Class IX Session 2024-25
Subject - Science
Sample Question Paper - 5

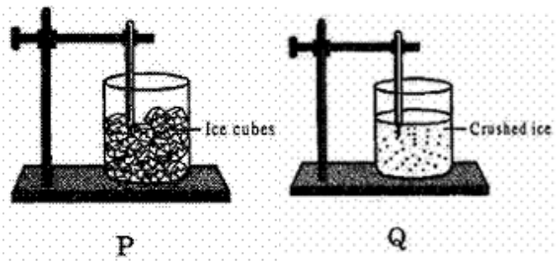
Time Allowed: 3 hours **Maximum Marks: 80**

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. Which experiments set-up is correct for determining the melting pt. of ice? **[1]**



a) Both P and Q
b) Q
c) P
d) Neither P nor Q

2. Take a clean glass slide and put few drops of water on it. Now place a complete Rheo leaf on water droplets and examine the cells of leaf under the high power of compound microscope. Put a few drops of concentrated salt/sugar solution on the mounted Rheo leaf on the glass slide. Wait for few minutes and again observe the leaf under the high power of microscope. **[1]**

What will be your observation after few minutes?

a) Cytoplasm along with plasma membrane has come to lie on one side of cell wall.
b) All of these
c) Cell contents are separated from the cell
d) A clear space is seen between the cell wall

wall. and protoplast of the cell.

3. Usha swims in a 90 m long pool. She covers 180 m in one minute going either way. The average velocity is: **[1]**

a) $30ms^{-1}$ b) zero

c) $180ms^{-1}$ d) $90ms^{-1}$

4. Irrigation ensures that the crops get water whenever they need it during growing season. Tube wells are *surface water* source of irrigation. They get water from porous *soil strata*. Canal system of irrigation draws water from rivers and is also related to generation of hydroelectricity. River lift system is advantageous in those areas where river water is easily available. Both canals and river lifts are *groundwate*r sources of irrigation. **[1]**
Select the correct option regarding this.

a) Canal should be replaced by tank. b) The positions of surface water and groundwater should be interchanged.

c) Soil strata should be replaced by river. d) The positions of canal and river lift should be interchanged.

5. Lignified, narrow, elongated and dead cells are found in **[1]**

a) collenchyma b) phloem

c) parenchyma d) sclerenchyma

6. Following are a few definitions of osmosis read carefully and select the correct definition. **[1]**

a) Movement of solvent molecules from its higher concentration to lower concentration b) Movement of solvent molecules from higher concentration to lower concentration of solution through a permeable membrane

c) Movement of solute molecules from lower concentration to higher concentration of solution through a semipermeable membrane d) Movement of water molecules from a region of higher concentration to a region of lower concentration through a semipermeable membrane

7. 440 g of carbon dioxide can be represented as **[1]**

i. 5 g mole of carbon dioxide
ii. 10 moles of carbon dioxide
iii. 6.023×10^{23} molecules of carbon dioxide
iv. 6.023×10^{24} molecules of carbon dioxide

a) (ii) and (iii) only b) (i), (ii), (iii) and (iv)

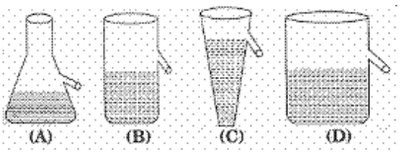
c) (i) and (ii) only d) (ii) and (iv) only

8. Roshini is making a temporary mount of onion peel. What precautions should be taken to avoid the entry of air bubbles in the slide? **[1]**

a) Coverslip should be gently dropped over the peel b) Peel should be immersed in stain for over an hour

c) Peel should be allowed to fold over itself once or twice d) Coverslip should be dropped on to the peel from a certain height

9. Four students A, B, C and D while performing an experiment on establishing the relation between the loss of weight of small solid when fully immersed in tap water, and the weight of water displaced by it, used four different shapes of overflow cans containing water as shown :The arrangement, that would given correct results is that of student: **[1]**



a) A
b) D
c) B
d) C

10. The area below v-t graph is a measure of: **[1]**

a) Angular speed
b) Displacement
c) Angular acceleration
d) Acceleration

11. An atom with 3 protons and 4 neutrons will have valency of **[1]**

a) 4
b) 1
c) 7
d) 3

12. The common characteristic of xylem tracheids and sieve tubes is that both are: **[1]**

a) thick-walled cells
b) dead cells
c) living cells
d) meant for conduction

13. Which of the following are covered by a single membrane? **[1]**

a) Mitochondria
b) Vacuole
c) Nucleus
d) Plastid

14. The substance which does not form a true solution in water is: **[1]**

a) alum
b) egg albumin
c) common salt
d) sugar

15. To prepare a colloidal solution of starch, we should: **[1]**

a) add the thin paste of starch to hot water with stirring
b) add starch powder to cold water and boil
c) add the starch powder to boiling water and cool
d) heat starch, add it to cold water and then bring it to boil

