

# Solution

## Section A

1.

**(b)** Both the availability of moisture and irrigation facilities decides the choice of the crop to be cultivated after one harvest and this cropping program reduces the need for fertilizers are correct.

**Explanation:**

The given image shows the crop rotation programme. For crop rotation, the availability of moisture and irrigation facilities decides the choice of the crop to be cultivated after one harvest.

Advantages of crop rotation includes:

- i. It controls pests and weeds.
- ii. It reduces the need for fertilizers.

Hence, both the given statements are correct regarding crop rotation programme.

2.

**(c)** True statement

**Explanation:**

It is true that viruses are non-cellular organisms. Viruses do not contain cell membranes and other cellular organelles. Viruses are the link between the living and the non-living. They do not show any characteristics of life until they enter the body of a host. They then use the host cell machinery for reproduction.

3.

**(c)** (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

**Explanation:**

- Meristematic tissue is composed of rapidly dividing the undifferentiated mass of cells.
- The epidermis is the outermost layer of the plant body.
- Blood and bones are types of connective tissues.
- Nervous tissue functions to conduct messages throughout the body.

4.

**(b)** (A)

**Explanation:**

A. Root tips are replaced; they are meristematic tissue; and not permanent tissue.

B. Mycoplasma gallisepticum is the smallest cell amongst the unicellular organisms.

C. Acetabularia measures nearly 10 cm in height.

D. Tonoplast is the membrane that bounds the chief vacuole of a plant cell. It is also known as the 'vacuolar membrane'. It separates the vacuolar contents from the cytoplasm of the cell.

Hence, statement A is incorrect.

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

**Explanation:**

Farm animals are given vaccinations to protect them from major viral and bacterial diseases, which can even cause death of animals.

6.

**(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.

7.

**(b) cellulose**

**Explanation:**

Cellulose is an important structural component of the primary cell wall of green plants, many forms of algae, and the oomycetes. Some species of bacteria secrete it to form biofilms. Thus, cellulose is the most abundant organic polymer on Earth.

8.

**(c) stratified squamous epithelium**

**Explanation:**

A nonkeratinizing stratified squamous epithelium is found at three prominent sites in the animal body:

- i. lining the esophagus,
- ii. lining the sides and floor of the oral cavity, and
- iii. lining the vagina.

9.

**(c) both organic matter is not replenished and microbes in the soil are harmed**

**Explanation:**

Continuous use of fertilizers in an area can destroy soil fertility because the organic matter in the soil is not replenished and micro-organisms in the soil are harmed by the fertilizers.

10. Following are the main advantages of mixed farming:

- (a) Farmyard manure is made available from livestock which is used again in agricultural farms.
- (b) Organic waste material like straw, husks and chaffs of grains, household kitchen waste, etc., are converted into human food through the agency of cattle, sheep, poultry, pigs, etc., as per the choice of farmer.
- (c) It provides work to all the members of a family throughout the year, thus providing subsidiary occupation without the need of employing special labour.
- (d) Adopting exact combination in mixed farming, income can be increased, e.g., the number of animals can be increased (as per the food/crop available) to enhance milk production.

11. When kept in a hypotonic solution, the onion cells will become turgid because the water will enter the cell due to osmosis. But the cell wall present outside the cell provides it rigidity and does not let any harm to occur.

Whereas, in RBC the movement of water inside the cell due to osmosis will lead to bursting of the cell because it does not have a rigid cell wall.

OR

Plastids is a cell organelle in found in plant cells only. It is of three types –

- (a) Chromoplast – It is the coloured plastids, which provides different colours to flower, which attracts insects for pollination.
- (b) Chloroplast – It is the green coloured plastid which contain chlorophyll. It helps in synthesis of food (photosynthesis).
- (c) Leucoplast – It is the colorless plastids. It helps in the storage of synthesized food.

12. As plants grow older, the outer protective tissue undergoes certain changes. A strip of secondary meristem is called phellogen. It is also known as cork cambium. It replaces epidermis of the stem.

