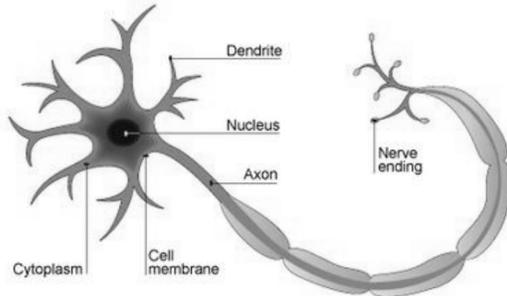# Solution

1.

(c) Dendron, Cyton, Nucleus, Axon

Explanation:

Dendron, Cyton, Nucleus, Axon

Dendron: These are hair like processes connected to the cyton. They receive stimulus, which may be physical, chemical, mechanical or electrical, and pass it on to the cyton.

Cyton: It is the cell body, with a central nucleus surrounded by cytoplasm.

Nucleus The main portion of the cell is called the soma or cell body. It contains the nucleus,

Axon: The axon is also known as the nerve fibre. It is an enlongated tubular structure that extends from the cell body and ends at other cells.

2.

(d) both (water only) and (water + inorganic substances)

Explanation:

The liquid found inside the plant cell vacuole is referred to as the cell sap and it is a dilute fluid consisting of water, amino acids, glucose i.e. (water + inorganic substances), water may also be inhabited with a negligible amount of salts because it somehow depends on the mineral excess inside the body of plants. The excess material is temporarily stored inside the cell sap. Thus, vacuoles act as storehouses in plants.

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

Explanation:

- Genes are functional units of heredity that determine the characters of organisms.
- Diffusion is the process of passage of fluid from a region of high concentration to a region of low concentration. It plays an important role in the gaseous exchange between the cells as well as the cell and its external environment. Water also obeys the law of diffusion.
- The passage of water from a region of higher water concentration to a region of lower water concentration through a semi-permeable membrane is called osmosis. The movement of water across the plasma membrane is affected by the amount of substance dissolved in water.
- Plasmolysis refers to the contraction of protoplast as a result of the loss of water from the cell. The shrinkage of cytoplasm occurs due to exo-osmosis in a hypertonic medium. A hypertonic solution is one that has a lesser concentration of water as compared to that inside the cell. During the process, there is a higher external osmotic pressure and a net flow of water from the cell.

4.

(c) (C)

Explanation:

Epithelial tissues form the covering or protective tissues in the animal body. The cells of this tissue are tightly packed and form a continuous sheet. They have only a small amount of cementing material between then and almost no intercellular space.

5.

    (c) All of these

    Explanation:

    Amaranthus, Chenopodium, Convolvulus are all broad-leaf weed.

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

    Explanation:

    Meristematic tissues are growth tissues and found in the growing regions of the plant. According to their position in plant, meristems are apical, lateral, and intercalary.

      i. **Apical meristem -** Apical meristem is present at the growing tips of stems and roots and increases the length of the stem and the root.

      ii. **Lateral meristem -** Lateral meristems are found beneath the bark. The girth of the stem or root increases due to lateral meristem (cambium).

      iii. **Intercalary meristem -** Intercalary meristem is the meristem at the base of the leaves or internodes (on either side of the node) on twigs. It increases the length of the organs such as leaves and internodes.

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

    Explanation:

    Mitochondria are cell organelles of aerobic eukaryotes. These are sites of aerobic respiration, where the Krebs cycle occurs in the matrix, while ETS and oxidative phosphorylation enzymes are located in the inner membrane. They are called powerhouses of cell because they produce energy in the form of ATP. They are the major centres of the release of energy in aerobic respiration.

8. The functions of bones (a strong and non-flexible connective tissue) are as follows:-

    1. Bones form the framework that supports the body. Bone cells are embedded in a hard matrix composed of calcium and phosphorus compounds. E.g. The backbone.

    2. Bones anchor the muscles and support the vital organs of the body such as the brain, lungs, tissue, etc.

    3. Bones provide shape and strength to the body and protect the vital body organs. E.g. The rib-cage protects the upper thoracic cavity. The skull protects the brain.

9. Cell organelles are responsible for the organisation and proper functioning of a cell, as each of them perform some specific functions and every organelle is interconnected because of its functions. Naturally, if any of these organelles are destroyed, the functions of the cell will be stopped and it may also result in the death of the cell.

