

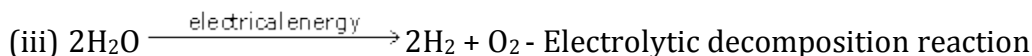
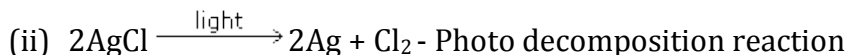
**Goa Board**  
**Class X Science**  
**Term 1**  
**Sample Paper – 4 Solution**

**Time: 3 hrs****Total Marks: 90**

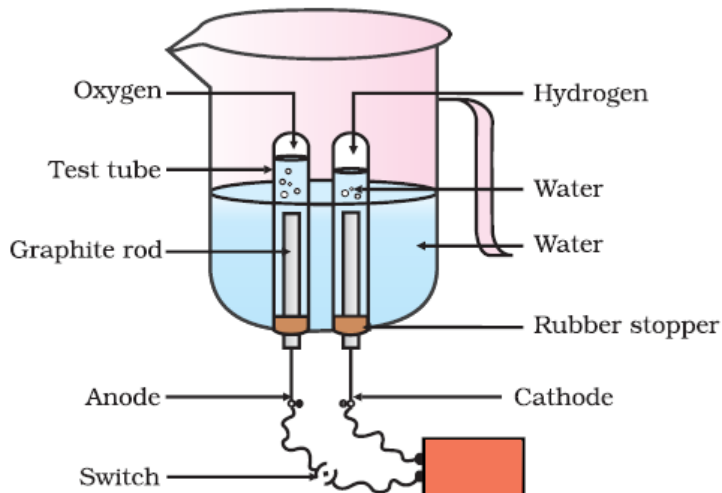
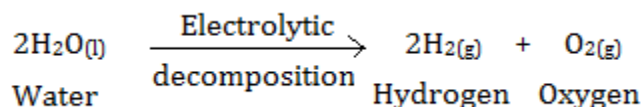
**SECTION A**

1. **Ans.** During a chemical combination, the product formed has its own set of properties and the reactants fail to retain their properties. So, water has different properties from its reactants and is hence used for extinguishing fires.
2. **Ans.** Kilowatt hour or kWh
3. **Ans.** Wind energy farms are places where large numbers of windmills are installed to produce electricity through wind energy.
4. **Ans.** Metals displace hydrogen from acids because they are above hydrogen in the reactivity series, resulting in the formation of a salt and hydrogen gas.  
Reaction between magnesium and hydrochloric acid is an example of this kind of displacement reaction.  
$$\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$$
5. **Ans.**  
Charge on one electron =  $1.6 \times 10^{-19}$  C  
Therefore, 1 C of charge will be carried by  
$$\frac{1}{1.6 \times 10^{-19}} = 6.25 \times 10^{18} \text{ electrons}$$
  
Now,  $1 \text{ A} = \frac{1 \text{ C}}{1 \text{ s}} = 6.25 \times 10^{18} \text{ electrons per second}$
6. **Ans.** The enzyme found in saliva is salivary amylase.  
**Role of saliva in the digestion of food:**
  - (i) Salivary amylase present in saliva converts starch into maltose and dextrose sugars.
  - (ii) Saliva moistens and lubricates the inner lining of the mouth cavity and the surface of the tongue and helps us in speaking.

7. Ans.



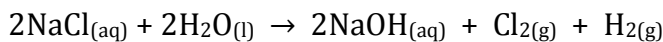
8. Ans. When electric current is passed through acidulated water kept in a voltameter, water ( $\text{H}_2\text{O}$ ) decomposes into oxygen ( $\text{O}_2$ ) and hydrogen gas ( $\text{H}_2$ ). This process is irreversible, i.e. these substances do not recombine to give back water when the flow of electric current is stopped.



**Electrolysis of Acidulated Water**

The number of hydrogen molecules produced is twice the number of oxygen molecules. Assuming an equal temperature and pressure for both gases, the produced hydrogen gas has twice the volume of the oxygen gas produced. The number of electrons pushed through the water is twice the number of generated hydrogen molecules and four times the number of generated oxygen molecules. So, we conclude that the ratio of hydrogen and oxygen elements in water is 2:1 by volume. Hence, water is a compound with the formula  $\text{H}_2\text{O}$ .