16. Which one of the following is not a draught animal? **[1]**

a) Horse
b) Elephant
c) Camel
d) Sheep

17. **Assertion (A):** A boy goes from A to B with a velocity of 20 m/min and comes back from B to A with a velocity of 30 m/min. The average velocity of the boy during the whole journey is zero. **[1]**
Reason (R): The ratio of speed to the magnitude of velocity when the body is moving in one direction is equal to one.

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):** Naphthalene, camphor, iodine, ammonium chloride are some common examples of the substances which undergo sublimation. **[1]**

Reason (R): All solids are first converted to liquids and then gases on heating.

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):** Dendrite is a single, long cylindrical process which forms fine branches terminally. **[1]**

Reason (R): It consists of short processes arising from the cyton.

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):** For noble gases, valency is zero. **[1]**

Reason (R): Noble gases have 8 valence electrons.

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. Calculate the work done against the gravity. **[2]**

OR

A rocket is moving up with a velocity v. If the velocity of this rocket is suddenly tripled, what will be the ratio of two kinetic energies?

22. Kelvin scale of temperature is regarded as better than Celsius scale. Give reason. **[2]**

23. A sound wave has a frequency 2 kHz and wavelength 40 cm. How long will it take to travel 1.6 km? **[2]**

24. Why the temperature of boiling water does not rise even when heat is continuously supplied to it? **[2]**

25. Two balls of the same size of different materials, rubber and iron are kept on the smooth floow of a moving train. The brakes are applied suddenly to stop the train. Will the balls start rolling ? If so, in which direction? Will they move with the same speed? Give reasons for yours answer. **[2]**

OR

A truck of mass M is moved under a force F. If the truck is then loaded with an object equal to the mass of the truck and the driving force is halved, then how does the acceleration change?

26. Summarise the rules for writing of distribution of electrons in various shells for the first eighteen elements. **[2]**

Section C

27. **[3]**

i. What is meant by frequency of sound waves?

ii. Give the range of frequencies of sound waves that an average human ear can detect.

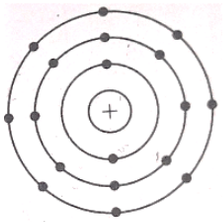
iii. A source of wave produces 20 crests and 20 troughs in 0.2 s. The distance between a crest and next trough is 50 cm. Find the

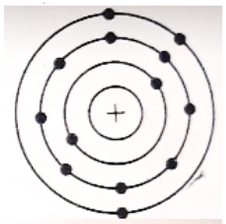
a. wavelength

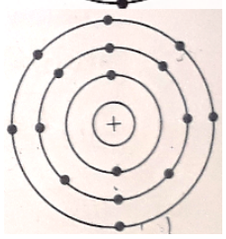
b. frequency

c. time period of the wave.

28. Find out the valency of atoms represented by the following figures. **[3]**

i. 

ii. 

iii. 

29. A stone is thrown in a vertically upward direction with a velocity of 5 ms^{-1}. If the acceleration of the stone during its motion is 10 ms^{-2}in the downward direction, what will be the height attained by the stone and how much time will it take to reach there? **[3]**

OR

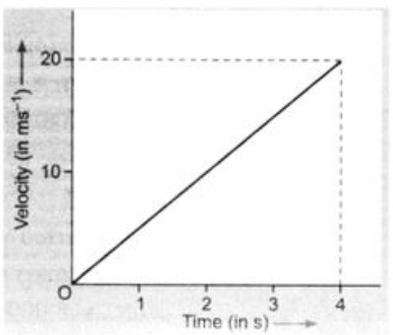
A bus starting from rest moves with a uniform acceleration of 0.1 m s^{-2} for 2 minutes. Find:

a. the speed acquired.