<div align="center">OR</div>

    All organisms are made up of cells. Each cell is capable of performing all life processes like respiration, execration, reproduction, etc. This is why cell is called the basic functional unit of life. Each cell is acquires its structure and ability to function because of organisation of its membrane and organelles in a specific way. This is why the cell is called the basic structural unit of life.

10. Manure helps in enriching soil with nutrients and organic matter and increasing soil fertility. The bulk of organic matter in manure helps in improving the soil structure.

    Fertilizers are used to ensure good vegetative growth (leaves, branches and flowers), giving rise to healthy plants by providing specific nutrients like nitrogen, phosphorus and potassium.

11.   i. The given diagram shows non-striated muscles or smooth muscles.

    ii. Following are the characteristics of non-striated muscles:

      a. The cells are spindle-shaped, uni-nucleated, elongated.

      b. They are elongated and have no striations.

    iii. The non-striated muscles or smooth muscles are found within the walls of the elementary canal, bladder, and blood vessels. The non-striated muscles or smooth muscles are involuntary in nature that is we can't control the movements of these muscles according to our will.

12.   i. Green manure help to enriching the soil with nitrogen and purposes.

    ii. Sun hemp and guar can be used for green manure.

    iii. Using biological manure help in recycling farm waste.

13.   i. Tendon.

    ii. Matrix of a bone cell composed of calcium and phosphorus compound.

    iii. Muscles are connected to the bone by the structure called tendon.

    OR

Ear, Nose, and Trachea.

14. Cell organelles are the intracellular structures present in the cytoplasm. Various cell organelles are –

    1. Mitochondrion – It produces energy

    2. Endoplasmic reticular – synthesize lipids and proteins

    3. Golgi apparatus - Storage, packaging and dispatch various substances.

    4. Lysosomes – Digest intracellular substances

    5. Ribosomes – Synthesize proteins

    6. Vacuoles – Provide turgidity and store house of various organic substances

<div align="center">OR</div>

    i. Differentiation is the process by which meristematic tissue takes up a permanent shape, size and function.

    ii. Large air cavities present in parenchyma (aerenchyma) of aquatic plants help the plant to maintain buoyancy in water.

    iii. Epidermis of plants living in dry habitats are thicker in order to prevent loss of water.

    iv. a. Xylem parenchyma consists of living cells having thin cell walls.

        b. Phloem fibres are the dead element of phloem.

    v. Tracheids and vessels of xylem are the two conducting tissues, which conduct water and minerals vertically.

<div align="center">**Section B**</div>

15.

(d) Statement A

Explanation:

Statement A is correct. The temperature of the liquid becomes constant once it starts boiling. The heat is used to change the state of matter.

The pressure of air at the sea level is 760 mm (76 cm) of Hg (mercury).

16.

(d) C and D

Explanation:

H_2SO_4 is composed of 2 atoms of Hydrogen, 1 atom of Sulphur, and 4 atoms of Oxygen. Its relative molecular mass is 98.

17. **(a)** Chemical change

Explanation:

    i. The new substance is formed

    ii. It is not reversible

    iii. It is permanent

    iv. After fermentation, you are not able to obtain grapes again.

      So, Fermentation of grapes is an example of chemical change.

18.

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

Explanation:

The discharge tube is a tube containing charged electrodes and filled with a gas in which ionization is induced with the help of an electric field. The gas molecules emit light as they return to the ground state. It was used in the discovery of subatomic particles. Neils Bohr explained that electrons do not move in orbits around the nucleus - rather they occupy discrete energy levels. Electron is considered as a universal particle as it is present in all atoms. It also provides the chemical properties to the atoms. Canal rays are positively charged.

19.

(d) 1

Explanation:

One molecule of water is linked by H-bond because only one molecule of water is present outside the coordination sphere.

20.

(c) 15°C

Explanation:

The melting point is the temperature at which solid and liquid are in equilibrium. It is the temperature above which a solid melts to a liquid, or the temperature below which a liquid freezes to a solid.

21.

(b) Adding NaCl to water

Explanation:

Adding of common salt (NaCl) to water is physical change as no new substance is formed and no heat is evolved during the addition of salt in water. Also, salt can be obtained by evaporation.

22.

(c) A is true but R is false.

Explanation:

Now, we use names and symbols as stated by IUPAC i.e. the International Union of Pure and Applied Chemistry. Many symbols are the first letter or the first two letters of the name of the element. The symbols of some elements are formed from the first letter of the name and a letter appearing later in the name.

