

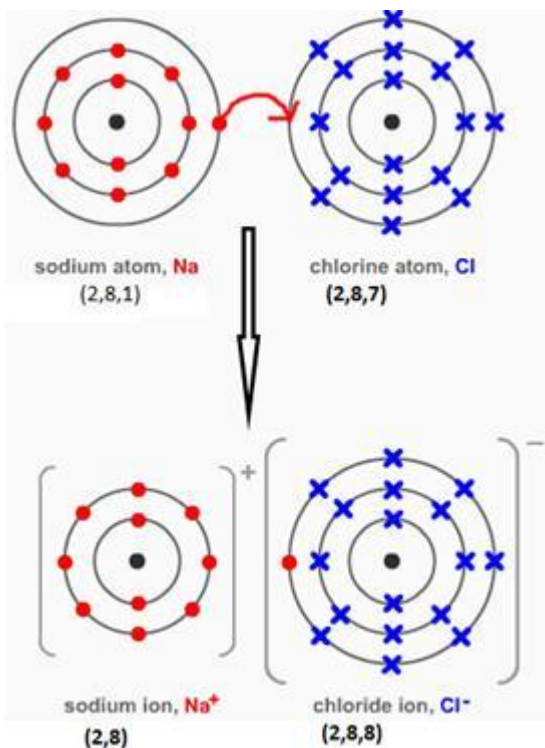
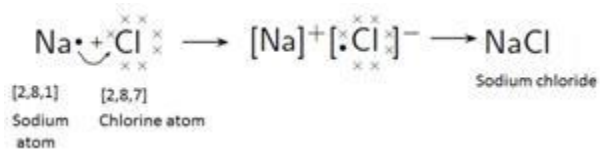
ICSE Board
Class IX Chemistry
Paper – 8 Solution

SECTION I

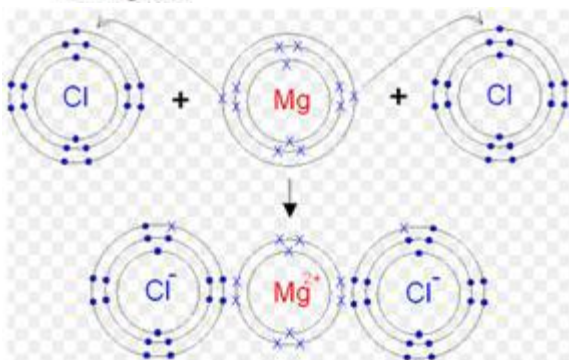
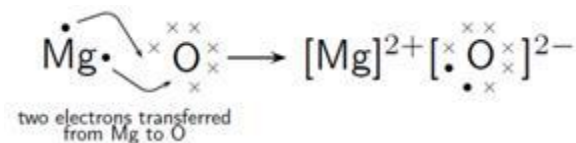
Answer 1

(a)

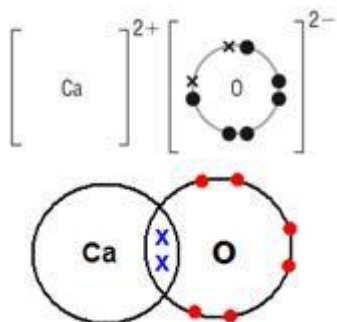
i. NaCl



ii. MgCl₂



iii. CaO



(b)

- Copper gets oxidised from 0 to +2 oxidation state.
- Magnesium gets oxidised from 0 to +2 oxidation state.
- Iron gets reduced from +3 to 0 oxidation state.
- Copper gets reduced from +2 to 0 oxidation state.
- Iron gets oxidised from +2 to +3 oxidation state.

(c) The outermost shell of all the noble gases is complete. Thus, its valency is zero. 'M' has three electrons more than the noble gas. Thus, the valency of the element 'M' is +3.