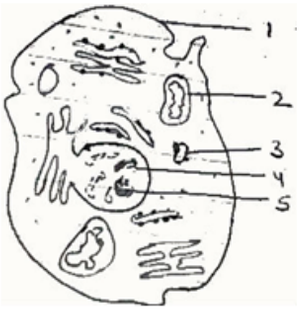
b. the distance travelled.

30. Sony says that the acceleration in an object could be zero even when several forces are acting on it. Do you agree with her? Why? **[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. Observe the diagram of the cell below - answer the following questions. **[3]**



i. Label the parts of the cell

ii. what function does part 1 perform?

iii. If the organelle 2 is removed from the cell, what effect is it going to make on the functions of the cell?

iv. Identify, whether it is plant cell or animal cell

v. Which structure is called 'Powerhouse of the cells'?

OR

What would happen if the plasma membrane ruptures or breaks down?

33. List the characteristics of cork. How are they formed? Mention their role. **[3]**

Section D

34. A car falls off a ledge and drops to the ground in 0.5 s. Let g = 10 ms^{-2} (for simplifying the calculations). **[5]**

i. What is its speed on striking the ground?

ii. What is its average speed during the 0.5 s?

iii. How high is the ledge from the ground?

OR

i. Prove that, if the earth attracts two bodies placed at the same distance from the centre of the earth with equal force, then their masses will be the same.

ii. Mathematically express the acceleration due to gravity in terms of mass of the earth and radius of the earth.

iii. Why is G called a universal constant?

35. Explain main functional regions of a cell with the help of a diagram. **[5]**

OR

Write the main function of each of the following.

(a) Plasma membrane

(b) cell wall

(c) Ribosome

(d) Lysosome

(e) Nucleolus

(f) Endoplasmic reticulum

36. i. Draw a neat and labelled diagram of the apparatus used to separate components of blue-black ink. Name the process and state the principle involved. **[5]**

ii. Identify, the physical and chemical changes from the following.

a. Burning of magnesium in air.

b. Tarnishing of silver spoon.

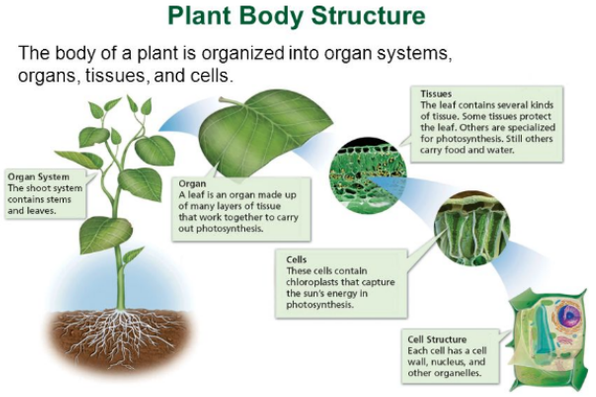
c. Sublimation of iodine.

d. Electrolysis of water.

Section E

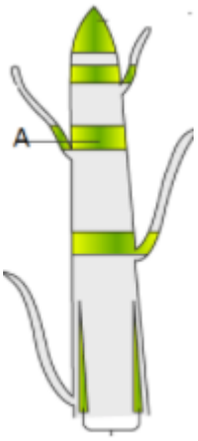
37. **Read the following text carefully and answer the questions that follow:** **[4]**

Plants are stationary or fixed they don't move. Since they have to be upright, they have a large quantity of supportive tissue. The supportive tissue generally has dead cells. Animals, on the other hand, move around in search of food, mates and shelter. Another difference between animals and plants is in the pattern of growth. The growth of plants occurs only in certain specific regions. New cells produced by meristem are initially like those of meristem itself, but as they grow and mature, their characteristics slowly change and they become differentiated as components of other tissues. The girth of the stem or root increases due to lateral meristem (cambium). Cells of meristematic tissue are very active, lack vacuoles.



i. Is meristematic tissue composed of a single type of cell? (1)

ii. Identify A in the given figure. (1)



iii. Which meristematic is present at the growing tips of stems and roots? (2)

OR

Mention some properties of cells of meristematic tissue. (2)

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

India has the maximum cattle population in the world. However, their productivity is less than half the productivity of many exotic breeds of cattle. The exotic breeds live in cold countries. They cannot live comfortably in hotter India. The only way to improve the productivity of Indian cattle is to produce hybrids which are acclimitised to Indian conditions and are resistant to most local diseases. For hybridisation exotic bulls are kept in colder climate. Their semen is collected and cryopreserved. The same is sent to various parts of the country for artificial insemination.