13. i. In the given diagram of the epidermis, A represents the epidermal cells of the roots bear long hair-like parts called root hairs. With the help of these cells, root hairs greatly increase the total absorptive surface area and help in water absorption.
- ii. B represents the stomata. Stomata are the pores present in the epidermis of the leaves. Stomata help in the exchange of gases with the atmosphere during photosynthesis and respiration. Also, the process of transpiration (loss of water in the form of water vapour) takes place through stomata.
- iii. C cell that represents the guard cells. These cells are kidney-shaped that enclose the stomata and thus help in the opening and closing of stomata.

14.	Active transport	Passive transport
	1. It involves movement of molecules against the concentration gradient. 2. It requires energy in the form of ATP molecules. 3. It is a rapid movement.	1. It involves movement of molecules along the concentration gradient. 2. No energy is required 3. It is a slow movement.

4. Movement of large molecules occur by active transport.

4. Small molecules or water molecules only are transported passively.

15. i. Growing two or more crops in different strips in the same field is Inter-cropping.  
ii. Intercropping is superior to all other means of cropping because
- Better utilisation of minerals and water from different layers of soil.
  - Nonspread of weeds to whole cropping area.
  - Nonspread of pests to whole cropping area.

iii. Inter-cropping

**OR**

Monocropping

16. i.
  - Lysosomes are membrane-bound sacs filled with digestive enzymes. These enzymes are made by the rough endoplasmic reticulum.
  - Lysosomes are a kind of waste disposal system of the cell. During the disturbance in cellular metabolism, e.g. when a cell gets damaged, lysosomes present in the cell may burst and the enzymes digest the damaged cell. Hence, lysosomes are called as 'suicidal bags' of a cell.
  - Lysosomes break up the foreign materials entering into the cell, such as bacteria or food into small pieces.
- ii. The dry raisins, when placed in plain water for some time will swell up due to endosmosis. If these raisins are again placed in a concentrated salt solution, they will shrink, due to exosmosis.

OR

Plant Tissues	Animal Tissues
In plants, dead supportive tissues are more abundant as compared to living tissues.	In multicellular animals living tissues are more common as compared to dead tissues.
They require less maintenance energy as they are autotrophic and can make their own food.	They require more maintenance energy as they are heterotrophic and have to move in search of food.
There is a differentiation of tissues into meristematic and permanent tissues, which are localized in certain regions of plant-based on their dividing capacity.	Such differentiation is absent in animals as their growth is uniform.
Due to the activity of meristematic tissue plants continue to grow throughout life.	Animals do not show growth after reaching maturity. Reparative growth is, however, present.
The organization of plant tissues is simple.	The organization of animal tissues is complex with the development of more specialized and localized organs and organ systems.
Tissue organization is meant for a stationary habit of plants.	Tissue organization is targeted towards the high mobility of animals.

**Section B**

17.

**(d)** A is false but R is true.

**Explanation:**

The conversion of gas directly into a solid is called desublimation. Naphthalene does not leave any residue when kept open for some time.

18.

**(b)** N<sub>2</sub>

**Explanation:**

- Nitrogen exists as nitrogen gas. It is a diatomic molecule. Therefore, it exists as N<sub>2</sub>. The chemical symbol for the element nitrogen is N.
- Ni is the chemical symbol for a nickel.
- N<sup>+</sup> is for nitrogen ion.

19.

(c) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

**Explanation:**

- Homogeneous is the types of mixtures in which the components mixed are uniformly distributed throughout the mixture or in other words “the same throughout”. We can observe only one phase of matter inhomogeneous mixtures.
- Heterogeneous is a type of mixture in which all the components are completely mixed and all the particles can be seen under a microscope. We can easily identify the components and more than one phase can be seen by naked eyes.
- Chemical change brings a change in the chemical properties of matter and the formation of a new substance always takes place. A chemical change is also called a chemical reaction.
- A physical change brings changes in the physical properties (like colour, hardness, rigidity, fluidity, density, melting point, boiling point, etc.) of the matter. It may or may not be reversible.