- MCl_3
- $\text{M}_2(\text{SO}_4)_3$
- $\text{M}(\text{OH})_3$
- MPO_4
- M_2O_3

(d)

- Silicate: The valency is -2 and the formula is SiO_4^{2-} .
- Hydroxide: The valency is -1 and the formula is OH^- .
- Acetate: The valency is -1 and the formula is CH_3COO^- .
- Bisulphite: The valency is -1 and the formula is HSO_3^- .
- Bisulphate: The valency is -1 and the formula is HSO_4^- .

(e)

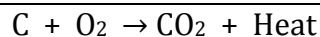
- sparingly
- hydrogen sulphide
- 2, 8, 2
- directly
- One, four

(f)

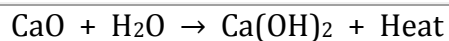
Exothermic reaction: A chemical reaction which takes place with the release of heat energy.

Example:

Carbon burns in oxygen to form carbon dioxide and heat energy is produced.



When water is added to quick lime (calcium oxide), slaked lime (calcium hydroxide) is produced with a lot of heat energy.



Endothermic reaction: A chemical reaction which takes place with the absorption of heat energy.

Example:

Formation of carbon disulphide



When nitrogen and oxygen are heated together to a particular temperature of about 3000°C, nitric oxide gas is formed.



(g)

- i. Hydrogen gas
- ii. Hydrogen sulphide gas
- iii. Oxygen gas
- iv. Carbon dioxide gas
- v. Oxygen gas

(h)

- i. (d)
- ii. (a)
- iii. (b)
- iv. (e)
- v. (c)

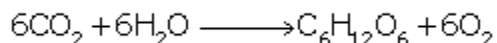
SECTION II

Answer 2

(a)

i. It is a reaction which occurs with absorption of light energy.

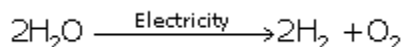
Example: Photosynthesis



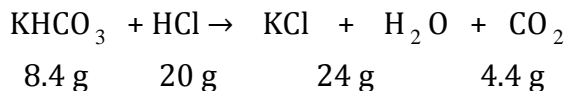
ii. It is a reaction which occurs with absorption of electrical energy.

Example:

Acidulated water breaks into hydrogen and oxygen.



(b)



$$\begin{aligned} \text{Total mass of the reactants (KHCO}_3 + \text{HCl)} &= 8.4 + 20 \\ &= 28.4 \text{ g} \end{aligned}$$

$$\begin{aligned} \text{Total mass of the products (KCl + H}_2\text{O + CO}_2\text{)} &= 24 + 4.4 \\ &= 28.4 \text{ g} \end{aligned}$$

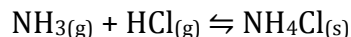
Because the total mass of the products is equal to the total mass of the reactants, the observations are in accordance with the law of conservation of mass.

(c)

i.

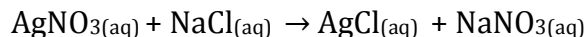
(a) Change of state

Ammonia gas reacts with HCl gas to give solid ammonium chloride.



(b) Formation of precipitate

When a solution of silver nitrate is added to a solution of sodium chloride, a white insoluble substance, silver chloride, is formed.



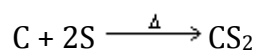
ii. Exothermic reaction:

When carbon burns in oxygen to form carbon dioxide, a lot of heat is produced.



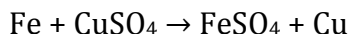
Endothermic reaction:

When carbon is heated with sulphur at high temperature, liquid carbon disulphide is formed.



iii. Colour change

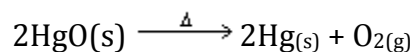
When a few pieces of iron are added into a blue-coloured copper sulphate solution, the blue colour of copper sulphate fades and eventually turns into light green due to the formation of ferrous sulphate.



(d)

Decomposition is the breaking up of a compound either into elements or simpler compounds such that these products do not combine to form the original compound. Decomposition may occur in the presence of heat or light or by the passage of an electric current.

Example: Mercuric oxide when heated decomposes to form two elements-mercury and oxygen.