9. **Ans.** When electricity is passed through an aqueous solution of sodium chloride (brine), it decomposes to form sodium hydroxide. This process is called the chlor alkali process.



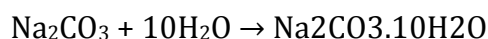
Sodium chloride      Sodium hydroxide Chlorine Hydrogen

Uses of NaOH obtained from the chlor alkali process:

- (i) To de-grease metals, soaps and detergents.
- (ii) To make paper and artificial fibres.

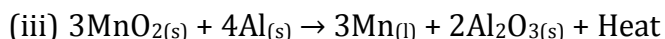
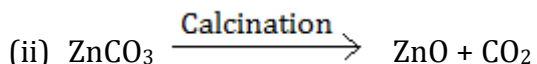
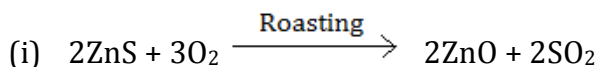
10. **Ans.**

- (i) Sodium carbonate or washing soda is obtained from baking soda, and it is used for removing the permanent hardness of water.
- (ii) Chemical formula:  $\text{Na}_2\text{CO}_3$
- (iii) When sodium carbonate recrystallises from its aqueous solution, it combines with 10 molecules of water to form hydrated sodium carbonate.



Sodium carbonate Water Hydrated sodium carbonate

11. **Ans.**



12. **Ans.**

- (a) Copper or aluminium wires have very low electrical resistance, so a very small amount of energy is wasted in transmission. They are also ductile and so can be easily drawn into wires.

- (b) Resistivity of manganin is very large, so it is thicker than copper.

$$R = \frac{\rho l}{A}$$

$$\therefore A = \frac{\rho l}{R}$$

$$\Rightarrow A \propto \rho$$

**13.Ans.** Sequence of events taking place in a biogas plant:

Slurry fed into the digester → Decomposition of biomass → Production of gases to be used as fuel

Slurry fed into the digester: In a mixing tank, the slurry of animal dung and other waste materials is prepared by mixing it with equal amount of water.

Decomposition of biomass: The slurry prepared is passed on into a digester tank, where it is decomposed in about 50–60 days by anaerobic bacteria to produce biogas.

Production of gases to be used as fuel: Biogas is mainly composed of methane (up to 75%), CO<sub>2</sub> (25%) and traces of other gases such as nitrogen and hydrogen.

**14.Ans.** The resistance between the points B and D is x. Here, 3 Ω is connected in series with 3 Ω and the combination of these resistors is connected in parallel with 3Ω.

$$x = \frac{3 \times 6}{3 + 6} = \frac{18}{9} = 2 \Omega$$

Now, the resistance of the whole combination is

$$R = 0.5 + x + 0.5 = 0.5 + 2 + 0.5 = 3 \Omega$$

∴ Ammeter reading is

$$I = \frac{V}{R} = \frac{3 \text{ V}}{3 \Omega} = 1 \text{ A}$$

**15.Ans.** A current-carrying conductor produces a magnetic field around it which interacts with the magnetic field in which it is held. Thus, it experiences a force. Direction of this force depends on the direction of the current and the magnetic field.

Fleming's left-hand rule: If we stretch the thumb, forefinger and middle finger of our left hand such that they are mutually perpendicular, and if the first finger points in the direction of the magnetic field, the second finger in the direction of the current, then the thumb will point in the direction of the force acting on the conductor.

**16.Ans.**

- (i) Adolescence brings about the secretion of hormones among teenagers. This causes some physical and emotional changes in them, which are beyond their control.
- (ii) Measures to overcome problems faced by teenagers:
  - a. Proper counselling of teenagers by the counsellor.
  - b. Healthy communication with parents.
  - c. Teenagers should be motivated to set realistic goals.
- (iii) By understanding the problems faced by teenagers, we will be able to handle various challenges of adolescence in a better way.



**17.Ans.**

Let R be the resistance of the heater

(i) For series combination:

$$R_s = 2R; I_s = \frac{V}{2R}$$

∴ Heat produced in one second is

$$H_s = I_s^2 R_s t = \frac{V^2}{4R^2} \times 2R = \frac{V^2}{2R}$$

(ii) For parallel combination:

$$R_p = \frac{R}{2}; I_p = \frac{2V}{R}$$

∴ Heat produced in one second is

$$H_p = I_p^2 R_p t = \frac{4V^2}{R^2} \times \frac{R}{2} = \frac{2V^2}{R} = 4H_s$$

Hence, heating takes place four times faster in a parallel connection.

