ICSE Board
Class IX Chemistry
Paper-1 Solution

SECTION-I

Answer 1

(a)

	Acidic radical	Basic radical
(a) $MgSO_4$	SO_4^-	Mg^+
(b) $(NH_4)_2SO_4$	SO_4^-	NH_4^+
(c) $Al_2(SO_4)_3$	SO_4^-	Al^{3+}
(d) $ZnCO_3$	CO_3^-	Zn^{2+}
(e) $Mg(OH)_2$	OH^-	Mg^{2+}

(b)

1.

i) $2AgNO_3 \xrightarrow{\text{Sunlight}} 2Ag + 2NO_2 + O_2$

(ii) $6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$

2.

$Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

Displacement

$2KClO_3 \rightarrow 2KCl + 3O_2$

Decomposition

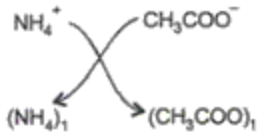
$CaCO_3 \rightarrow CaO + CO_2$

Decomposition

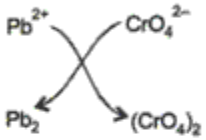
(c)

Radicals	Formula	Valency
(i) Phosphide	P^{3-}	-3
(ii) Plumbous	Pb^{2+}	+2
(iii) Mercuric	Hg^{2+}	+2
(iv) Manganate	MnO_4^{2-}	-2
(v) silicate	SiO_3^{2-}	-2

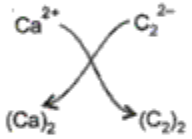
(d)

(i) 

$= CH_3COONH_4$

(ii) 

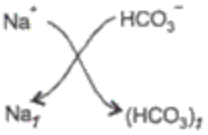
$= PbCrO_4$

(iii) 

$= CaC_2$

(iv) 

$= Al_4C_3$

(v) 

$= NaHCO_3$

(e)

(i) Valency is defined as the number of electrons lost, gained or shared by an element during a chemical reaction.

(ii) (a) Fluorine - 7 valence electrons
(b) Carbon- 4 valence electrons
(c) Oxygen- 6 valence electrons
(d) Calcium - 2 valence electrons

(f)

(i) Reducing agent:
The substance which loses hydrogen or an electronegative radical is called a reducing agent. The substance which gains oxygen or an electronegative radical is also called as reducing agent. They get oxidized in a reaction.

(ii) Oxidising agent:

The substance which loses oxygen or an electronegative radical is called an oxidising agent. The substance which gains hydrogen or an electropositive radical is also called as an oxidising agent. They get reduced in a reaction.

(iii) Synthesis reaction:
A chemical reaction in which two or more substances combine to form a single product is called a Synthesis reaction.

(iv) Direct combination reaction:
When two or more elements combine chemically to give a single product then the reaction is called direct combination reaction.

(v) Decomposition reaction:
It is the chemical reaction in which a compound breaks down to give two or more products on absorbing energy.

(g)

(i) Melting or Fusion
(ii) Solid state
(iii) Gaseous state
(iv) Plasma state
(v) Sublimation

(h)

(i) According to Boyle's law, At constant temperature the volume of a given mass of dry gas is inversely proportional to its pressure.

$V \propto \frac{1}{P}$ (T = Constant)

$V = K \frac{1}{P}$ (K = Constant)

$PV = K = \text{Constant}$

$P_1V_1 = P_2V_2 = K$ (T = Constant)

(ii) Charles' law states that - "Pressure remaining constant, the volume of a given mass of dry gas increases or decreases by 1/273 of its original volume at 0^0C for each degree centigrade rise or fall in temperature."
Using absolute scale, Charles' law can be generalized as pressure remaining constant; the volume of a given mass of a gas is directly proportional to the absolute temperature.

$$\frac{V}{T} = k$$

SECTION-II

Answer 2

(a) (i) The thermal decomposition of calcium carbonate can be shown as:

$$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$$

Mass of $CaCO_3$ = 100g

Total mass of products ($CaO + CO_2$) = 56g + 44g = 100g

Since the total mass of the products obtained in the reaction is the same as that of the reactant taken, the results are in accordance with the law of conservation of mass.

(ii) The "Melting" process on the basis of kinetic theory of matter can be explained as:

(a) The heat energy given to the solid is absorbed by its particles and thus, gaining kinetic energy.

(b) The kinetic energy gained by the particles, increases the rate of vibration of particles.

(c) The kinetic energy of the particles overcome the force of attraction, and thus, the particles from the surface of solid becomes free and hence the state changes from solid to liquid.

(ii) Boiled water tastes flat because it does not contain matter such as air, carbon dioxide and other minerals.

