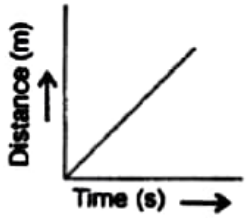
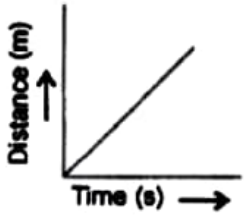
SOLUTION

Section A

1. **(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.
2. **(d)** Endothermic
   Explanation: Evaporation of ether occurs due to the absorption of heat by surrounding. So, it is an endothermic process. The chemical reaction in which heat is absorbed is called an endothermic reaction. The reaction in which heat is evolved is called exothermic reaction and the reaction in which no thermal changes occur is called the athermic process.
3. **(a)**



   Explanation: Uniform motion of a moving object



4. **(a)** cuticle
   Explanation: Cuticle are protective, hydrophobic waxy covering produced by epidermal cells of leaves, young shoots and other aerial parts. It minimises the water loss through transpiration (with the help of stomata) and also reduces pathogen entry.
5. **(c)** Gram
   Explanation: Sources of carbohydrate include plant foods such as fresh fruits, vegetables, corn, potatoes etc. Unhealthy sources include soda, white bread, artificial sugar, pastries and other highly processed foods. Gram is not a source of carbohydrate.
6. **(c)** 26
   Explanation:
   There are 26 chromosomes (13 pairs) in the cells of a frog. These 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.
7. **(c)** cambium
   Explanation: Cambium in plants is a layer of actively dividing cells between xylem (wood) and phloem (bast) tissues that are responsible for the secondary growth of stems and roots.
8. **(d)** (b) and (c) are incorrect
   Explanation: Zinc Phosphate - $Zn_3(PO_4)_2$ and Sodium Sulphide -Na_2S is correct chemical formulae.

$Fe_3(CO_3)_2$is an incorrect formula for Ferric Carbonate. The correct chemical formula would be $Fe_2(CO_3)_3$.

Ca_3PO_4 is an incorrect formula for Calcium Phosphate. The correct chemical formula would be $Ca_3(PO_4)_2$.

9. **(b)** All of these
   Explanation: Displacement is the shortest distance travelled so it can be positive or negative or zero.
10. **(a)** 5 gwt
    Explanation: The reading on the spring balance when suspended freely in the air.
11. **(c)** True statement
    Explanation:
    The gram atomic mass of an element and the gram molecular mass of a compound contains the same number of molecules, which is equal to 6.022×10^{23} molecules.
12. **(d)** Ligament break
    Explanation: Dislocation of joint occurs when there is an abnormal separation in joint, which are held together by ligament. Therefore ligament break may result in dislocation of bone. Areolar tissues join skin to muscles, fills spaces inside organs and is found around muscles, blood vessels and nerves. Hence are not concerned with bones.
13. **(a)** 3:4
    Explanation: The atomic mass of magnesium is 24. The atomic mass of sulphur is 32. Therefore, the ratio of magnesium and sulphur by mass in magnesium sulphide (MgS) is 24:32 or 3:4.
14. **(a)** Smooth endoplasmic reticulum
    Explanation: Smooth endoplasmic reticulum synthesises lipids while rough endoplasmic reticulum synthesise proteins.
15. **(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.
16. **(a)** colloid
    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.
17. **(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.
18. **(a)** Both A and R are true and R is the correct explanation of A.
    Explanation: According to statement of reason, as the graph is a straight line, $P \propto Q$, or, $P = \text{constant} \times Q$
    $\frac{P}{Q} = \text{constant}$
    Equation of a straight line is $y = mx + c$
19. **(b)** Both A and R are true but R is not the correct explanation of A.
    Explanation: Xylem and phloem are vascular tissues that conduct water, minerals and food to various parts of plants. Vascular tissue is a distinctive feature of complex plants, one that has made their survival in terrestrial environments possible.
20. **(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. It all depends upon the amount of kinetic energy available with the constituent particles which determines their speed and the attractive forces existing between them.
    1) If the constituent particles have sufficiently more kinetic energy, and they move so fast that they are not able to remain close to each other. Then the substance is in gaseous state.
    2) If they are moving slowly enough then the force between the constituent particles have a chance to pull them together and the substance then exists in the form of a liquid.
    3) If the constituent particles are moving so slowly that the forces of attraction hold them rigidly together, then substance exist in the form of a solid.
    The important fact to keep in mind is that, 'the higher the temperature, the faster the constituent particles move'. Due to this reason, solids melt as the temperature increases and vapourises at yet higher temperatures. The exact temperature at which a change takes place depends on the strength of the force between the molecules.