i. Mention two exotic breeds of cattle. (1)

ii. Mention two hybrid breeds of cattle. (1)

iii. Mention some factors governing the yield of milk. (2)

OR

When can cattle be inseminated? (2)

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

A solution of a solid in a liquid such as water can be prepared by adding it slowly to water with constant stirring at a certain temperature (room temperature). If the addition process is continued, a stage is ultimately reached in the dissolution process when no more of the solid dissolves. Rather it starts setlling at the bottom of the container such as a glass beaker. The solution at this stage is said to be saturated. The solubility of a solute is always expressed with respect to the saturated solution. It may be defined as the maximum amount of the solute that can be dissolved in 100 g of the solvent to form a saturated solution at a given temperature. Please remember that the role of temperature is very important. If temperature is increased, the solution becomes unsaturated. In case the temperature is decreased, the solution becomes supersaturated. As a result, crust of the solute gets deposited on the surface.

i. What do mean by the term Solubility? (1)

ii. 20 g of a solute are dissolved in 500 g of the solvent. The solubility of the solute is: (1)

iii. When a saturated solution becomes unsaturated? (2)

OR

What do you mean by concentration of solution? (2)

Solution

Section A

1. **(b)** Q
   Explanation: Q is correct arrangement of determination of melting point of Ice because its contains crushed ice cubes. In P ice cubes added in place of crush ice, so its not correct arrangement of determination of melting point of Ice.

2. **(b)** All of these
   Explanation: Shrinkage of the protoplast of a plant cell from its cell wall under the influence of a hypertonic solution is called plasmolysis. If we put a Rheo leaf in a concentrated salt/ sugar solution, it will cause exosmosis or withdrawal of water from cytoplasm and then the central vacuole of cell. As a result, the size of cytoplasm as well as central vacuole decreases and hence protoplast reduces. The plasma membrane gets withdrawn from the cell wall and a clear space is seen between the cell wall and protoplast of the cell.

3. **(b)** zero
   Explanation: The average velocity for the entire swing would be zero because its final position and initial position are identical.

4. **(b)** The positions of surface water and groundwater should be interchanged.
   Explanation: The positions of surface water and groundwater should be interchanged.

5. **(d)** sclerenchyma
   Explanation: Sclerenchyma tissue is dead simple permanent tissue of the plant. The cells of sclerenchyma are closely packed without intercellular spaces, like tiles in the mosaic floor so that, it can provide the strength, rigidity, flexibility, and elasticity to the plant to withstand various strains.

6. **(d)** Movement of water molecules from a region of higher concentration to a region of lower concentration through a semipermeable membrane
   Explanation: Osmosis is the passive movement of water or any other solvent molecules from a region of higher water concentration to a region of lower water concentration through a semipermeable membrane.

7. **(d)** (ii) and (iv) only
   Explanation: 44 g of carbon dioxide = 1 mole of carbon dioxide
   $= 6.023 \times 10^{23}$ molecules of carbon dioxide
   440 g of carbon dioxide = 10 moles of carbon dioxide
   $= 6.023 \times 10^{24}$ molecules of carbon dioxide

8. **(a)** Coverslip should be gently dropped over the peel
   Explanation: Precautions:
   i. The staining of the peel must be appropriate. Excess stain can be removed by rinsing the peel with water taken in the watch glass.
   ii. Always hold the slide by its edges to avoid making the slide dirty.
   iii. Use a brush to transfer the peel to the slide.
   iv. The peel should never be folded.
   v. The peel should be mounted in the centre of the slide.
   vi. Always keep the coverslip gently to avoid the entry of air bubbles.

9.

(d) C

Explanation: Water has to be filled to the level of overflow.

10.

(b) Displacement

Explanation: The area under the velocity-time graph gives the distance (magnitude of displacement) which has the unit is metre (m).

11.

(b) 1

Explanation: Atomic number = Number of protons = 3

Mass number = Number of protons + number of neutrons =3 + 4 = 7

Electronic configuration of the atom is 2,1(K,L)

Hence, its valency is 1.

12.

(d) meant for conduction

Explanation: Xylem is composed of tracheids, vessels, xylem parenchyma, and xylem fibres. Tracheids and vessels are tubular structures and thus they provide a channel for conduction of water and minerals. Phloem is composed of sieve tubes, companion cells, phloem fibre and phloem parenchyma. Sieve tubes are tubular cells with perforated walls. Sieve tubes are the conducting elements of phloem.