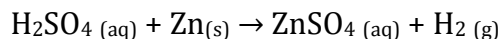
**18.Ans.**

(a) Coal and petroleum.

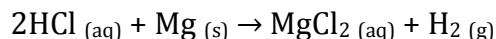
(b) Yes. It is a cleaner fuel because on burning it, only water vapour is produced, which is non-polluting. It is not used on a daily basis on account of its explosive nature, because of which even its storage and transportation is difficult.

**19.Ans.**

(a) (i) Sulphuric acid + Zinc → Zinc sulphate + Hydrogen



(ii) Hydrochloric acid + Magnesium → Magnesium chloride + Hydrogen



(b) The salts which contain water of crystallisation are called hydrated salts, whereas the salts which have lost their water of crystallisation are called anhydrous salts.

(c) Uses of washing soda:

(i) Sodium carbonate (washing soda) is used in glass, soap and paper industries.

(ii) It is used in the manufacture of sodium compounds such as borax.

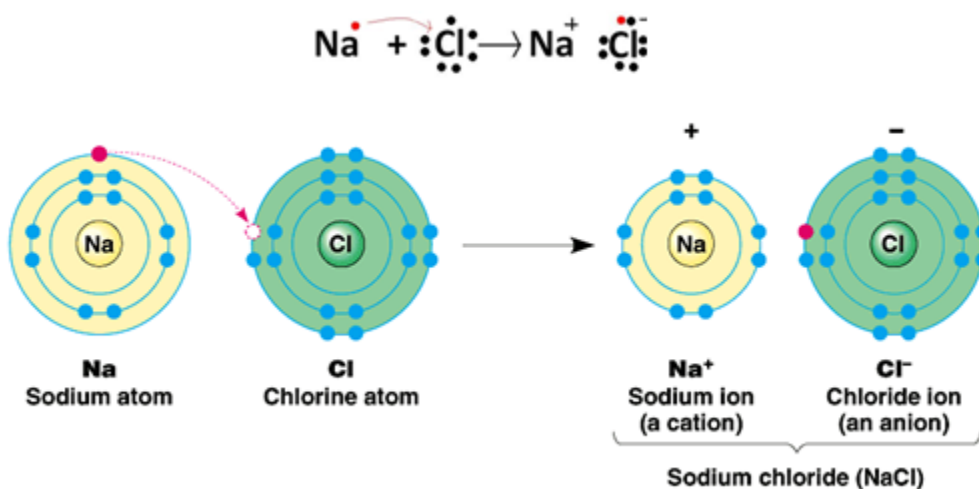
**20.Ans.**

Metals in the low reactivity series are obtained by heating their oxides alone. Mercury is obtained by heating mercurous oxide. Metals high up in the reactivity series are obtained by electrolytic reduction. Sodium is obtained by the electrolysis of its molten chlorides.

(a) Electronic configuration of sodium (Na) = 2, 8, 1

Electronic configuration of Chlorine (Cl) = 2, 8, 7

Formation of sodium chloride by the transfer of electrons

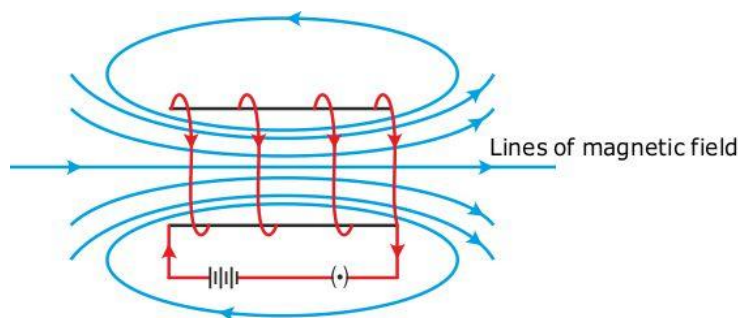


(b) (i) Highly exothermic; (ii) the metal starts floating

**21.Ans.**

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

(b)



It is clear from the field pattern of the solenoid that this field is similar to that of a bar magnet.