Answer 3

(a) Boyle's law

Statement: At constant temperature, the volume of a given mass of a dry gas is inversely proportional to its pressure.

$$V \propto \frac{1}{P} \text{ (At Constant Temperature)}$$

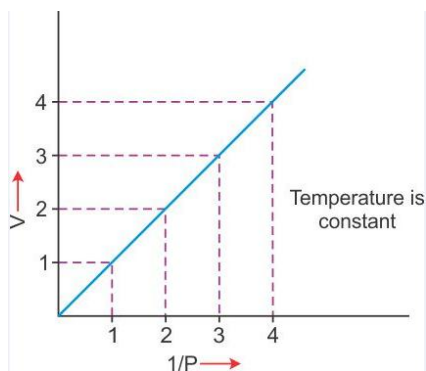
$$\therefore V = K \frac{1}{P} \text{ (K=Constant)}$$

$$\therefore PV = K = \text{Constant}$$

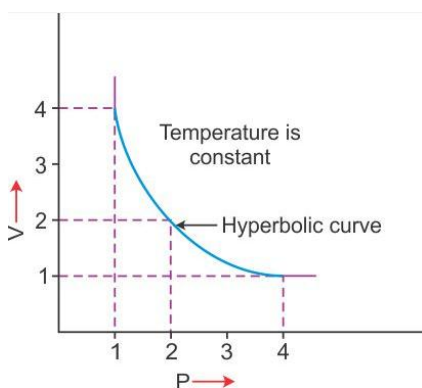
$$P_1V_1 = P_2V_2 = K \text{ (T = Constant)}$$

Graphical verification of Boyle's law

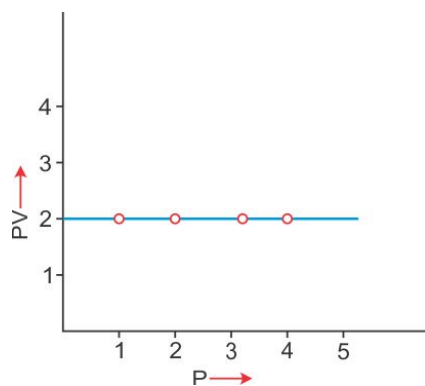
1. **V versus $\frac{1}{P}$** : Variation in volume (V) plotted against ($\frac{1}{P}$) at a constant temperature – a straight line passing through the origin is obtained.



2. **V versus P:** Variation in volume (V) plotted against pressure (P) at a constant temperature – a hyperbolic curve in the first quadrant is obtained.



3. **PV versus P:** Variation in PV plotted against pressure (P) at a constant temperature – a straight line parallel to the X-axis is obtained.



(b)

- i. Mercuric oxide and silver oxide
- ii. Chlorine
- iii. Sulphur dioxide
- iv. Copper, Silver
- v. Silver carbonate

Answer 4

(a)

Valencies of aluminium, ammonium and zinc are 3, 1 and 2, respectively.

The valency of sulphate is 2.

Hence, chemical formulae of the sulphates of aluminium, ammonium and zinc are $\text{Al}_2(\text{SO}_4)_3$, $(\text{NH}_4)_2\text{SO}_4$ and ZnSO_4 .

(b) The salt mainly used for cooking purpose is common salt (NaCl) and its solubility does not change with temperature.

(c)

- Washing soda: $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
- Potassium permanganate: KMnO_4
- Hydrated ferrous sulphate or green vitriol: $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
- Hydrated copper sulphate or blue vitriol: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
- Ammonium chloride: NH_4Cl

Answer 5

(a)

i.

Element	Group	Period	Element Configuration		
			K	L	M
A	17	3	2	8	7

ii.

Metal	Non-metal	Inert gas
B	A	E
	B	
	C	

iii.

