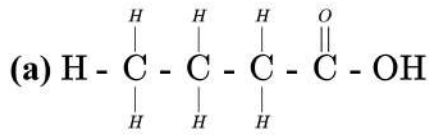
Solution

Section A

1. **(c)** (i) and (iii)
   Explanation: Genes are units of hereditary and are responsible for inheritance. Genes control the expression of a trait or a character in an organism. Genes are located on the chromosomes inside the nucleus of the cell.
2. **(d)** 0.1 A
   Explanation: Last cout = $\frac{Range}{Total\ divisions} = \frac{2}{20} = \frac{1}{10} = 0.1$ A
3. **(c)** (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)
   Explanation:
   - Dynamo is a device that makes direct current electric power using electromagnetism. It is also known as a generator. Dynamos and generators work using the wild complex phenomena of electromagnetism.
   - Magnetism is one aspect of the combined electromagnetic force. It refers to physical phenomena arising from the force caused by magnets, objects that produce fields that attract or repel other objects.
   - A generator converts mechanical energy into electrical energy, while a motor converts electrical energy into mechanical energy. Both the devices work because of electromagnetic induction, which is when a voltage is induced by a changing magnetic field.
   - Andre-Marie Ampere was a French physicist and mathematician who was one of the founders of the science of classical electromagnetism. The SI unit of measurement of electric current, the ampere, is named after him.
4. **(c)** Starch
   Explanation: Starch is made up of two components **Amylose** and **Amylopectin**. When we add iodine to starch-containing water Amylose reacts with iodine to form a blue colour complex. Here solution gives blue-black colour on adding iodine which confirms the presence of starch in the rice water.
5. **(d)** Mg
   Explanation: Mg
6. **(a)** (i) and (iii)
   Explanation: Ionization can be defined as the dissociation of molecule into its respective ions. Mixing of an acid with water decreases the concentration of acid and is called as dilution.
7. **(a)** 
   Explanation: The general formula of a carboxylic acid is R-COOH where R is an alkyl group. So, because 'butane' shows the presence of 4 single-bonded carbon atoms 'oic acid' shows the presence of $-\overset{\overset{O}{\|}}{C}-\ OH$ group. The formula of butanoic acid is C_3H_7COOH.
8. **(d)** plumule, cotyledon and radicle
   Explanation:
   - A represents the plumule which forms the shoot.
   - B represents the cotyledon, and

- C represents the radicle that forms the roots.

9. **(c)** Gram, pea and ground-nut
   Explanation: Gram, pea and ground-nut
10. **(a)** exothermic
    Explanation: On adding concentrated acid to water, a large amount of heat energy is evolved resulting in an exothermic reaction.
11. **(c)** One-fourth
    Explanation: We know that
    $R = \frac{\rho l}{A}$
    Therefore, when the diameter of the wire is doubled, the resistance becomes one-fourth of the actual value.
12. **(b)** Genetics
    Explanation: Genetics is the study of genes, genetic variation, and heredity in living organisms. It is generally considered a field of biology, but intersects frequently with many other life sciences and is strongly linked with the study of information systems.
13. **(b)** Fe
    Explanation: Sodium reacts vigorously with water. Such is the reaction that it has to be stored under kerosene. Calcium can react with cold water. Magnesium reacts with hot water. Heated iron reacts with water when hot steam is passed over it.
    $3Fe\ (s) + 4H_2O\ (g) \rightarrow Fe_3O_4\ (s) + 4H_2\ (g)$
14. **(d)** Tadpole
    Explanation: A tadpole lives underwater so it only has one way of gas exchange (through the gills). First, the tadpoles open their mouth to let water enter. Then, the water moves into the gills which contain small membranes called lamella.
15. **(c)** the screen in the direction of the lens or the lens in the direction of the screen
    Explanation: The candle is closer to the lens when compared to the distant lamp. Hence, the image of the candle will be farther away from the lens when compared to the image of the distant lamp. As the image will be more close to focus as the distance of the object is larger.
16. **(b)** Both A and R are true but R is not the correct explanation of A.
    Explanation: The wires are parallel to each other but the direction of current in it is in same direction so they attract each other. If the current in the wire is in opposite direction then wires repel each other.
17. **(d)** testis $\rightarrow$ vasdeferens $\rightarrow$ urethra
    Explanation: Sperms are produced in the testis and then carried away by the vas deferens to the urethra.
18. **(d)** A is false but R is true.
    Explanation: Baking soda, being alkaline, neutralises the acidity in the stomach and removes it.
19. **(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.
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. Nerve control is superior to chemical control because it allows faster communication and co-ordination within the multicellular organisms.
22. In diamond, all the four valence electrons of carbon are involved in the formation of covalent bonds. Thus, no free electrons are available to conduct electricity. Whereas, in

