

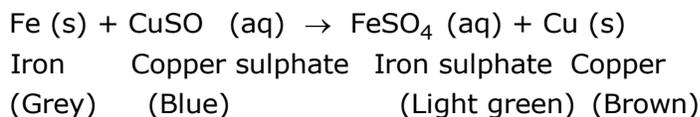
**CBSE Board
Class X Science
Board Paper - 2010
Solution**

Time: 2½ hrs

Total Marks: 60

SECTION-A

Ans1. When iron nails are dipped in copper sulphate solution for about 30 minutes, iron nails become brownish in colour and the blue colour of copper sulphate solution fades and changes to light green.



Ans2. Two characteristic features of carbon which give rise to a large number of carbon compounds are:

- (a) Catenation: Carbon has the unique ability to form bonds with other atoms of carbon giving rise to large molecules i.e. carbon has a tendency to catenate.
- (b) Tetravalency: Since carbon has a valency of four, it is capable of bonding with four other atoms of carbon or atoms of some other mono-valent element

Ans3. A ray of light passing through the centre of curvature of a concave mirror falls on the mirror along the normal to the reflecting surface. Hence, it gets reflected along the same path following the laws of reflection.

Ans4. The nature of the image formed by a concave mirror if the magnification produced by the mirror is +3 is virtual, erect and magnified.

Ans5. Using Fleming's left hand rule we can easily find out that the nature of the charge on the particle is positive.

Ans6. Eye lens help us to focus near and distant objects in quick succession.

Ans7. When an aqueous solution of sodium sulphate reacts with an aqueous solution of barium chloride, insoluble barium sulphate along with solution of sodium chloride is formed.

If the reactants are in solid state, then reaction will not take place between sodium sulphate and barium chloride.



Reaction between aqueous solution of sodium sulphate and aqueous solution of barium chloride is a double displacement reaction.

Ans8. The main constituent of biogas is methane.

Biogas is obtained by the anaerobic degradation of biomass in the presence of water.

Two advantages of using biogas are:

1. It burns without smoke and hence does not cause air pollution.
2. It has a high calorific value.

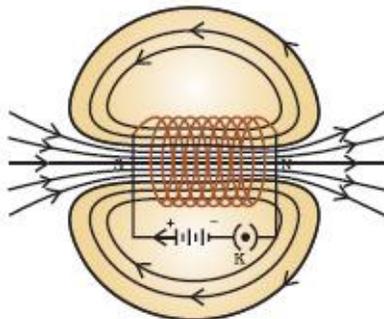
Ans9.

(a) Red color will be seen at Y and violet colour will be seen at X.

(b) Different colors of white light travel at different speeds through the glass prism. Hence, they bend through different angles with respect to the incident beam of light.

Ans10. A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid.

Magnetic field lines of a solenoid through which a steady current is flowing:



The field lines inside the solenoid are in the form of parallel straight lines. This indicates that the magnetic field is the same at all points inside the solenoid. That is, the field is uniform inside the solenoid.

Ans11.

- (i) A momentary deflection in the galvanometer will be seen, indicating a flow of current in the circuit.
- (ii) A momentary deflection in the galvanometer (but in opposite direction) will be seen, indicating a flow of current in the opposite direction in the circuit.
- (iii) No deflection in the galvanometer will be seen, indicating that no current flows in the circuit.

The phenomenon involved is electromagnetic induction.

Ans12. Four limitations in harnessing wind energy on a large scale are:

- (a) Wind energy farms can be established only at those places where wind blows at least with a speed of 15 km/h for the most part of the year.
- (b) There should be some back-up facilities (like storage cells) to take care of the energy needs during a period when there is no wind.
- (c) Establishment of wind energy farms requires large area of land.
- (d) Since the tower and blades are exposed to the vagaries of nature like rain, sun, storm and cyclone, they need a high level of maintenance.

Ans13. Focal length, $f = +18$ cm

Image distance, $v = +24$ cm

Object distance, $u = ?$

Magnification, $m = ?$

According to lens formula:

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

$$= \frac{1}{24} - \frac{1}{18}$$

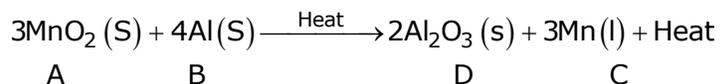
$$= \frac{3 - 4}{72}$$

$$u = -72 \text{ cm}$$

$$m = \frac{v}{u} = \frac{24}{-72} = -0.33$$

Ans14.