(b)

i. $3Fe + 4H_2O \leftrightharpoons Fe_3O_4 + 4H_2$

ii. The reaction is reversible because if hydrogen formed is not removed, then the iron oxide formed is reduced back to iron.

iii. Because the reaction is a reversible reaction, equilibrium is attained at 700°C. At this stage, the amount of reactants and products does not change

Sodium atom	Sodium ion
Sodium atom is electrically neutral.	Sodium ion is positively charged.
In sodium atom, there are 11 protons and 11 electrons, i.e. equal number of protons and electrons.	In sodium ion, there are 11 protons but 10 electrons, i.e. sodium ion contains lesser number of electrons.
Sodium atom has only one electron in its valence shell.	Sodium ion has 8 electrons in its valence shell.
Size of a sodium atom is larger than a sodium ion.	Size of a sodium ion is smaller than a sodium atom.

Answer 3

(a) (i) $HCl + NaOH \rightarrow NaCl + H_2O$

(ii) $AgNO_3 + NaCl \rightarrow AgCl\downarrow + NaNO_3$

(iii) $2K + 2H_2O \rightarrow 2KOH + H_2$

(iv) $NH_4Cl \underset{\text{cool}}{\overset{\Delta}{\rightleftharpoons}} NH_3 + HCl$

(v) $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

(b)

(i) Oxidized
(ii) Oxidized
(iii) Reduced
(iv) Oxidized
(v) Oxidized

Answer 4

(a)

(i) Solution: A homogeneous mixture of two or more substances which are chemically non reacting, whose composition can be varied within certain limits is called a solution.

(ii) Crystallisation: It is the process by which crystals of a substance separate out on cooling its hot saturated solution

(iii) Hard water: Water is said to be hard when it does not readily form lather with soap.

(b) The substances which easily absorb moisture from the other substances are called drying agents.

Name of the gas	Drying agent
(i) Chlorine	Conc. H_2SO_4
(ii) Hydrogen chloride	Conc. H_2SO_4
(iii) Ammonia	CaO
(iv) Sulphur dioxide	Conc. H_2SO_4

(c)

i. The chemical bond formed due to the electrostatic force of attraction between a cation and an anion is called an electrovalent bond.

ii. Water dissolves many substances forming an aqueous solution. It can dissolve solids, liquids and gases. When a solid dissolves in water, the solid is the solute, the water is the solvent and the resultant liquid is the solution. So, it is said that water is a universal solvent. In other words, water can dissolve nearly every substance..

Answer 5

(a)

(i) Rubidium
(ii) Copper
(iii) Oxygen
(iv) Chlorine
(v) Krypton

(b)

(i) VII A
(ii) Third period
(iii) Seven
(iv) Valency of T = –1
(v) Non - metal

Answer 6

(a)

(i) An atom is electrically neutral because the number of positively charged particles i.e., protons is equal to the number of negatively charged particles i.e., electrons.

(ii) Mass of an atom is contributed by the mass of the protons and neutrons present inside the nucleus of an atom and the electrons present outside the nucleus are of negligible mass therefore mass of atom is concentrated inside the nucleus of an atom.

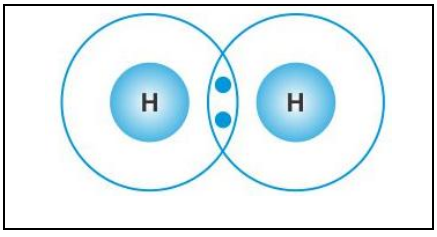
(iii) The size of the nucleus is very small as compared to the size of an atom, therefore, atom as a whole is an empty space.

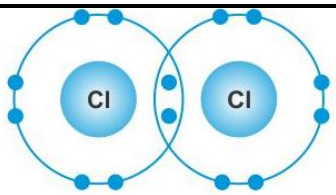
(iv) According to Rutherford the protons are present inside the nucleus and electrons are revolving around the nucleus. Electron continuously loses energy and ultimately it falls nto the nucleus following a spiral path and thus the nucleus of an atom gets destroyed.

(v) Mass numbers are different of two isotopes of magnesium because of different number of neutron, that is, 12 and 14 respectively present in the nucleus of the isotopes of magnesium.

(b) Similarity of hydrogen with alkali metals and halogens.

	Similarity of hydrogen with alkali metals [Group 1 (IA)]	**Similarity of hydrogen with halogens [Group 17 (VIIA)]**
Electronic configuration	Electronic configuration = 1. Thus, 1electron in the outermost valence shell. Example: H=**1**; Li= 2, **1**; Na=2,8,**1**; K=2,8,8,**1**	One electron less than the nearest noble gas. Example: H= 1 (He=2) F= 2,7 (Ne=2,8) Cl= 2,8,7 (Ar=2,8,8)
Ion formation	Electropositive character exhibited. $H - 1e^- \rightarrow H^{1+}$ $Li - 1e^- \rightarrow Li^{1+}$ $Na - 1e^- \rightarrow Na^{1+}$	Electronegative character exhibited. $H + 1e^- \rightarrow H^{1-}$ $F + 1e^- \rightarrow F^{1-}$ $Cl + 1e^- \rightarrow Cl^{1-}$
Valency	Electrovalency of 'one' exhibited.	Electrovalency and covalency exhibited.