20.

(c) A is true but R is false.

**Explanation:**

An atom contains a positively charged center called the nucleus of the atom. Almost all the mass of the atom is concentrated in the nucleus. The size of the nucleus is many times smaller than the size of the atom. The nucleus of an atom is 10,000 times smaller than the atom.

21. (a) ii, iii and iv only

**Explanation:**

According to law of constant proportions, the ratio of carbon and oxygen by weight should always be 3 : 8 in  $\text{CO}_2$ .

In experiment i - C : O = 3 : 8

In experiment ii - C : O = 1.2 : 3

In experiment iii - C : O = 4.5 : 6.5

In experiment iv - C : O = 4 : 26.3

22.

(b) remains constant

**Explanation:**

The temperature remains constant during the boiling of water even though heat is supplied continuously. This is because the heat supplied is absorbed by the water particles and this heat increases their kinetic energy. Thus, because of an increase in kinetic energy, the bond between the water particles is cut down and they move more freely, compared to water. Hence, they become gas. So, this is why the temperature remains constant even though heat is supplied continuously to the water.

23.

(c) X, Y, Z, W

**Explanation:**

The gas having lowest boiling point i.e., highly volatile will be distilled out first and the gas having highest boiling point i.e., least volatile will be distilled out at the last. So, the correct order of gases distilling out is X, Y, Z, W.

24.

(c) c

**Explanation:**

c shows the correct setup for absorbing the law of conservation of mass in a chemical reaction before the solution is mixed.

25. A compound is always a single substance in which two or more elements are combined chemically. A mixture is a combination of elements or compounds or both. Thus, a compound fulfils the definition of a pure substance but not a mixture. Moreover, a compound has a sharp melting or boiling point while a mixture does not have.

26. i.  $\text{Al}_2(\text{SO}_4)_3$  is aluminium sulphate. Ions present are  $\text{Al}^{3+}$  and  $\text{Cl}^-$

ii.  $\text{CaCl}_2$  is calcium chloride. Ions present are  $\text{Ca}^+$  and  $\text{SO}_4^{2-}$

- iii.  $K_2SO_4$  is potassium sulphate. Ions present are  $K^+$  and  $SO_4^{2-}$
- iv.  $KNO_3$  is potassium nitrate. Ions present are  $K^+$  and  $NO_3^-$
- v.  $CaCO_3$  is calcium carbonate. Ions present are  $Ca^{2+}$  and  $CO_3^{2-}$

OR

Dalton's atomic theory states that atoms of different elements combine together in simple whole number ratio. In the formula of  $C_{12}H_{22}O_{11}$ , the carbon, hydrogen and oxygen combine in whole number ratio but the ratio is not simple.

Evaporation	Vaporisation
1. Evaporation takes place at all temperatures.	1. Vaporisation takes place only at the boiling point of the liquid.
2. Temperature changes during evaporation.	2. The temperature does not change during vaporisation.
3. It is a very slow process.	3. It is a fast process.
4. Evaporation takes place only at the surface of the liquid (surface phenomenon)	4. Vaporisation takes place in the entire body of the liquid (bulk phenomenon).

- 28. i. James Chadwick discovered neutrons in 1932. Neutrons are neutral particles and they are found in the nucleus of an atom.
- ii. Nitrogen
- iii. Phosphorus has atomic no-15. so its k shell has 2 electron, L shell has 8 electron and M shell has 5 electron hence electronic configuration of phosphorus is 2, 8, 5

OR

The maximum number of electron that can be accommodated in a shell is given by the formula  $2n^2$   
M shell,  $n=3$ , hence M can accommodate maximum 18 electrons.

- 29. i. It is a physical change because moisture in the shirt is converted from its liquid state to gaseous state because of the heat of the Sun.
- ii. It is a physical change because water in the radiator is converted from a liquid state to gaseous state.
- iii. It is a chemical change because combustion of kerosene occurs and new products are formed.
- iv. It is a chemical change because there is a reaction between citric acid present in lemon and the compounds of the tea resulting in the formation of new products.
- v. It is a physical change because the cream suspended in milk is separated by churning (centrifugation).