- (i) Based on the given information, solid A can be assumed to be manganese dioxide (MnO_2) and solid B can be assumed to be aluminium powder (Al). When manganese dioxide is heated with aluminium powder, the following reaction takes place:



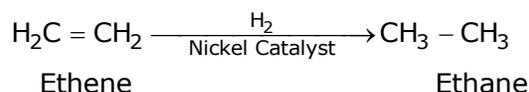
The reaction is highly exothermic reaction and a lot of heat is evolved.

(ii)

- (a) Displacement reaction
- (b) Exothermic reaction
- (c) Redox reaction

(Any two can be mentioned)

Ans15. The functional groups of organic compounds that can be hydrogenated are alkenes and alkynes.



Unsaturated hydrocarbons undergo addition reactions with hydrogen in the presence of catalysts such as palladium or nickel to give saturated hydrocarbons. During this reaction, unsaturated compounds like vegetable oils which are in liquid state are converted to animal fats in solid state. Vegetable oil is an example of natural source of organic compound that are hydrogenated.

Ans16.

(i)

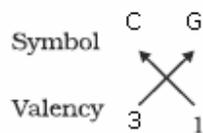
Elements	Group	Period
A	1	3 rd
B	2	3 rd
C	13	3 rd
D	14	3 rd
E	15	3 rd
F	16	3 rd
G	17	3 rd
H	18	3 rd

(ii) Nature of the compound formed by combination of element B and F is ionic.

(iii) Elements A and B are definitely metals.

(iv) Element H belonging to group 18 is most likely to be found in gaseous state at room temperature.

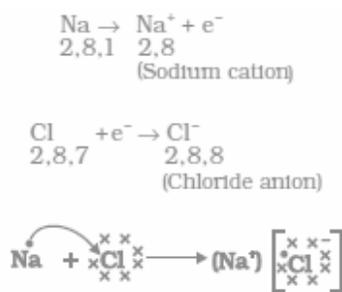
(v) Formula of the compound formed by combination of C and G is CG_3



Ans17. Names and symbols of the two most reactive metals belonging to group I of the periodic table:

No.	Name of metals	Symbol of metals
1.	Sodium	Na
2.	Potassium	K

Formation of sodium chloride:



Sodium and chloride ions, being oppositely charged are held by strong electrostatic forces of attraction. Bond formed between sodium and chloride ion is ionic bond.

The class of compounds formed by the transfer of electrons from a metal to a non-metal is known as ionic compounds or electrovalent compounds.

Physical properties of ionic or electrovalent compounds:

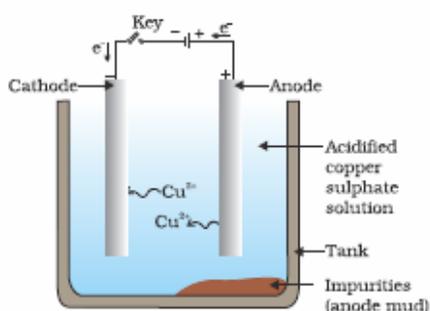
1. Ionic compounds are solids and are somewhat hard.
2. Ionic compounds have high melting and boiling points.
3. Ionic compounds are generally soluble in water and insoluble in solvents such as kerosene, petrol, etc.
4. Ionic compounds conduct electricity in aqueous solution and in molten state. They do not conduct electricity in solid state.

OR

Ans17. Process of obtaining pure metal from its impure form is called refining of metals.

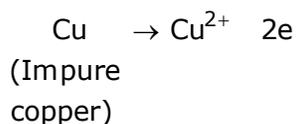
The most widely used method for refining impure metals is electrolytic refining.

Electrolytic refining of copper:

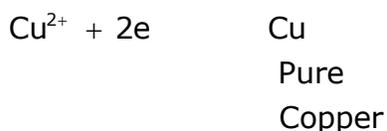


In electrolytic refining of copper, electrolyte is a solution of acidified copper sulphate. Anode is made up of impure copper. Cathode is made up of a strip of pure copper metal.

On passing current through the electrolyte, pure copper metal from the anode dissolves into the electrolyte i.e. acidified copper sulphate.



At cathode: An equivalent amount of pure metal from the electrolyte is deposited on the cathode.



The soluble impurities go into the solution, whereas, the insoluble impurities settle down at the bottom of the anode and are known as anode mud.

Ans18. Let us take a resistor of resistance R. Let the current flowing through this resistor is equal to I and the potential difference across it is equal to V. Suppose in time t, Q amount of charge flows through the resistor

Work done in moving this charge, $W = VQ$... (1)

According to the definition of electric current,

$$I = \frac{Q}{t}$$
$$Q = I \times t$$

Putting this in equation (1),

$$W = V \times I \times t$$

This work done is dissipated as heat.