(c) When current through a solenoid is reversed, the magnetic field also reverses its direction.

**22.Ans.**

(a) An electric fuse is a device which is used in series in an electric circuit as a safety device to prevent the damage caused by short-circuiting or overloading of the circuit.

It is a small, thin wire of a material whose melting point is very low. If due to some fault the electric circuit gets short-circuited, then a strong current begins to flow. Due to such a strong flow of current, the fuse wire is heated and it melts. As a result, the electric circuit is broken and the flow of the current stops. Thus, possible damage to the circuit and appliances is avoided.

(b) When current in coil A is changed, there would be a change in the magnetic field around the coil A. This will induce a magnetic field on coil B, and due to electromagnetic induction, a current will be induced in coil B.

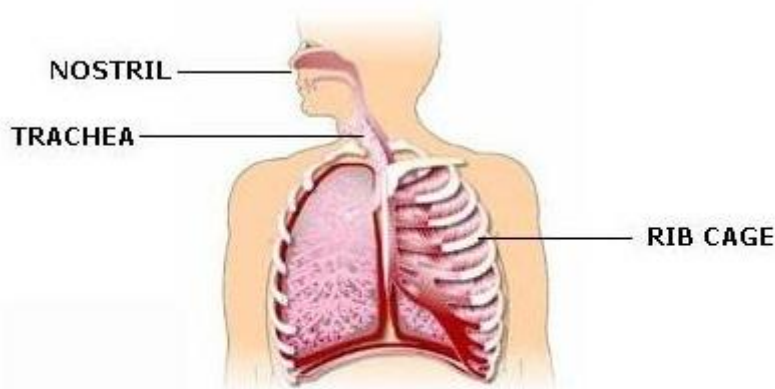
**23.Ans.**

(a)

(i) Part through which air is taken in: Nostrils

(ii) Part which protects the lungs: Rib cage

(iii) Part which carries air into the lungs: Trachea



**HUMAN RESPIRATORY SYSTEM**

(b) Within the lungs, the respiratory passage divides into smaller and smaller tubes, which finally terminate into balloon-like structures called alveoli. The walls of the alveoli contain an extensive network of blood vessels.

Role of alveoli in respiration: They provide a surface where the exchange of gases takes place.



(c) Differences between aerobic and anaerobic respiration:

| <b>Aerobic respiration</b>                                                  | <b>Anaerobic respiration</b>                                               |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1. Also called oxybiotic respiration.                                       | 1. Also called anoxybiotic respiration.                                    |
| 2. Proceeds in the presence of oxygen.                                      | 2. Proceeds in the absence of oxygen.                                      |
| 3. Occurs in mitochondria.                                                  | 3. Occurs in cytoplasm.                                                    |
| 4. Complete breakdown of glucose.                                           | 4. Incomplete breakdown of glucose.                                        |
| 5. End-products are carbon dioxide and water.                               | 5. End-products are ethyl alcohol and carbon dioxide.                      |
| 6. Large quantity of energy is liberated (38 ATP) from one mole of glucose. | 6. Small quantity of energy is liberated (2 ATP) from one mole of glucose. |
| 7. Normally occurs throughout life.                                         | 7. Occurs temporarily for short periods.                                   |

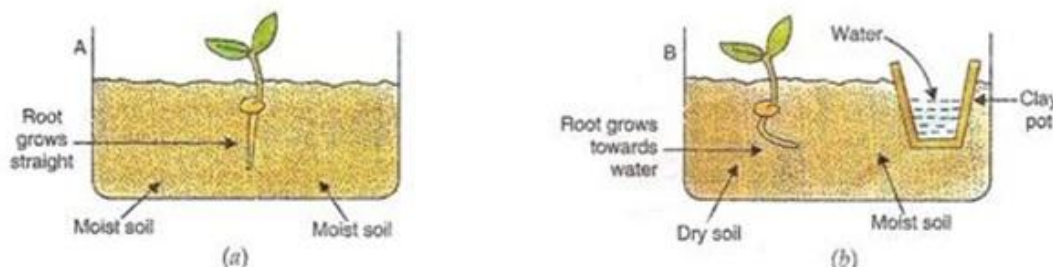
**24.Ans.**

(i) Plants do not have a nervous system, but they can sense things in the presence of stimuli such as light, touch, water etc. and respond to these stimuli by the effect of hormones. In this way, plants coordinate their behaviour against environmental behaviour by using organic chemicals called hormones. This is called chemical coordination. The hormones in plants coordinate their behaviour by affecting the growth of a part of the plant, resulting in the movement of that plantpart in response to a stimulus. Control and coordination in animals takes place by both nervous system (nervous control) and endocrine system (hormonal control).