graphite, three electrons in the valence shell of carbon are involved in the formation of covalent bond. The fourth electron is free to move. So,it conducts electricity.

OR

i. Ethanol does not react with sodium bicarbonate but ethanoic acid reacts with sodium bicarbonate releasing CO_2 gas.

ii. Ethanol does not change the colour of blue litmus paper but ethanoic acid changes the colour of blue litmus to red due to presence of carboxylic acid group.

23. **Effects of ozone depletion.**

1) UV radiation striking the earth and these radiation cause skin cancer and damage to eye.
2) These damage defence (immune) system of body.
3) May lead to variations in global rainfall.
4) It causes ecological disturbances such as floods, shortage of food etc.
5) Ozone layer depletion leads to decrease in ozone in the stratosphere and increase in ozone present in the lower atmosphere.
6)These harmful effects are observed because exposure to UV radiations results in lethal mutations in the cellular DNA.
7) It can also cause the death of phytoplanktons, and an increase in global warming.

24. According to law if 5 J of energy is available to man then 10% energy is available to primary consumer so primary consumer is filled with 50J. Producers consume only 1% of energy which is available from sun therefore 5000J of energy is available to the producers.

25. A substance which gives oxygen for oxidation is called an **oxidising agent**. Alkaline potassium permanganate ($KMnO_4$) and acidified potassium dichromate ($K_2Cr_2O_7$) are examples of strong oxidising agents. E.g. Ethanol undergoes oxidation in the presence of alkaline potassium permanganate solution to form ethanoic acid.

$$C_2H_5OH + O_2 \xrightarrow[KMnO_4]{alkaline} CH_3COOH + H_2O$$

26. i. The mirror used by the dentist is concave mirror.

ii. The phenomenon of light by which doctor is able to examine Kapil is reflection of light.

iii. The doctor gave the correct advise to Kapil on how to keep his mouth clean and gums healthy. The doctor's son and doctor was helping in nature. Kapil followed the advise given by the doctor. So, he is an obedient boy.

OR

i. The type of mirror used is convex mirror.

ii. Convex mirror is used as a side mirror in vehicles. Convex mirrors have a wider field of view as they are curved outwards. Therefore, convex mirrors enable the driver to view much larger area.

iii. Sunil was a kind and helpful Boy. We learn to help needy people, from Sunil's character

Section C

27. Let us assume that the window pane is between F2 and infinity from this lens and this is a convex lens. We know that when the object is between infinity and F_2, its inverted and real images is formed between 2F and $2F_2$.

Now, the distant building is at infinity from the lens. Its image would be formed at 2F. So, the screen needs to be moved towards the lens in order to get a sharp image. Its approximate focal length is 10 cm (less than image distance in earlier case).

28. Calcium oxide reacts with water to form calcium hydroxide, liberating a large amount of heat. This makes the beaker warm. The substance, X, is therefore, Calcium oxide (CaO).

$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq) + Heat$

This is a type of a Combination reaction.

29.

i. Yes, it is possible that people using spectacles or those who have been operated for cataract can donate their eyes.

ii. The eyes have to be removed from your dead body and then implanted in two corneal blind people. Your permission in the form of a pledge is essential. In fact, the pledge is to be signed in the presence of your near and dear ones, who will be in charge of the body after you die.

Eyes of a dead person can be donated to a person having corneal blindness. It will help him/her see the world. We can also register ourselves to donate our eyes. The organisations that put up eye donation camps preserve our eyes after our death and donate them to the needy.

iii. Yes, I want to make a pledge for such a noble cause. Because after my death both my eyes will be used to give vision to two corneal blind people.