22. Initial velocity of stone (u) = 40 ms^{-1}
    Final velocity of stone (v) = 0
    Acceleration due to gravity (g) = -10 ms^{-2} [For upward direction g is -ve]
    Height attained by stone (S) = ?
    We know, $v^2 - u^2 = 2gS$
    $(0)^2 - (40)^2 = 2 \times (-10) \times s$
    $\Rightarrow S = \frac{-1600}{-20} = 80\ m$
    ∴ Maximum height attained by stone = 80 m
    Net displacement of stone = 0
    (since the stone returns back to the same point)
    Total distance covered by the stone = 2 × height attained
    = 2 × 80 = 160 m

    OR

    Mass of substance m = 50 g
    Volume of substance V = 20 cm^3
    Therefore density of substance is
    $D = \frac{M}{V} = \frac{50}{20} = 2.5\ g\ cm^{-3}$
    The substance will sink in water, because its density is more than that of water.

23. We have given that,
    Frequency, ν = 2 kHz = 2000 Hz
    Wavelength, λ = 35 cm = 0.35 m
    We know that speed, v of the wave = wavelength × frequency
    $v = \lambda \nu$
    = 0.35 m × 2000 Hz = 700 m/s
    The time taken by the wave to travel a distance, d of 1.5 km is
    $t = \frac{d}{v} = \frac{1.5 \times 1000m}{700ms^{-1}} = \frac{15}{7}s = 2.1s$
    Thus sound will take 2.1 s to travel a distance of 1.5 km.

24. Initially, the carpet and dust-particles are at rest. When the carpet is beaten, it is suddenly set into motion. The dust particles tend to remain at rest due to the inertia of rest, therefore, dust comes out of it.

    OR

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.

25. The increasing order of density for the given substances is:
Air, exhaust from chimneys, cotton, water, honey, chalk, iron. Actually, the density of a substance depends upon the number of particles per unit volume as well as upon their mass. The number of the particles is related to their size as well as the attractive forces among them.

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. a. The technique of obtaining picture of internal organs of body by using echoes of ultrasound pulse is called ultrasonography.
b. The ultrasonography is based on the principle that ultrasound waves are sent from transducer and propagate through different tissues and then return to the transducer as reflected echoes.
c. To disclose the gender is against the law and also to discourage the curiousity of knowing the sex of the child before birth.
d. Obeying laws, honesty.

28. a. We know that area under v-t graph gives displacement.
So, Area = distance (S) = area of triangle + area of rectangle
Area of triangle = $\frac{1}{2} \times base \times height$
$= \frac{1}{2} \times 6 \times 10$
= 30 m
Area of rectangle = length × breadth
= (16-6) × 10
=10 × 10
= 100 m
Total area = 100 + 30 = 130m
Therefore distance covered by the runner in 16s = 130 m
b. Since, at t = 11 sec, runner is travelling with uniform velocity so, there is no change in velocity hence acceleration is zero.

OR

i. Volume in iron ball = 200 cm^3
$\therefore$ Mass of iron ball = $200 \times 10^{-6} \times 7800 = 1.56$ kg
Weight of iron ball in air = m × g = 1.56 × 10
Weight of iron ball in air = 15.6 N
ii. Upthrust = Volume of water displaced (V) × density of water (d) × g
= Vdg = $2 \times 10^{-4} \times 1000 \times 10$
Upthrust = 2N
iii. Apparent weight = True weight - Upthrust = (15.6 - 2)
Apparent weight = 13.6 N

iv. Apparent density = density of solid - density of liquid = 7800 - 1000

Apparent density = 6800 kgm^{-3}

29. The tabular form is as below:

Element	Atomic Number (= no. of p)	Mass Number {= no. of (p+n)}	Number of Electrons (= no. of p)	Electronic Configuration	Valency
X	5	5 + 6 = 11	5	2, 3	3
Y	8	8 + 10 = 18	8	2, 6	2
Z	15	15 + 16 = 31	15	2, 8, 5	3, 5

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.