13.

(b) Vacuole

Explanation: Vacuole is a cavity within the cytoplasm of a cell, surrounded by a single membrane and containing fluid, food, or metabolic waste. Mitochondria, Nucleus and Plastids are surrounded by double membrane.

14.

(b) egg albumin

Explanation: Egg albumin has a particle size of the order 10^{-9} to 10^{-12} i.e. of the order of colloidal size. Due to which it is not able to form a clear solution in water and results into a colloidal solution.

15. **(a)** add the thin paste of starch to hot water with stirring

Explanation: The colloid of starch is prepared by the dispersion method. 2-3 g of powdered/crushed starch is dissolved in 3-4 ml of water to make a thin paste. This paste is added to100 ml of boiling water while stirring. Allow the solution to cool and filter. The filtrate is colloid of starch.

16.

(d) Sheep

Explanation: Draught animals are used in agriculture and transportation. Camel, elephant, and horse all are used for agriculture and transportation whereas sheep are not used for agriculture and transportation.

17.

(d) A is false but R is true.

Explanation: A boy goes from A to B with a velocity of 20 m/min and comes back from B to A with a velocity of 30 m/min. The average velocity of the boy during the whole journey is 24m/min.

18.

(d) A is false but R is true.

Explanation: Certain solids directly change to the gaseous state upon heating without passing through the liquid state. The process is called sublimation.

19.

(d) A is false but R is true.

Explanation: Dendrite consists of short processes called dendrons that arises from the cyton and branches into dendrites. Axon is a single, long cylindrical process which forms fine branches terminally.

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

Explanation: Both A and R are true and R is the correct explanation of A.

Section B

21. Suppose a body of mass m is lifted vertically upwards against the gravity (g) through a distance h.
Here, the force (F) required to lift the body = weight of the body, mg (where m is mass and g is acceleration due to gravity).
Now, Work done (W) in lifting a body =Force × displacement = Weight of body × Vertical distance
W = mg × h = mgh.
Therefore, Work done against the gravity = mgh

OR

Initial velocity = v, then final velocity, v= 3v
Initial kinetic energy = $\frac{1}{2}mv^2$
Final kinetic energy (KE) = $\frac{1}{2}mv'^2 = \frac{1}{2}m(3v)^2 = 9\left(\frac{1}{2}mv^2\right)$
$(KE)_{initial}$: $(KE)_{final}$ =1:9.

22. In the Celsius scale of temperature we often come across a negative sign for the temperature (e.g., -4 ^{0}C). Since the sign is always positive in the Kelvin scale, it is regarded as better.

23. Given frequency, v =2 kHz = 2 × 10^3 Hz,
Wavelength, λ = 40 cm = 0.40 m
Speed of sound = Frequency × Wavelength
i. e., $v = v\lambda$
= (2 × 10^3 Hz) ×(0.40 m)
= 0.80×10 Hz = 800 ms^{-1}
Time, t = $\frac{\text{Distance}}{\text{Speed}}$
t = $\frac{s}{v}$
Given distance, s = 1.6 km = 1.6 × 10^3 m
Time, t = $\frac{1.6\times10^3 m}{800\ ms^{-1}}$
= $\frac{1600}{800}s$= 2s

24. The heat which is taken by the particles of water in liquid state is used to overcome the forces of attraction which are holding these particles together in the liquid state. When these particles change their state from liquid (at 100°C) to vapour state (at 100°C), they only absorb latent heat which is only 22.5 × 10^5 J/kg. This latent heat does not increase the kinetic energy of water particles in gaseous state and hence no rise in temperature takes place during the boiling of water.

25. Yes, the balls will start rolling in the direction in which the train was moving. Due to the application of the brakes, the train comes to rest but due to inertia the balls try to remain in motion, therefore, they begin to roll. Since the masses of the balls are not the same, therefore, the inertial force are not same on both the balls. Thus, the balls will move with different speeds.

OR

Acceleration can be given as follow:
F = ma or a = $\frac{f}{m}$ or $a_1 = \frac{F}{M}$
When mass is doubled and force is halved;
$a_2 = \frac{F}{4M}$ *or* $\frac{a_2}{a_1} = \frac{F}{4M} \div \frac{F}{M} = \frac{1}{4}$
So, acceleration becomes one-fourth.