30. a. It is a displacement reaction.

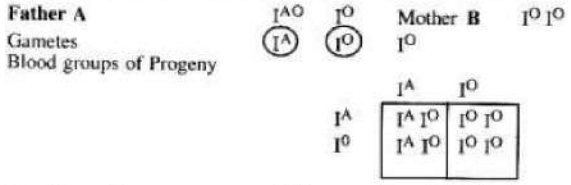
$Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$

b. It is a double displacement reaction.

$2Kl + Pb(NO_3)_2 \rightarrow 2KNO_3 + Pbl_2$

31. Blood groups being a hereditary character, the knowledge of blood groups of parents can give information about the possible blood groups of children and vice-versa.

In this case illustration is as follow:



In the above cross 50 per cent of progeny will have A blood group and 50 per cent O blood group.

At the same time this data is insufficient. It is not mentioned father has homozygous or heterozygous A blood group. If it is homozygous A then 100 per cent of progeny will have A blood group as Gene IA is dominant over Gene I^O .

OR

Let the dominant trait be represented by PP.

Let the recessive trait be represented by pp.

Parents PP × pp

F_1-generation (Pp) (Pp) (Pp) (Pp) i.e. all pink colour flowers, but hybrid. i.e. none are pure homozygous all the progeny has heterozygous combination, but since, pink is dominant over white, all are pink.

F_2-generation when self-fertilised (Pp) × (Pp)

F_2-generation gives (PP) (Pp) (Pp) (pp)

Ratio 3 pink colour flowers : 1 white colour flower.

32. A camera in many ways is similar to the human eye as both eye and camera has convex lens. But, there are some basic differences in image formation between the two as follows:

i. In camera, the distance between the lens and the screen can be adjusted but not the focal length of the lens. However, in eye, the ciliary muscles adjust the focal length keeping the distance between the lens and the retina constant.

ii. The image formed on the retina is temporary and its impression is recorded in the brain as memory. However, the image formed on the film of camera is a permanent record.

33. i. This special tissue that provides nutrition is called the placenta.

ii. Besides providing nutrition to the embryo, placenta helps in removing waste products from embryo, it also helps in providing oxygen to the embryo and eliminating carbon

dioxide from embryo.

iii. The placenta is a disc-like structure that is attached to the wall of the uterus. It is formed by two sets of a minute finger-like process called villi. One set from uterine wall and other set from the embryo. The blood flows through the fine capillaries of the placenta.

OR

Fertilization takes place in the fallopian tube only if mature ovum is released. In a normal menstrual cycle, ovulation occurs during middle of sexual cycle. Thus if copulation occurs only during this period only then fertilization is possible.

Section D

34. a. Platinum, gold and silver are used to make jewelry because of their bright shiny surface and high resistance to corrosion. Also they have high malleability and ductility.

b. Sodium, potassium and lithium are stored under oil to prevent their reaction with oxygen, moisture and carbon dioxide of air so as to protect them.

c. Aluminum metal forms a thin layer of aluminum oxide all over its surface under the action of moist air. This layer prevents the metal underneath from further corrosion. It is cheap, easily available, malleable and ductile. Therefore, it is used to make utensils for cooking.

d. It is easier to obtain a metal from its oxides as compared to its sulphides and carbonates. So, prior to reduction, metal carbonate and sulphides must be converted into metal oxides. A carbonate ore is converted into oxide by calcination whereas a sulphide ore is converted into oxide by roasting.

e. When copper vessels are exposed to moist air, they form a green coating of basic copper carbonate [$CuCO_3.Cu(OH)_2$].

$$\underset{From\ Moistair}{2Cu + CO_2 + O_2 + H_2O} \rightarrow \underset{Basic\ Copper\ Carbonate\ (Green)}{CuCO_3.Cu(OH)_2}$$

The sour substances such as lemon or tamarind juice contain acids. Lemon juice contains citric acid and tamarind contains tartaric acid. These acids dissolve the coating of copper oxide or basic copper carbonate present on the surface of tarnished copper vessels and make them shining red-brown again.

