside the pot. This water evaporates continuously and takes the latent heat required for vaporisation from the remaining water. In this way, the remaining water loses heat and gets cooled.

3. **(A)**
Explanation: Decaying of wood and burning of wood are chemical changes, because in these processes, the chemical composition of wood is changed and new substances are formed, which cannot be converted back into their original form. Sawing of wood and hammering of a nail into a piece of wood are physical changes.

4. **(C)**
Explanation: Atomic number, *i.e.*, the number of protons in the element is written at the bottom and atomic mass number which is the sum of protons and neutrons is written at the top of the symbol. It means sodium atom contains 11 protons and 12 (23-11) neutrons.

5. **(C)**
Explanation: Rutherford's alpha particle experiment led to the discovery of nucleus in the atom.

6. **(A)**
Explanation: On increasing the temperature, kinetic energy of water molecules increases and more particles get enough kinetic energy to go into the vapour state. This increases the rate of evaporation. On the other hand, decrease in temperature of water, less exposed surface area of water and addition of common salt to water decrease the rate of evaporation.

7. **(C)**
Explanation: On applying the formula,
T°C + 273 = K,

Boiling point of diethyl ether = 35°C + 273 = 308 K

Boiling point of acetone = 56°C + 273 = 329 K
and Boiling point of *n*-butyl alcohol = 118°C + 273 = 391 K
Hence, the correct order of boiling points in Kelvin scale is 308 K, 329 K and 391 K.

8. **(A)**
Explanation: Cotton being good absorber of water helps in absorbing the sweat, which on evaporation gives a cooling sensation in the body.

9. (a) $Zn_3(PO_4)_2$
(b) $PbCO_3$

10. (a) Because of small size, the particles cannot scatter a beam of light that is why path of light is not visible in a solution when a beam of light is passed through it.
(b)
(i) Colloids
(ii) Suspension

11. The physical state of matter can be changed by changing the pressure. By lowering temperature and increasing the pressure, gases can be changed into liquids and some solids can be changed into gases on decreasing the pressure. This happens with gases as there is lots of space between the particles of a gas and upon applying high pressure, particles come close to each other which upon cooling gets liquefied.

OR

A^{26}_{13} electrons = 13 protons + 13 neutrons
Atomic number = 26 − 13 = 13
B^{26}_{14} electrons = 14 protons + 12 neutrons
Atomic number = 26 − 12 = 14

They are isobars.
Isobars are any member of a group of atomic or nuclear species all of which have the same mass number and have different atomic number.

12. (a) Two ways by which we can change a saturated solution to unsaturated solution are:
(i) By increasing the temperature/heating the solution.
(ii) By increasing the amount of solvent.
(b)

S. No.	Homogeneous Mixture	Heterogeneous Mixture
(i)	Uniform composition.	Non-uniform composition.
(ii)	No distinct boundaries of separation. e.g., sugar + water.	Distinct boundaries of separation. e.g., sand + water.

When a solid melts the temperature of the system does not change after the melting point is reached even when we continue to supply heat because the supplied heat energy gets used up in changing the state by overcoming the forces of attraction between the particles. This is called latent heat.
Latent heat of vaporisation: The amount of heat energy that is required to change 1 L of a liquid into gas at atmospheric pressure at its boiling point.

Steam will give more severe burns because particles of steam have extra energy in the form of latent heat of vaporisation.

13. (a) Element B has number of protons greater than number of electrons. So, it will tend to form a cation.
(b) The atomic number of element D is 18. So, it's electronic configuration will be 2, 8, 8. The outermost shell is complete, so it is a noble gas.
(c) Element A has number of electrons greater than number of protons. So, it will tend to form an anion.

OR

Element D and E both have same mass number, i.e. 40 but different atomic number so they are isobars of each other.

BIOLOGY

1. **(B)**
Explanation: Girth of the stem increases due to lateral meristematic tissue. They are found beneath the bark (called cork cambium) and in vascular bundles of dicot roots and stems (called vascular cambium) as thin layers. This increase in the diameter or girth of the plant is called secondary growth.