26. The following rules are followed for writing the number of electrons in different energy levels or shells**:**
(i) The maximum number of electrons present in a shell is given by the formula $2n^2$, where 'n' is the orbit number or the energy level (1,2,3,…)
Hence, the maximum number of electrons in different shells are as follows**:-**
Maximum number of electrons in the first orbit or K-shell will be = 2×1^2= 2
Maximum number of electrons in the second orbit or L-shell will be = 2×2^2= 8
Maximum number of electrons in the third orbit or M-shell will be = 2×3^2 = 18
Maximum number of electrons in the fourth orbit or N-shell will be = 2×4^2 = 32 and so on.
(ii) The maximum number of electrons that can be accommodated in the outermost (valence) orbit is 8.
(iii) The shells are built up in a step-wise manner. Electrons are not accommodated in a given shell, unless the inner shells have been filled.

Section C

27. i. The number of waves produced per second is called the frequency of the wave.
ii. Sound waves range from 20 Hz to 20 kHz

iii. a. Since the distance between a crest and next trough is $\frac{\lambda}{2}$.

Therefore, $\frac{\lambda}{2}$ = 50 cm (given)

λ = 100 cm or 1 m

b. One vibration or oscillation consists of one trough and one crest.

In 0.2s number of vibrations are 20

So, in 1s number of vibrations = $\frac{20}{0.2}$ = 100

$\therefore$ Frequency = 100 Hz

c. Time period, T = $\frac{1}{frequency}$ = $\frac{1}{100}$ = 0.01 sec

28. i. Valency = 0 [$\because$ number of valence electrons = 8]

ii. Valency = 5 [$\because$ number of valence electrons = 3]

iii. Valency = 2 [$\because$ number of valence electrons = 6]

29. u = 5 ms^{-1}, a = -10 ms^{-2}

v = 0 (since at maximum height its velocity will be zero)

v = u + at = 5 + (-10) $\times$ t

0 = 5 – 10t

10t = 5, or, t = 5/10 =0.5second.

s = ut + $\frac{1}{2}$at^2= 5 $\times$ 0.5 + $\frac{1}{2}$ $\times$ (-10) $\times$ 0.5^2

= 2.5 – 1.25 = 1.25m

OR

a. u = 0, a = 0.1 ms^{-2}, t = 2min = 120 seconds.

v = u + at = 0 + 0.1 $\times$ 120 = 12 ms^{-1}

so speed acquired = v = 12ms^{-1}

b. S = 0 $\times$ 120 + $\frac{1}{2}$ $\times$ 0.1 $\times$ 120^2 = 720 m.

30. Yes, Sony is right because if several forces acting on an object are balanced forces, i.e., their resultant is zero (i.e., $\Sigma F = 0$), then there is no acceleration of the object.

This may be seen as follows:

From Newton's second law, $\Sigma F = ma$

If $\Sigma F = 0$, ma = 0 or acceleration, a = 0

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 $20 ms^{-1}$

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,

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

$\therefore$ Force acting on the ball, F = ma

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

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

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

32. a. 1. Cell membrane

2. Mitochondrion

3. RER

4. Chromosome

5. Nucleolus

b. Selective transport of substances.

c. Cell becomes energy deficient

d. Animal cell (cell wall absent)

e. Mitochondria

OR

Plasma membrane is the selectively permeable membrane that surrounds the cell and allows the entry and exit of selected materials of the cell. If it ruptures, the contents of the cell will come in direct contact with the surrounding medium and not only unwanted material will be able to enter freely into the cell, but useful material will also find its way out of the cell easily. This will seriously disrupt the various metabolic activities of the cell and will result in its eminent death.

33. Cork covers the old stems of woody trees.

Characteristics of cork are as follows:

i. Cells of cork are dead at maturity.
ii. These cells are compactly arranged.
iii. Cells do not contain intercellular spaces.
iv. Cells possess chemical substance suberin in their walls.
v. They are several layers thick.
vi. Cork is impervious to gases and water.

As plants grow older, a strip of the secondary lateral meristem (called cork cambium) develops in the cortical region. It cuts cells towards both the outer and inner sides. Gradually, this secondary tissue replaces the epidermal layer of the stem. This forms several layer thick corks.

Role of cork is mentioned below:

i. It protects the internal tissues from mechanical injury and from parasitic attacks.
ii. It contains small pores (called lenticels) for gaseous exchange.
iii. It provides mechanical strength.