23. **The postulates (assumptions) of Dalton's atomic theory are as follows::**

1. All the matter is made of very tiny particles called an **'atom'.**
2. Atoms are indivisible particle;
3. Atoms can neither be created nor destroyed during a chemical reaction.
4. Atoms of a given element are identical in every respect, having the same mass, size and chemical properties.
5. Atoms of different elements have different mass, size and chemical properties.
6. Atom combines in the ratio of their whole number to form compounds.
7. The relative' number' and 'kind' of atoms are constant in a compound.
8. Atoms of the same elements can combine in more than one ratio to form more than one compound.

24. When sodium chloride is dissolved in water, the process is endothermic in nature. This means that heat energy is absorbed in the process. Therefore, solubility increases with rise in the temperature. In case of lithium carbonate, the process of dissolution is exothermic. This means that heat is evolved in the process. Therefore, its solubility in water decreases with rise in temperature.

OR

Metals	Non-metals
Metals have lustre i.e. they have a shinning glow.	Non-metals do not have lustre. They cannot be polished.
They are mostly solids at room temperature. Exceptions - Mercury and Gallium are liquids at 30 ^{o}C	They are either gases or brittle solids at room temperatures.
Most of the metals are good conductors of heat and electricity.	They are mostly bad conductors of heat and electricity. Exception: Graphite
They are malleable i.e. they can be beaten into flat sheets. Exception: Zinc	They are non-malleable.
They are ductile i.e. they can be drawn into wires. Exception: Zinc	They are non-ductile.
They are sonorous (produce a sound on being hit)	They are non-sonorous.
They generally have high melting points and high boiling points.	They generally have low melting points and low boiling points.
E.g. Sodium, Magnesium, and Aluminium	E.g. Chlorine, Oxygen and Carbon

25. 1. The element A is Na has three shells K, L and M but here only 2 shells are given, Further, L-shell cannot have more than 8 electrons but here 9 electrons are given.

2. The correct structure is
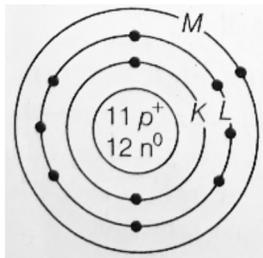
3. As Na has 1 valence electron, thus it has a valency of +1 and chlorine has a valency of -1. Hence, the formula of its chloride is ACl, i.e. NaCl.

26. i. Solids have a definite mass and shape. The intermolecular distances are short and intermolecular forces are strong in solids. They have fixed volumes. They have definite boundaries and r constituent particles have fixed positions and oscillate about their mean positions.

 ii. Sublimation is the process in which solid directly changes to gas. For example - camphor, which directly converted from solid to gas .

 iii. Vaporization can be defined as the process in which the liquid state changes into the vapour state. As a result of an increase in temperature, the kinetic energy of the molecules increases.

OR

Deposition,when a substance in gas form changes states to become a solid. The gaseous substance gets deposited (usually as crystals) bypassing the intermediate liquid state. An example of deposition is when water vapor in the atmosphere changes directly into ice, such as the formation of frost.

27.

Atomic Number	Mass Number	Number of Neutrons	Number of Protons	Number of Electrons	Name of the atomic Species
9	19	10	9	9	Fluorine
16	32	16	16	16	Sulphur
12	24	12	12	12	Magnesium
1	2	1	1	1	Deuterium
1	1	0	1	0	Hydrogen ion

Explanation:

 i. Fluorine ($_9^{19}$F) Given, atomic number = 9 and number of neutrons = 10

 Mass number = Atomic number + number of neutrons = 9 + 10 = 19

 Number of protons = Atomic number = Number of electrons = 9

 ii. Sulphur ($_{16}^{32}$S) Given, atomic number = 16

 Number of protons = Number of electrons = 16

 Number of neutrons

 = Mass number - atomic number = 3 2 - 16= 16.

 iii. Magnesium ($_{12}^{24}$Mg) Number of protons = 12

 Atomic number = Number of protons = 12

 Number of electrons = Number of protons = 12

 Number of neutrons = Mass number - atomic number = 24 — 12 = 12

 iv. Deuterium ($_1^2$D) Number of protons = 1 and Number of electrons = 1

 ∴Atomic number = 1, mass number = 2

 Number of neutrons =2-1=1

 v. Hydrogen ion (1H+) Mass number = 1

 Number of protons = 1

 Number of neutrons = 0

 Number of electrons = 0

 Atomic number = Number of protons = 1

 Atomic number = Number of protons = 1

 Because number of electrons is zero, i.e. not equal to that of protons, so the species is hydrogen ion, not hydrogen atom.