Sr.No.	SER	RER
1.	Ribosomes are absent.	Ribosomes occur over the surface of RER.
2.	Synthesis is specialised to synthesize lipids and steroids.	Synthesis is specialised to synthesize proteins.
3.	The products do not pass into lumen.	The products pass into lumen of E.R. for transport to other places.
4.	Less stable	More stable
5.	Found in Epithelial cells, Intestinal cells, Sarcoplasmic Reticulum	Found in Pancreatic Exocrine cells

OR

1. Plasma Membrane is the phospholipid layer, found in all types of cells; it helps in protecting the protoplasm and checks the passage of molecules inside the cell, Though cell wall is found in the plant cell, fungi, bacteria only and protects the cell from external shocks, and provide rigidity and shape to the cell.
2. The cell wall is the outermost boundary of the cell (if present), and plasma membrane is present in the inner lining of the cell. The plasma membrane is delicate thin layer while cell wall is the thick and rigid layer. Plasma Membrane is selectively permeable membrane allowing small molecules entry only; their layer is made up of lipids and proteins and few carbohydrates, while Cell wall constituents may vary from chitin, peptidoglycon, and cellulose.
3. Plasma membrane is the living membrane made up of lipids and proteins, whereas cell wall is non-living made up of cellulose.

Function of Plasma membrane: It acts as semi permeable membrane which allows only selective substances to pass through it.

Function of Cell Wall: It provides rigidity and protection to cell.

32. i. 15 g-wt.
ii. From Newton's third law, the force exerted by B on A and force exerted by A on B are equal.

iii. Force of reaction balance A exerts on balance B and force of action balance B exerts on balance A.

33. i. A represents companion cells, B represents sieve tubes, and C represents phloem parenchyma. which are small thin-walled cell containing dense and very active cytoplasm and large elongated nucleus.

ii. The sieve tubes end walls are perforated by numerous pores and are called sieve plates.

iii. The phloem parenchymatous cell performs the following functions:

a. Storage of food.

b. Slow lateral conduction of food.

Section D

34.

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

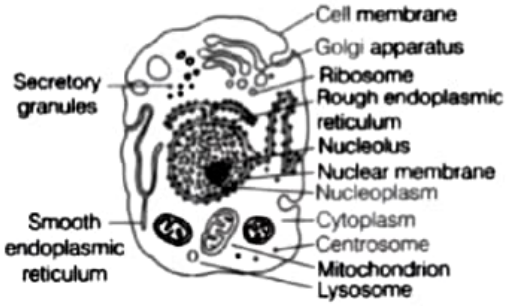
The plasma membrane, cytoplasm, and nucleus are three main functional regions of a cell.

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:-



35. i. a. Gravitational force acting on the 50 kg,

$F = mg = 50 \times 9.8 = 490\ N$

b. Gravitational force acting on the 50 kg mass due to jupiter,

$$F_{Jupiter} = \frac{G \times M_{jupiter} \times M_{person}}{(\text{distance of jupiter from the earth})^2}$$

$$F_{Jupiter} = \frac{6.67 \times 10^{-11} \times 2 \times 10^{27} \times 50}{6.3 \times 10^{11} \times 6.3 \times 10^{11}}$$

$$F_{Jupiter} = 1.68 \times 10^{-5}\ N$$

c. Gravitational force acting on the 50 kg mass due to saturn

$$F_{saturn} = \frac{G \times M_{saturn} \times M_{person}}{(\text{distance of saturn from the earth})^2}$$

$$F_{saturn} = \frac{6.67 \times 10^{-11} \times 6 \times 10^{26} \times 50}{1.28 \times 10^{12} \times 1.28 \times 10^{12}}$$

$$F_{saturn} = 1.12 \times 10^{-6} \text{ N}$$

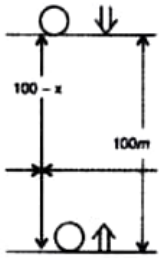
$\therefore$ Total gravitational force due to the Jupiter and the Saturn = $(1.68 \times 10^{-5} + 1.12 \times 10^{-6}) = 1.8 \times 10^{-5}$ N

Thus, the combined force due to the planets Jupiter and Saturn (1.8×10^{-5}) N is negligible as compared to the gravitational force i.e. 490 N due to the earth.

ii. We know that g at the equator is less than g at poles (Antarctica). Thus, weight at the equator is less than weight at the pole (Antarctica). A bag of sugar weighs 'w' at a certain place on the equator. If this bag is taken to Antarctica, then it will weigh more due to the greater value of g.

OR

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



Initial velocity (u) = 0
Distance (S) = 100 - x
Time (t) = ?

$S = ut + \frac{1}{2}gt^2$

$\Rightarrow (100 - x) = 0 \times t + \frac{1}{2}10 \times t^2$

$\Rightarrow 100 - x = 5t^2$ ...(1)

For the stone moving vertically upward:

Initial velocity (u) = 25 ms^{-1}
Time (t) = ?