2. **(D)**
Explanation: The undefined nuclear region of a prokaryotic cell is called nucleoid. The prokaryotic cells lack true nucleus. A circular DNA lies naked in the cytoplasm.

3. **(A)**
Explanation: Rough endoplasmic reticulum (RER) is associated with the synthesis of proteins while smooth endoplasmic reticulum (SER) is associated with the synthesis of lipids.

4. **(B)**
Explanation: The working of both smooth and cardiac muscles are involuntary while skeletal (also known as or striated) muscles move according to our will i.e. are voluntary in action.

5. **(C)**
   Explanation: Amoeba has membrane bound nucleus which is a characteristic found in eukaryotic cells only.

6. **(C)**
   Explanation: Fertilisers supply nitrogen, phosphorus and potassium (NPK), but not iron.

7. **(C)**
   Explanation: Type of flower from which the bees collect nectar decides the quality of honey.

8. **(B)**
   Explanation: Mitochondria have their own DNA and ribosome to make proteins. They can replicate independent of nuclear DNA. Hence, they are known as semi-autonomous organelle. They are also associated with ATP production.

9. **(A)**
   Explanation: Roughage provides fibres while concentrates provide proteins and other nutrients. Hence, cattle are fed with roughage and concentrates

10. Differences between cell wall and cell membrane:

S. No.	Cell wall	Cell membrane
(1)	It is present only in plant cell.	It occurs both in animal cells and plant cells.
(2)	It is dead in nature and permeable.	It is a living membrane and is semi-permeable.

11. The plasma membrane is called a selectively permeable membrane because it allows only some substances to pass through it

    OR

    Differences between voluntary and involuntary muscles:

S. No.	Voluntary muscles	Involuntary muscles
(1)	Those muscles whose action is normally controlled by an individual's will.	Those muscles that contract without conscious control.
(2)	**Example:** Skeletal muscles which are present in limbs (quadriceps, biceps and pectoralis, etc.)	**Example:** Smooth muscles which are present in iris or the eye, bronchi of the lungs and ureter.

12. (a) Composite fish culture is a process of growing different types of fish in the same pond.
    (b) Its advantage is, all areas of the pond are utilised for better fish production.

13. Differences between prokaryotic and eukaryotic cell:

S. No.	Prokaryotic cell	Eukaryotic cell
(1)	**Size:** Generally small (1–10 µm) 1 µm = 10^{-6} m.	**Size:** Generally large (5–100 µm)
(2)	**Nuclear region:** Contains only nucleic acid and is undefined due to the absence of nuclear membrane and is known as nucleoid.	**Nuclear region:** Well defined and surrounded by a nuclear membrane.
(3)	Membrane-bound cell-organelles absent.	Membrane-bound cell organelles (e.g., chloroplasts, golgi bodies etc.) present.

14. (1) The epidermis protects all parts of the plants.
(2) Epidermal cells on the aerial part of the plant often secrete a waxy, water resistant layer which helps in protection against water loss and mechanical injury.
(3) The epidermis protects against invasion of parasitic fungi.

15. (a)
(i) When a cell possesses higher water concentration than the surrounding medium then exosmosis occurs in the cell due to the difference in concentration. As a result, the cell shrinks.
(ii) When a cell has low water concentration than surrounding medium then endosmosis occurs that results in the swelling of the cell.
(iii) A cell having equal water concentration to its surrounding medium will not show any change.
(b) Cell wall is composed of cellulose and cell membrane is composed of lipids and proteins.

OR

(a) Meristematic tissue

(b) The different types of meristematic tissue are:
(i) Apical Meristem
(ii) Intercalary Meristem
(iii) Lateral Meristem

(c) **Apical meristem:** Helps in growth of the stem and the root.

Intercalary meristem: Helps in elongating internodes of plants like sugarcane.

Lateral meristem: Helps in growth and development of plant's girth (both shoot and root).

16. (a) The diagram shows meristematic tissues.

(b) Meristem present at the growing tips of stem and root is called apical meristem. It brings about increase in length of the stem and the root.

(c) Intercalary meristem is found at the base of leaves and internodes.

OR

Meristem located on the lateral portion of plant (lateral meristem) is responsible for increasing the girth of root and stem.