Atomic number	Mass number	Number of neutrons	Number of protons	Number of electrons	Name of the atomic species
9	19	10	9	9	Fluorine
16	32	16	16	16	Sulphur
12	24	12	12	12	Magnesium
1	2	1	1	1	Deuterium (Isotope of Hydrogen)
1	1	0	1	0	Hydrogen ion

Mass number of atomic species (A) = Number of protons (Z) + Number of neutrons

Number of neutrons = Mass number (A) - Atomic number (Z)

Atomic number (Z) = Number of protons = Number of electrons

When the number of protons is equal to the number of electrons, the atomic species is a neutral atom.

When the number of protons is not equal to the number of electrons, the atomic species is an ion (either cation or anion).

Section C

28.

(b) Move a stationary object

Explanation:

The given image shows that a force can move a stationary body by applying force on a stationary object.

29.

(c) Heat energy

Explanation:

All forms of energy can be completely converted to heat, but heat cannot be completely converted into work or other forms of energy because of the entropy heat contains.

30. **(a)** (A)

Explanation:

If velocity is constant then the speed has to be constant. A body can have a constant speed but a changing velocity because the direction can change while the speed is constant. (A car goes 50 mph around a roundabout). However, a body cannot have a constant velocity at changing speed.

31.

(c) both density of the liquid and dipped volume of the body immersed.

Explanation:

Factors affecting the Upthrust are:

i. Volume of object immersed in liquid - as volume increases the upward force increases.

ii. Density of liquid: As the density of liquid increases the upward force exerted also increases.

32.

(d) A is false but R is true.

Explanation:

The velocity of sound in the gaseous medium is given by

$v = \sqrt{\frac{\gamma P}{\rho}}$. Clearly, the velocity of sound in a gas is inversely proportional to the square root of the density of the gas. The density of oxygen is 16 times the density of hydrogen, therefore, the velocity of sound in hydrogen is four times the velocity of sound in oxygen.

33. Mass of ball (m) = 200 g = 0.2 kg

Initial velocity of ball (u_1) = 10 ms^{-1}

Final velocity of ball (u_2) = -5ms⁻¹

(Negative sign denotes that ball is moving in opposite direction)

Initial momentum of ball = mu_1

= 0.2 × 10 = 2 Ns

Final momentum of ball = mu_2

= 0.2 × (-5) = -1Ns

Change in Momentum = Final Momentum - Initial Momentum

= -1 - 2 = -3Ns

Negative sign denotes that change in momentum is in the direction opposite to the direction of initial momentum of the ball.

34. $K.E. = \frac{1}{2}\left(m \times v^2\right)$

Given initial kinetic energy = 25 J

given velocity

$v = 5m/s$

$25 = \frac{1}{2} \times m \times 25$

$m = 2$

When velocity is doubled, new velocity,

$v = 10m/s$

K.E.$= \frac{1}{2} \times 2 \times \left(10^2\right)$

$K.E. = 100J$

When velocity is made three times,

$v = 15m/s$

K.E.$= \frac{1}{2} \times 2 \times \left(15^2\right)$

$= 225$

<center>OR</center>

Volume of water raised = 30,000 litres $\frac{30,000}{1000} m^3$ = 30 m³.

Mass of water raised, M = Volume× Density

= (30 m³) ×(10³kg/m³)

M = 3000 kg

Height, h = 45 metre

Work done by machine,

W = Weight of water raised×Height

= (Mg) × h=(30 × 10³ × 9.8) ×45

W =1.323 ×10⁷joule.

Time taken, t = 10 minutes = 10 ×60 = 600 seconds.

Power, P = $\frac{W}{t}$

$\frac{1.323 \times 10^7 J}{600s}$

= 22 ×10³ W = 22 kW.