OR

- i. Alloys are a homogeneous mixture of metals or non-metals because
  - a. It shows the properties of its constituents, and
  - b. It has variable composition, e.g. brass is considered a mixture because it shows the properties of its constituents, copper and zinc; and it has a variable composition.
- ii. No, a solution is not generally a liquid always. For e.g. alloys are known to be solid solutions.
- iii. The term solution is generally used for 'true solution'. In this case, the solution is always homogeneous. In the case of 'colloidal solution', that is not a true solution i.e. the solution is heterogeneous.

### Section C

30.

(c)  $F = \frac{P}{t}$

**Explanation:**

$F = \frac{P}{t}$  because momentum can be given as the product of the force applied and time.

- 31. (a) Both A and R are true and R is the correct explanation of A.

**Explanation:**

Work done  $W = \vec{F} \cdot \vec{ds} = Fds \cos \theta = 0$  when  $\theta = 90^\circ$

No work is done when force is normal to the displacement.

32.

- (c) All of these

**Explanation:**

Sonar is a device that uses ultrasonic waves to measure the distance, direction and speed of underwater objects.

33. Mass of the moon ( $M$ ) =  $7.4 \times 10^{22}$  kg  
 Radius of the moon ( $R$ ) =  $1.74 \times 10^6$  m  
 Gravitational constant ( $G$ ) =  $6.7 \times 10^{-11}$  Nm<sup>2</sup>kg<sup>-2</sup>  
 $\therefore$  Acceleration due to gravity =  $\frac{GM}{R^2}$

On moon ( $g_m$ )

$$g_m = \frac{6.7 \times 10^{-11} \times 7.4 \times 10^{22}}{(1.74 \times 10^6)^2}$$

$$= \frac{6.7 \times 7.4}{1.74 \times 1.74} \times \frac{10^{-11+22}}{10^{12}}$$

$$g_m = 1.63 \text{ ms}^{-2}$$

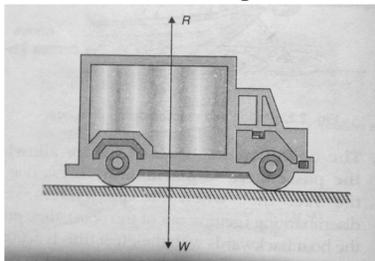
$$\frac{g_m}{g_e} = \frac{1.63}{9.81} = \frac{1}{6} \text{ approx.}$$

$$g_m = \frac{1}{6} \text{ approx.}$$

34. When the branch is, suddenly set in motion, the leaves attached to it tend to continue in their state of rest, on account of inertia of motion. Thus a lot of strain acts on the junction of the leaves and the branches. Due to this strain the weakly held leaves are left behind and, hence fall off the branch.

OR

The various forces acting on the truck at rest are as follows:



Here, the weight of the truck  $W$  is balanced by the reaction  $R$  of the ground on the truck. But the frictional force due to the ground is much more than the force of push. Therefore, the truck does not move.

35. a.  $u = 0$ ,  $a = 0.1 \text{ ms}^{-2}$ ,  $t = 2 \text{ min} = 120 \text{ seconds}$ .  
 $v = u + at = 0 + 0.1 \times 120 = 12 \text{ ms}^{-1}$   
 so speed acquired =  $v = 12 \text{ ms}^{-1}$   
 b.  $S = 0 \times 120 + \frac{1}{2} \times 0.1 \times 120^2 = 720 \text{ m}$ .
36. 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 curiosity of knowing the sex of the child before birth.  
 d. Obeying laws, honesty.
37. The velocity-time graph shows that velocity of the ball at  $t = 0$  is  $30 \text{ ms}^{-1}$

Initial velocity of the ball,  $u = 30 \text{ ms}^{-1}$

The velocity of the ball at  $t = 6 \text{ s}$  is zero.