Hence, heat produced, $H = W = VIt$

$$H = VIt \dots (2)$$

According to Ohm's law, $V = IR$.

Putting this in equation (2),

$$H = IR \times It$$

$$H = I^2Rt$$

This relation is known as Joule's law of heating

Numerical:

Power, $P = 12 \text{ W}$

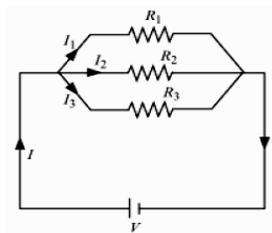
Potential difference, $V = 12 \text{ volt}$

Time duration, $t = 1 \text{ min} = 60 \text{ s}$

$$P = \frac{H}{t}$$
$$H = P \times t$$
$$12\text{W} \times 60\text{s}$$
$$= 720\text{J}$$

The heat generated by the instrument is 720 J.

OR



The given figure shows a circuit consisting of three resistors R_1 , R_2 and R_3 connected in parallel. The total current in the circuit (I) gets divided among the three resistors as I_1 , I_2 and I_3 .

$$\text{Thus, } I = I_1 + I_2 + I_3 \text{ ----- (1)}$$

Applying Ohm's law for each resistor,

$$\left. \begin{aligned} I_1 &= \frac{V}{R_1} \\ I_2 &= \frac{V}{R_2} \\ I_3 &= \frac{V}{R_3} \end{aligned} \right\} \text{----- (2)}$$

Let the equivalent resistance of the circuit be R_{eq} .

Applying Ohm's law for the equivalent circuit,

$$I = \frac{V}{R_{eq}} \text{----- (3)}$$

Using eqns. (1), (2) and (3),

$$\frac{V}{R_{eq}} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

This is the expression for the equivalent resistance of a parallel combination of three resistances. An ammeter has to be connected in series with the combination of all these resistors so that the current passing through the ammeter is equal to the total current through the circuit.

The voltmeter has to be connected in parallel to that resistor across which the potential difference has to be measured.

SECTION-B

Ans19. The green dot-like structures are chloroplasts. This green colour is due to the presence of chlorophyll

Ans20. The spinal cord is protected by the vertebral column or backbone.

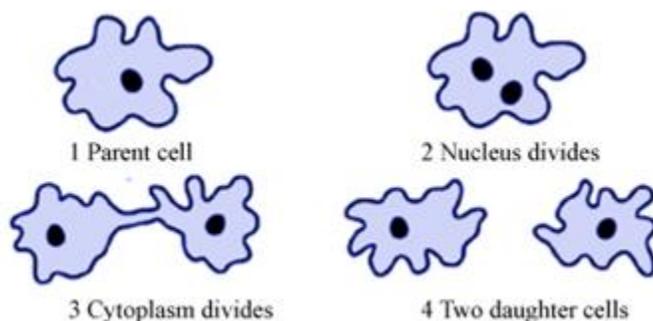
Ans21. Our increasing demand for energy is depleting our natural resources and polluting the environment in one or the other way.

Ans22. A hormone is a chemical compound synthesized by a group of cells or endocrine glands that affect cells in other parts of the body and is also used for control and coordination in the organisms.

Thyroid gland secretes the hormone thyroxin.

Thyroxin regulates carbohydrate, protein and fat metabolism in the body so as to provide the correct balance for growth.

Ans23.



Ans24. Example of inherited trait - Shape of the eye or hair colour.

Example of acquired trait - Building of muscles while exercising.

Inherited characters affect the DNA of germ cells and hence can be passed on to the future generations.

Acquired characters do not cause changes in DNA of the germ cells and hence cannot be passed on to future generations.

Ans25. DNA – Deoxyribonucleic acid.

DNA is present in the nucleus of the cell.

DNA in the cell nucleus is the information source for making proteins and is thereby, responsible for inheritance of features. A basic event in reproduction process is DNA copying, accompanied by the creation of an additional cellular apparatus after which the DNA copies separate, each with its own cellular apparatus.

The consistency of DNA copying during reproduction is important for the maintenance of body design features. Variations occur in the DNA copying reactions during reproduction, due to which the surviving cells are similar to, but subtly different from each other. This inbuilt tendency for variation during reproduction is the basis for evolution.

Ans26. When non-biodegradable substances such as pesticides, enter the food chain, they get accumulated progressively at each trophic level. This results in a cumulative increase in the concentration of the substance in successively higher trophic levels of the food chain. This phenomenon is known as biological magnification.

For example - Pesticides entering our food chain through soil or water are not degradable and hence gets progressively accumulated at each trophic level, with maximum accumulation in human bodies.