Section D

34. We have given that,

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

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

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

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

i. speed v = at

v = 10 ms^{-2} $\times$ 0.5 s

= 5 ms^{-1}

Thus,

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

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

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

= 2.5 ms^{-1}

Thus,

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

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

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

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

= 1.25m

Thus,

Height of the ledge from the ground = 1.25 m

OR

i. Let the two bodies have masses m_1 and m_2 and they are placed at the same distance R from the centre of the earth. According to the question, if the same force acts on both of them, then

$F_1 = \frac{GMm_1}{R^2}$ ....(i)

and $F_2 = \frac{GMm_2}{R^2}$ ....(ii)

As, $F_1 = F_2$

Hence, $\frac{GMm_1}{R^2} = \frac{GMm_2}{R^2}$

So, $m_1 = m_2$, their masses will be the same.

ii. Mathematically, $g = \frac{GM}{R^2}$

Where, g = acceleration due to gravity

G = universal gravitational constant, M = mass of the earth and R = radius of the earth

iii. G is known as the universal gravitational constant because its value remains the same all the time everywhere in the universe, applicable to all bodies whether celestial or terrestrial.

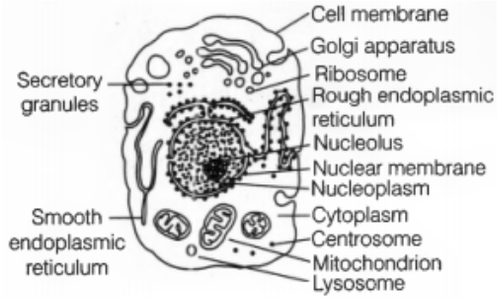
35. The plasma membrane, cytoplasm, and nucleus are three main functional regions of a cell.

i. Plasma membrane: It is a thin, selectively permeable membrane, covering the cell and is made up of lipids and proteins.

ii. Cytoplasm: It is aqueous material containing a variety of cell organelles along with non-living inclusions.

iii. Nucleus: It is the control centre of a cell. It contains the cells hereditary information (DNA).

The diagram of the eukaryotic cell is:-



OR

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

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

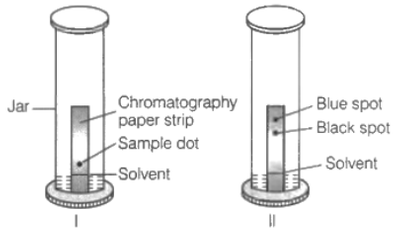
(c) Ribosome – Ribosomes are small particles which are found individually in the cytoplasm and also line the membranes of the rough endoplasmic reticulum. Ribosomes produce protein. They could be thought of as "protein factories" of the cell.

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

(e) Nucleolus – It synthesizes ribosome

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

36. i.



The labelled diagram of the apparatus used to separate components of blue-black ink is shown above.

Name of the process: Paper chromatography.

Principle of paper chromatography: Different components of a mixture move with different speeds in a solvent, so they separate at different heights. Here blue ink and black ink rise with the help of solvent at different speeds to form two spots at different heights.

ii. The physical and chemical changes are as follows:

- Burning of magnesium in the air: Chemical change
- Tarnishing of silver spoon: Chemical change
- Sublimation of iodine: Physical change
- Electrolysis of water: Chemical change

Section E

37. i. Yes, meristematic tissue is composed of a single type of cell.

ii. Intercalary.

iii. Apical meristematic.

OR

Properties of cells of meristematic tissue:

a. It has dense cytoplasm.

b. It has thin cellulose walls.

c. It has prominent nuclei.

38. i. Brown Swiss and Jersey

ii. Frieswal and Karan-Swiss

iii. Some factors governing the yield of milk are:

a. Number of milkings per day

b. Amount of milk at cach milking

c. Length of the lactation period

OR

Only when it is in heat.

39. i. The maximum amount of solute that can dissolve in a given amount of solvent.

ii. Given, Mass of solute = 20g

Mass of solvent = 500g

Mass-Volume percentage = $\frac{20}{500} \times 100$

= 4%

Solubility of 500 g of solute = $\frac{4}{100} \times 500$

= 20g

Hence, the solubility of 20g of solute in 500g of solvent is 20g.

iii. A saturated solution becomes unsaturated by either heating it or by adding more of the solvent.

OR

Concentration of a solution is defined as the amount of solute that is present in a given amount of solution. It can be expressed in terms of: Mass by the mass percentage of a solution = $\frac{\text{mass of solute}}{\text{mass of solution}} \times 100$.