Final velocity of the ball,  $v = 0$

Time,  $t = 6 \text{ s}$

$\therefore$  Acceleration of the ball,

$$a = \frac{v-u}{t} = \frac{0-30 \text{ ms}^{-1}}{6 \text{ s}}$$

$$= -5 \text{ ms}^{-2}$$

Negative sign shows that the ball is retarded or decelerated.

Also, mass of ball,  $M = 50 \text{ g} = \frac{50}{1000} = \frac{1}{20} \text{ kg}$

Therefore, Force acting on the ball,  $F = ma$

$$= \left( \frac{1}{20} \text{ kg} \right) (-5 \text{ ms}^{-2})$$

$$= -0.25 \text{ kg ms}^{-2}$$

$$= 0.25 \text{ N [ 1 kg ms}^{-2} = 1 \text{ N]}$$

Here -ve sign indicates that the force is retarding or stopping force.

38. i. Mass refers to the amount of matter present in an object. It is an intrinsic property and is a measure of how much substance is in an object, regardless of its location..For example, an object's mass on Earth would be the same as its mass on the Moon or any other planet

Weight refers to the force exerted on an object due to gravity. It is the gravitational force acting on an object's mass. Weight depends on both the mass of the object and the strength of the gravitational field it's in. Weight is usually measured in newtons (N) in the SI system.

- ii. The weight of an object is the gravitational force acting on it. Since, the gravitational force of the moon is  $\frac{1}{6}$ th of earth. The weight of an object on moon is also  $\frac{1}{6}$ th as compared to its weight on earth.

$$\begin{aligned} \text{iii. } g &= \frac{GM_e}{R_e^2} \text{ and } g_p = \frac{G \times \frac{M_e}{4}}{\left(\frac{R_e}{8}\right)^2} \\ &= \frac{64GM_e}{4R_e^2} = 16 \frac{GM_e}{R_e^2} = 16g \end{aligned}$$

**OR**

The weights of an object depend on following factors

- mass
  - Acceleration Due to Gravity
39. Consider an undisturbed simple pendulum, in its mean position P. When the pendulum is pulled to position R, it gains height. Thus, at position R, it has :

- Maximum potential energy.
- Zero kinetic energy, as the pendulum is held by hand in position R.

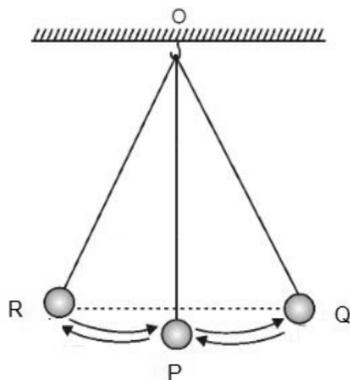
When the pendulum is released from position R, it moves towards position P. In doing so, its velocity increases.

Due to the increase in velocity, its kinetic energy increases, at the expense of potential energy. At position A, it has :

- Maximum kinetic energy.
- Zero potential energy, as it is at its lowest position.

When the pendulum swings from P to Q, it again gain height, and hence, its potential energy increases. However, due to gain in height, its velocity decreases, and hence, the kinetic energy decreases. At position Q, it has :

- Maximum potential energy.
- Zero kinetic energy, as pendulum comes to rest at Q for a moment, before swinging back to position P. From the above example, it is clear, that in the system of pendulum and earth, the energy is conserved. It is the potential energy, which changes into the kinetic energy and vice-versa.



**OR**

- No, when the body comes back to the same position after travelling a distance, its displacement is zero through it has travelled some distance.

- Given:** Initial velocity  $u = 0.7 \text{ m/s}$

Final velocity,  $v = 0$

Acceleration,  $a = -0.07 \text{ m/s}^2$

Now, from the first equation of the motion,

$$v = u + at$$

$$\Rightarrow 0 = 0.7 + (-0.07) t$$

$$\Rightarrow 0.07 t = 0.7$$

$$\therefore t = \frac{0.7}{0.07} = 10 \text{ s}$$

Hence, the body will take 10 s to stop.