Acceleration due to gravity (g) = - 10ms^{-2}
[In upward direction g is -ve]
Distance (S) = x
We know: $S = ut + \frac{1}{2}gt^2$ a

$\Rightarrow x = 25 \times t + \frac{1}{2}(-10t^2)$

$\Rightarrow x = 25t - 5t^2$ ...(2)

Substituting the value of x from (2) in (1) we get,

$100 - (25t - 5t^2) = 5t^2$

$100 - 25t + 5t^2 = 5t^2$

$25t = 100$

$t = 4$ s

Put the value of t in (1)

$\Rightarrow 100 - x = 5(4)^2$

$\Rightarrow 100 - x = 80$

$x = 20$ m

$\therefore$ the stones will meet at a height of 20 m from ground, after 4s.

36.

S.No.	Compounds		Mixtures
1.	Compounds are formed as a result of chemical reactions between two or more elements or compounds.	1.	Mixture is formed by simply mixing two or more constituents. There are no chemical reactions between the constituents.
2.	The components of a compound are always present in a definite ratio by mass.	2.	The components of a mixture may be present in any ratio.
3.	The properties of a compound are entirely different from its constituents.	3.	The properties of a mixture are the same as those of its constituents.
4.	Compounds are always homogeneous in nature.	4.	Mixtures are usually heterogeneous (except in solutions).
5.	Compound formation is accompanied by absorption or evolution of light, heat or electrical energy.	5.	Heat, light or electrical energy may not be evolved or absorbed during the formation of a mixture.
6.	Melting and boiling points of a compound are usually sharp and fixed.	6.	Melting and boiling points of a mixture are usually not sharp and fixed.
7.	The constituent elements of a compound can not be separated by any physical method. Special chemical methods or electrochemical methods are employed to separate them.	7.	The constituent elements of the mixture can be easily separated by physical means.
8.	For example, Water, Carbon dioxide.	8.	For example, A mixture of iron filings and sulphur.

Section E

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

Cattle Breeding

Cross-breeding helps in the development of certain desired characteristics in animals like, Increased milk production, Resistance against diseases, Breeds that require less amount of quality feed.

Exotic breed cattle (long lactation) are interbred with the locally bred cattle (high resistance to the diseases) to produce high quality bred that contain both the characteristics. In order to obtain a good quality of milk from the cattle, it is important to manage shelter, food, breeding and disease control of cattle. Cattle are prone to various internal and external parasites, bacteria and virus which are likely to affect their milk

production.

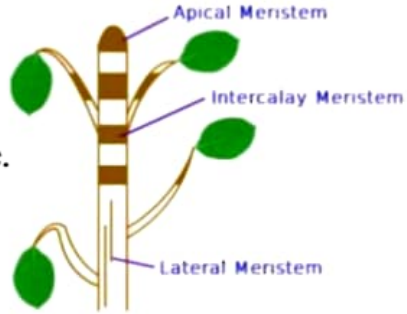
(i) Animals that produce milk are called **milch animals**. In India, buffaloes are the primary source of milk. Example - Cows, goats, buffaloes.
(ii) Animals that are used for carrying out agricultural work like tilling, carting etc. are called draught animals (males and females that are poor in milk-yielding varieties).
(iii) Cross-breeding helps in the development of certain desired characteristics in animals like,
  i. Increased milk production.
  ii. Resistance against diseases.
  iii. Breeds that require less amount of quality feed.

OR

In order to obtain good quality milk from the cattle, it is important to manage shelter, food, breeding, and disease control of cattle.

38. **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.

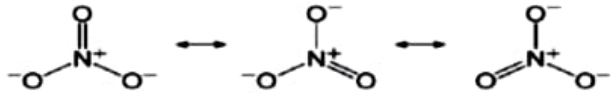
(i) Cambium tissue help in the secondary growth of the plant.
(ii) Between mature tissue segments, intercalary meristematic growth occurs.

OR

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

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

Nitrate is an organic polyatomic ion carrying a **'-1' charge**, made of one Nitrogen and 3 Oxygen atoms. Nitrite is an inorganic polyatomic ion carrying a '-1' charge, made of one Nitrogen and two Oxygen atoms. The oxidation number in Nitrogen is +5.



An element ${}^{14}_{7}A$ exists as diatomic gas in nature which is relatively inert and forms 78% of earth's atmosphere.

(i) Nitrogen gas (N_2), nitrate ion (NO_2^-), nitrate ion (NO_3^-)

(ii) 1 mole of N_2 gas 6.022×10^{23} molecules of N_2

$= 2 \times 6.022 \times 10^{23}$ atoms of N

$= 12.044 \times 10^{23}$

(iii)As H atom contains only protons, so mass of one atom of H = 1 amu.

OR

Molecular mass of NH_4NO_3

$= 14 + 1 \times 4 + 14 + 3 \times 16$

$= 80$ u