	H^{1+} , Li^{1+} , Na^{1+}	**Hydrogen**: forms NaH (electrovalent)forms CH_4 (covalent) **Chlorine**: forms NaCl (electrovalent) forms CCl_4 (covalent)
Reactions	Strong affinity for non-metals (example: O, S, Cl) **Hydrogen**: forms H_2O; H_2S; HCl **Sodium**: forms Na_2O; Na_2S; NaCl	—
Reducing agent	Acts as a reducing agent. **Hydrogen**: $CuO + H_2 \rightarrow Cu + H_2O$ **Sodium**: $CuO + 2Na \rightarrow Cu + Na_2O$	—
Atomicity	—	Diatomic molecules are formed. (Two atoms linked by a single bond) **Hydrogen** H:H or H-H $\rightarrow$ H_2  **Chlorine** Cl:Cl or Cl-Cl $\rightarrow$ Cl_2

Resemblance with Halogens:

(i) Both exist in the form of diatomic molecules.
(ii) Both show gaseous nature.
(iii) Both have a valency of 1.
(iv) Both are non-metals.
(v) Both lose electron to term anions.

Answer 7

(a)

V = 3 liters t = $0^oC = 0 + 273 = 273$ K

V_1 = ?

$T_1 = -20^oC = -20^o + 273 = 253$ K

$P = P_1$

Using gas equation,

$$\frac{PV}{T} = \frac{P_1V_1}{T_1}$$

$$\frac{3 \times P}{273} = \frac{V_1 \times P}{253} \quad [\because P = P_1]$$

$$\therefore V_1 = \frac{3 \text{ X } 253}{273}$$

= 2.78 liters

$\therefore V_1$ = 2.78 liters

(b) Acid rain

Factories in big cities release nitrogen dioxide and sulphur dioxide as their wastes. These gases dissolve in rainwater during rains and form nitrous acid and sulphurous acid. As the rain falls, these acids come down to the ground as an acid rain.

The normal rain is slightly acidic having a pH about 5·6 as carbon dioxide gas reacts with it to form a weak carbonic acid.

$$CO_2 + H_2O \rightarrow H_2CO_3$$
(Carbonic acid)

The pH of acid rain ranges between 5·6 - 3·5 and in some cases pH can go even lower than 2.

The two forms of deposition of acid rains are:

1. Dry deposits-Particles containing sulphates and nitrates.
2. Wet deposits-dew, rain, fog, smoke.

Formation of acid rain

- Acid rain refers to rain which has pH less than 5.6. It is mainly caused by atmospheric pollutants.
- **Natural sources:** Bacterial decomposition, forest fires, volcanic eruptions.
- **Man made sources:** Industries and smelting plants, automobile exhausts, power plants etc.
- **Oxides of nitrogen and sulphur** interact with water vapour in presence of sunlight in the atmosphere to form nitric acid and sulphuric acid mist respectively. This mist remains as vapours at high temperatures and condenses at low temperatures. These acids mix with rain (snow or fog) and fall down on the Earth resulting in acid rain.

Causes of acid rain

- The formation of mineral acids like carbonic acid, nitric acid and sulphuric acid is the main cause of acid rain.

Formation of Nitric acid and Nitrous acid

- Nitrogen and oxygen (that is oxides of nitrogen) combines in the presence of thunder and lightning to form nitric acid.
- They are also produced by internal combustion engines (automobile engines). This then gets oxidized in the atmosphere to nitrogen dioxide. Nitrogen dioxide combines with water to form a mixture of nitrous acid and nitric acid.

$$N_2 + O_2 \rightarrow 2NO$$

(Nitrogen oxide)

$$2NO + O_2 \rightarrow 2NO_2$$

(Nitrogen dioxide)

$$2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$$

(Nitrous acid) (Nitric acid)

Formation of Sulphuric acid and Sulphurous acid

1. Impurities in the coal: Coal used in power plants contains upto 4% sulphur. On combustion it forms pollutant sulphur dioxide (i.e, oxides of sulphur).

$$S + O_2 \rightarrow SO_2$$

(Sulphur dioxide)

2. Sulphur dioxide reacts with water vapour to form sulphurous acid.

$$SO_2 + H_2O \rightarrow H_2SO_3$$

(Sulphurous acid)

3. Sulphur dioxide can also be oxidized to sulphur trioxide.

$$2SO_2 + O_2 \rightarrow 2SO_3$$

(Sulphur trioxide)

4. Sulphur trioxide reacts with water vapour to form sulphuric acid.

$$SO_3 + H_2O \rightarrow H_2SO_4$$

(Sulphuric acid)