(ii)

| <b>Stimulus</b> | <b>Type of tropic movement</b> |
|-----------------|--------------------------------|
| Light           | Phototropism                   |
| Gravity         | Geotropism                     |
| Chemicals       | Chemotropism                   |
| Water           | Hydrotropism                   |
| Touch           | Thigmotropism                  |

(iii) The movement of a plant part in response to water is called hydrotropism.



**Hydrotropism**

## SECTION B

- 25.Ans.** D. Explosion with a lot of heat is not observed when solid lead nitrate is heated. Lead nitrate decomposes to form brown  $\text{NO}_2$  gas and yellow  $\text{PbO}$  on heating.
- 26.Ans.** B. Ethanoic acid being acidic in nature turns blue litmus red and reacts with sodium hydrogen carbonate to form brick effervescence of carbon dioxide gas.
- 27.Ans.** C. It was observed that the matchstick was extinguished immediately because  $\text{CO}_2$  gas is released when acetic acid reacts with sodium hydrogen carbonate, which is not a supporter of combustion (burning).
- 28.Ans.** C. The voltmeter should be connected in parallel and the ammeter should be connected in series with a resistor. In circuit III, the voltmeter is connected in parallel across the series combination of two resistances and the ammeter is connected in series. Circuit I is also correct because the ammeter has negligible resistance.
- 29.Ans.** D. In circuit A, for a fixed resistance, lower the voltage applied, lower is the current and lower is the voltage drop across R.  
In circuit B, for a fixed voltage applied, higher the resistance, lower is the current through the circuit and lower is the voltage drop across R.

**30.Ans.** B.

The ammeter reading is  $180 \text{ mA} = 180 \times 10^{-3} \text{ A}$

The voltmeter reading is  $0.9 \text{ V}$

Hence, the resistance is

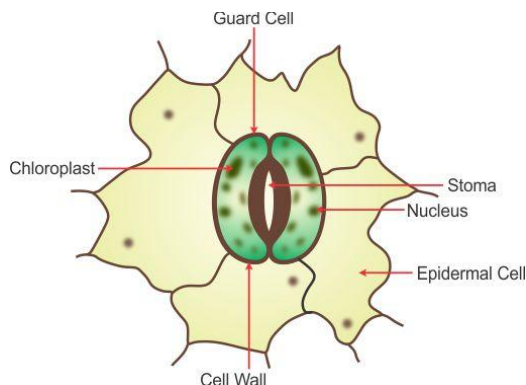
$$R = \frac{V}{I} = \frac{0.9}{180 \times 10^{-3}} = 5.0 \, \Omega$$

**31.Ans.** A. The reading of the voltmeter is  $15 \times 0.05 = 0.75$  V.

**32.Ans.** C. The least count of the ammeter is  $3/30 = 0.1$  A.

**33.Ans.** C. The diagram showing the microscopic view of the epidermal tissue is incorrect because the guard cells are directed backwards.

Correct diagram:



**34.Ans.**

- (i) B. A conical flask plugged with an airtight rubber cork is more secure than that plugged with cotton wool. Hence, carbon dioxide produced in the flask of student B gets absorbed completely by KOH, thereby causing the water level to rise in the bent tube.
- (ii) Potassium hydroxide (KOH) absorbs the carbon dioxide gas from the air present in the flask so that no carbon dioxide is left in the air inside the flask.

**35.Ans.**

- (i) B. Reading for I will be correct as the ammeter is connected in series, while reading for V will be wrong as the voltmeter should have been connected in parallel across resistances.
- (ii) If the resistance  $R_2$  is removed, then the ammeter current will increase as the total resistance has decreased in the circuit.

**36.Ans.** Statements A and B are correct. When we heat copper sulphate crystals, their water of crystallisation is removed and the salt turns into a white amorphous powder.