35. i. The distance-time graph represents the line AB which shows the speed of the body. So,

speed = $\frac{Distance}{Time}$

= $\frac{3cm}{(5-2)s}$

= 1 cm/s

ii. The distance-time graph shows that the body is at rest between graph line B to C, it means no movement. So speed is zero i.e.,

speed = $\frac{Distance}{Time} = \frac{0cm}{(7-5)s}$

iii. The distance-time graph represents the line CD which shows the speed of the body. So,

speed = $\frac{Distance}{Time}$

=$\frac{(7-3)cm}{(9-7)s} = \frac{4cm}{2s}$

= 2 cm/s

36. i. In the graphical figure, both the waves are of the same frequency but with different amplitude. In wave, A amplitude is less and in wave, B amplitude is higher.

ii. The relationship between the velocity of sound, its wavelength and frequency is given as-

Velocity of sound = frequency $\times$ wavelength

iii. Amplitude

iv. Frequency its unit is hertz.

37.   i. Given mass, m = 50 g = $\frac{50}{1000}$ kg.

Acceleration during intervals 0 to 3 s = $a_1 = \frac{v-u}{t} = \frac{120-0}{3}$ = 40 m/s^2

According to Newton's second law of motion : Force, F_1 = ma = $(\frac{50}{1000}) \times$ 40 = 2 N

ii. Acceleration during intervals 6 to 10 s = $a_2 = \frac{v_2-v_1}{t} = \frac{0-120}{(10-6)}$ = -$\frac{120}{4}$ = -30 m/s^2

Similarly, Force, F_2 = ma$_2 = \frac{50}{1000} \times$(-30) = -1.5 N.

iii. Time interval in which no force acts on the object ='3's - '6' s i.e A to B.

This is because in this interval, the velocity of object is constant i.e. 120 m/s .

Hence, Acceleration= '0' m/s^2. Therefore, F= '0' N.

38.   i. Work done on an object is defined as the magnitude of the force multiplied by the distance moved by the object in the direction of the applied force.

Work done = force $\times$ distance

W = F $\times$ s

ii. F = 250 kg $\times$ 10 ms^{-2} (g = 10 ms^{-2}) = 2500 Ns = 1 m

W = F.s = 2500 N $\times$ 1 m = 2500 Nm = 2500 J

iii. Zero, as the box does not move at all while holding it.

OR

In or do hold the box, men are applying a force that is opposite and equal to the gravitational force acting on the box. While applying the force, muscular effort is involved. So, they feel tired.

39.   i. We know that, Original weight,W_o = mg = $\frac{GMm}{R^2}$, where M is the mass of the earth, m= mass of body.

Let the new mass of earth = M'

According to question, New mass, M' = M + 10% of M = M + $\frac{10}{100}$M = M + $\frac{M}{10}$ = $\frac{11M}{10}$ = 1.1M

$\therefore$New weight, W_n= $\frac{GM'm}{R^2}$ = $\frac{G \times 1.1Mm}{R^2}$

Now, Ratio of new weight to original weight = $\frac{New\ weight}{Original\ weight}$ = $\frac{1.1GMm/R^2}{GMm/R^2}$ = 1.1

New weight becomes 1.1 times the original weight of body.

i.e., weight of body will increase by 10%.

ii. Again, Original Weight, W_o = $\frac{GMm}{R^2}$, where R is the radius of the earth.

According to question, when R changes to 2R, the new weight is given by,

New weight,W_n = $\frac{GMm}{4R^2}$

Now, Ratio of new weight to original weight =$\frac{New\ weight}{Original\ weight}$ = $\frac{GMm/4R^2}{GMm/R^2}$ = $\frac{1}{4}$

Therefore, New weight becomes $\frac{1}{4}$ times of original weight

<div align="center">OR</div>

We have given that,

The mass of the wooden block = 5 kg

The dimensions = 40 cm $\times$ 20 cm $\times$ 10 cm

Here, the weight of the wooden block applies a thrust on the table top.

i.e,

Now we know that,

Thrust = F = m$\times$g

= 5 kg $\times$ 9.8 ms^{-2}

= 49 N

Area of a side = length $\times$ breadth

= 20 cm $\times$ 10 cm

= 200 cm^2 = 0.02 m^2

From equation Pressure = $\frac{thrust}{area}$ .....(i)

Pressure = $\frac{49N}{0.02m^2}$

= 2450 Nm^{-2}.

When the block lies on its side of dimensions 40 cm × 20 cm, it exerts the same thrust.

Area length × breadth

= 40 cm × 20 cm

= 800 cm^2 = 0.08 m^2

From equation (i)

Pressure = $\frac{49N}{0.08m^2}$

The pressure exerted by the side 20 cm × 10 cm is 2450 Nm^{-2} and by the side 40 cm × 20 cm is 612.5 Nm^{-2}.