Biomagnification of a toxic substance has the potential to cause harm to organisms, particularly to the tertiary consumers. This is because tertiary consumers occupy the top level in a food chain and hence maximum concentration of such chemicals gets accumulated in their bodies.

Ans27.

- i. Mouth - In mouth, large food pieces are crushed with the help of our teeth and mixed with saliva secreted by the salivary glands, using the tongue. Salivary amylase, the enzyme present in saliva, breaks down starch to give sugar.
- ii. Stomach - The muscular walls of the stomach help in mixing the food thoroughly with the digestive juices secreted by the gastric glands present in the wall of the stomach. These glands release hydrochloric acid, a protein digesting enzyme called pepsin, and mucus, which protects the inner lining of the stomach. The hydrochloric acid creates an acidic medium which facilitates the action of the enzyme pepsin.
- iii. Small intestine - The small intestine is the site of the complete digestion of carbohydrates, proteins and fats. It receives the secretions of the liver and pancreas for this purpose.

Bile juice from liver makes the acidic food coming from stomach alkaline for facilitating the action of pancreatic enzymes. Bile also emulsifies fats so as to increase the efficiency of enzyme action.

The pancreas secretes pancreatic juice which contains enzymes like trypsin for digesting proteins and lipase for breaking down emulsified fats.

The walls of the small intestine contain glands which secrete intestinal juice. The enzymes present in it finally convert the proteins into amino acids, complex carbohydrates into glucose and fats into fatty acids and glycerol.

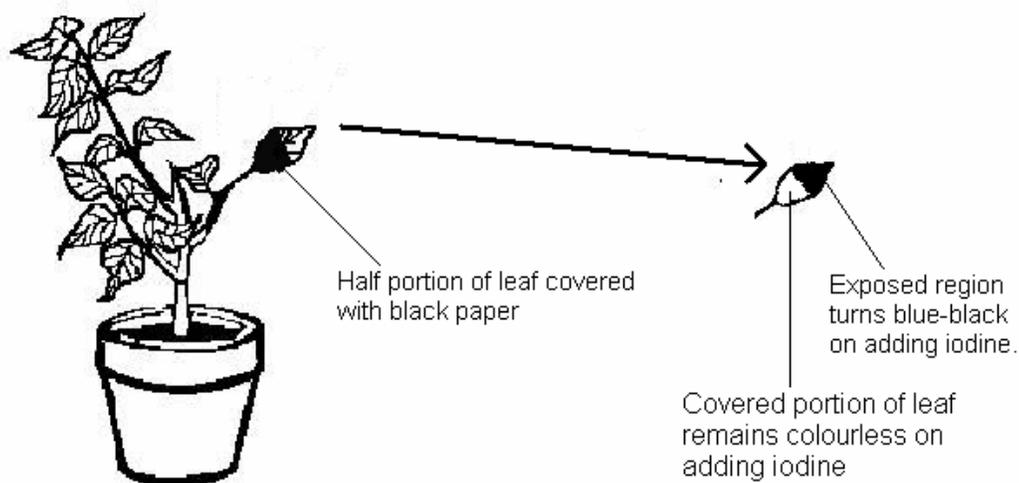
OR

(a) The three events that occur during the process of photosynthesis are:

- (i) Absorption of light energy by chlorophyll.
- (ii) Conversion of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen.
- (iii) Reduction of carbon dioxide to carbohydrates.

Stomata help in exchange of gases (carbon dioxide and oxygen) for the purpose of photosynthesis.

(b)



Experimental set-up to show that light is essential for photosynthesis:

- i. Keep a potted plant in a dark room for three days so that all the starch gets used up.
- ii. Now cover one half of a leaf of this plant with black paper or metal foil on both sides.
- iii. Then keep the plant in sunlight for about six hours.
- iv. Pluck the leaf which was half covered and remove the paper or foil.
- v. Mark the covered area.
- vi. Dip this leaf in boiling water for a few minutes.
- vii. Then immerse it in a beaker containing alcohol.
- viii. Carefully place this beaker in a water-bath and heat till the alcohol begins to boil.
- ix. The leaf gets decolourised.
- x. Now, dip the leaf in a dilute solution of iodine for a few minutes.
- xi. Take out the leaf and rinse off the iodine solution. Observe the colour of the leaf.

The part containing starch will be turned blue-black by iodine.

You will find that the portion of the leaf exposed to sunlight will turn blue-black whereas the covered half of the leaf remains colourless. This is because the covered part did not receive sunlight and hence could not form carbohydrates.

This proves that light is essential for photosynthesis.