OR

The gas which smells like that of rotten eggs isH_2S. Hence, the ore is a sulphide ore. It is concentrated by froth-floatation process. The metal is obtained from the concentrated ore in the following two steps:

i. Roasting: Heating the ore strongly in the presence of air. The metal sulphide is converted into metal oxide along with evolution of sulphur dioxide gas.

$$\text{Metal sulphate} + O_2 \xrightarrow{Roasting} \text{Metal oxide} + SO_2$$

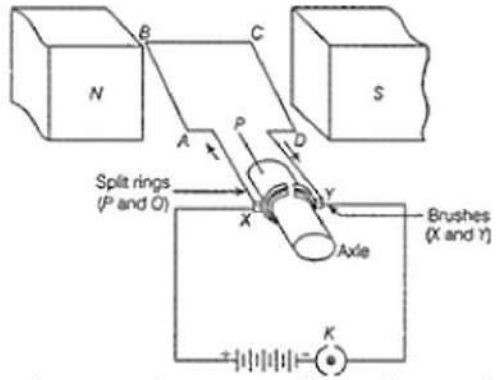
ii. Reduction with carbon: On heating the metal oxide with carbon, it is reduced to free metal.

$$\text{Metal oxide} + \text{Carbon} \xrightarrow{Reduction} \text{Metal} + \text{Carbon monoxide}$$

35. a.

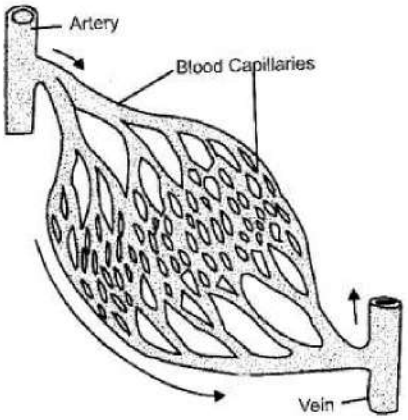
- Fleming's left-hand rule.
- Adjust your hand in such a way that the forefinger points in the direction of magnetic field and the centre finger points in the direction of current, then thumb gives the direction of force acting on the conductor

b. Electric motor.



36. The three main types of blood vessels are:
    i. Arteries
    ii. Veins
    iii. Capillaries.

Arteries have thick elastic walls and its diameter may be 1 cm. These blood vessels carry the blood from the heart to the various parts of the body. Arteries divide into thin arterioles and arterioles further ramify into capillaries (1 micron diameter). The wall of a capillary is made up of a single layer of cells. The muscles and elastic fibres are absent in the capillaries. The walls of these capillaries are so thin that the exchange of food materials, waste materials and gases takes place between the blood and protoplasm of cells (liver, lung etc) through them. The capillaries again reunite to form venules and venules unite to form veins. These venules and veins return the blood to the heart.



OR

Nutrition: All living organisms need matter to build up the body and energy to operate the metabolic reactions that sustains life. The materials which provide these two primary requirements of life are called nutrients or foods. The sum total of processes by which organisms obtain matter and energy is termed nutrition.

Modes of nutrition

The organisms have evolved two different modes of nutrition:

1) Autotrophic or Holophytic nutrition: All green plants and certain protozoans (Euglena) have evolved a mechanism to directly use the energy of sunlight for preparing organic food in their own body from simple raw materials i.e. CO_2 and H_2O. These single inorganic materials are transformed into glucose and oxygen is evolved.

Energy is trapped with the help of chlorophyll present in chloroplasts of cells. The process is called photosynthesis and the organisms capable of it are termed photoautotrophs.

$$6CO_2 + 6H_2O \xrightarrow[Light]{Chlorophyll} C_6H_{12}O_6 + O_2$$

Carbon dioxide Water Gloucose Oxygen

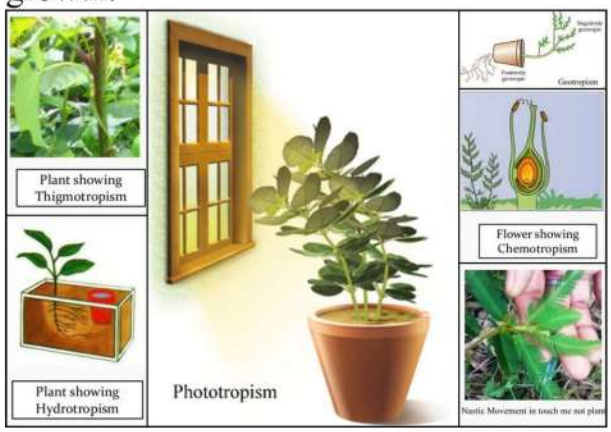
Some bacteria are known as chemotrophs, as they obtain energy released during oxidation of inorganic chemicals, and the process as chemosynthesis. Nitrifying bacteria Nitrosomonas and Nitrobacter are chemotrophs.

2) Heterotrophic nutrition: Animal, fungi, (Amoeba) and many bacteria cannot utilize sun energy. They use chemical bond-energy of organic molecules synthesized by other organisms in building their own organic molecules. Such a mode of feeding is termed heterotrophic nutrition, and the organisms having it are called heterotrophs.

Section E

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

Animals have a nervous system for controlling and coordinating the activities of the body. But plants have neither a nervous system nor muscles. So, how do they respond to stimuli? When we touch the leaves of a chhui-mui (the 'sensitive' or 'touch-me-not' plant of the Mimosa family), they begin to fold up and droop. When a seed germinates, the root goes down, the stem comes up into the air. What happens? Firstly, the leaves of the sensitive plant move very quickly in response to touch. There is no growth involved in this movement. On the other hand, the directional movement of a seedling is caused by growth. If it is prevented from growing, it will not show any movement. So plants show two different types of movement - one dependent on growth and the other independent of growth.



(i) In plants, **chemical coordination** occurs with the help of plant hormones (Phytohormones).

(ii) *Mimossa pudica's* leaves drop down when we touch it. It is due to the turgor pressure difference between the upper and lower halves of the base of the petiole. Its other name is "touch-me-not" or "chui-mui".

(iii) Turgor movement is the movement due to the difference in turgidity of the cells in the lower half and the upper half of pulvinus (petiole of a leaf).

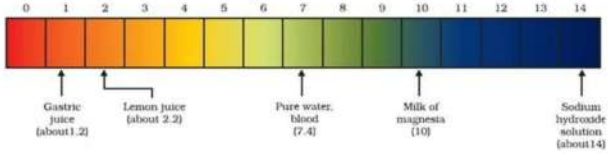
OR

The movements which are in a particular direction in relation to the stimulus are called tropic movements. Tropic movements happen as a result of the growth of a plant part in a particular direction. For example; the shoot usually grows in the direction of sunlight. This is called positive phototropic movement.

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

The strength of acid and base depends on the number of H^+ and the number of OH^- respectively. If we take hydrochloric acid and acetic acid of the same concentration, say one molar, then these produce different amounts of hydrogen ions. Acids that give rise to more H^+ ions are said to be strong acids, and acids that give less H^+ ions are said to be

weak acids. Can you now say what weak and strong bases are?



(i) The pH of milk is 6. As it changes to curd, the pH will reduce because curd is acidic in nature. The acids present in it decrease the pH.
(ii) Yes, gastric juice is a weak acid.
(iii) Milk of magnesia is a base and it can be used as an antacid.

OR

The pH value of saliva after the meal is 5.8.

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

The heating effect of current is obtained by transformation of electrical energy into heat energy. Just as mechanical energy used to overcome friction is covered into heat, in the same way, electrical energy is converted into heat energy when an electric current flows through a resistance wire. The heat produced in a conductor, when a current flows through it is found to depend directly on (a) strength of current (b) resistance of the conductor (c) time for which the current flows.

The mathematical expression is given by $H = I^2Rt$.
The electrical fuse, electrical heater, electric iron, electric geyser etc. all are based on the heating effect of current.

(i) Low resistance, high melting point.
(ii) High resistance, low melting point

Electric Fuse is based on the principle of the heating effect of Electric current.

OR

Given: $H = I^2Rt$
So, $H' = (2I)^2 \cdot \frac{R}{2}t = 2\ H$