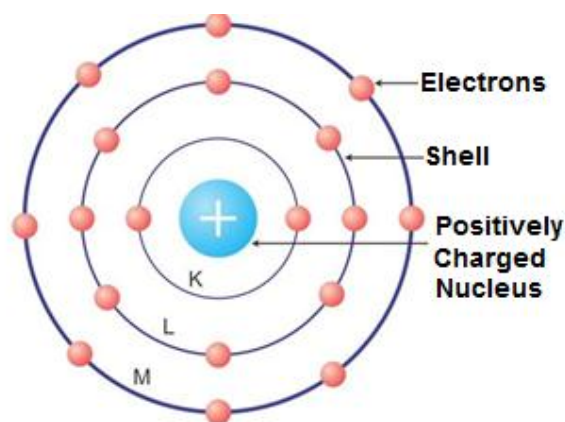
Element	Element Configuration		
	K	L	M
A	2	8	7
B	2	8	1
C	2	4	—
D	2	6	—
E	2	8	8

(b) Bohr's model of an atom

In 1913, Niels Bohr, a Danish physicist, explained the causes of the stability of the atom in a different manner.

Niels Bohr revised Rutherford's atomic model and put forth the following suggestions:

- Electrons possess a specific amount of energy which allows them to revolve around the nucleus.
- An atom contains discrete orbits which correspond to a specific amount of energy. Hence, these orbits are also known as energy levels.
The energy levels of an atom are represented as **K, L, M, N** and so on or the numbers $n = 1, 2, 3, 4$ and so on.



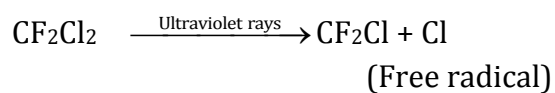
Bohr's Model of an Atom

- The electrons are confined to these energy levels. While revolving in these discrete orbits, electrons do not radiate energy. Hence, these orbits are also known as '**stationary orbits**' or '**stationary shells**'. Smaller the size of the orbit, smaller is its energy.
- As we move away from the nucleus, the energy of the orbit increases progressively.
- The transfer of an electron from one orbit to another is always accompanied with absorption or emission of energy.
- When an electron jumps from a lower energy level to a higher energy level, it **absorbs energy**.
- When an electron returns from a higher energy level to a lower energy level, it **emits energy**.

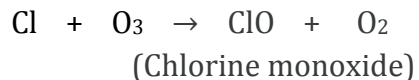
Answer 6**(a)**

Element	Element Configuration				Valency	Type of Element
	K	L	M	N		
P	2	8	2	–	2	Metal
Q	2	8	8	1	1	Metal
R	2	8		–	5	Non-metal
S	2	8	8	–	8	Inert gas
T	2	8	–	–	6	Non-metal

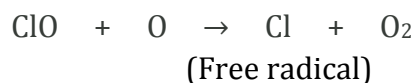
(b) Chlorofluorocarbons are decomposed by ultraviolet rays to highly reactive chlorine which is produced in the atomic form.



The free radical [Cl] reacts with ozone to form chlorine monoxide.



This causes depletion of the ozone layer. Chlorine monoxide then reacts with atomic oxygen to produce more chlorine free radicals.



Again this free radical destroys ozone, and the process continues, depleting the ozone layer.

Answer 7

(a) Initial volume of gas $V_1 = 5.6 \text{ dm}^3$

Initial pressure of gas $P_1 = 2 \text{ atm}$

$$\text{The 20\% of initial pressure} = 2 \times \frac{20}{100} = \frac{4}{10} = 0.4$$

Final pressure $P_2 = 0.4 + 2 = 2.4 \text{ atm}$

Final volume $V_2 = ?$

$$P_1 V_1 = P_2 V_2$$

$$2 \times 5.6 = 2.4 \times V_2$$

$$V_2 = \frac{5.6 \times 2}{2.4} = 4.67 \text{ dm}^3$$

(b) Initial volume of gas (V_1) = 100 cm^3

Initial temperature (T_1) = $27 + 273 = 300 \text{ K}$

Final volume (V_2) = ?

Final temperature (T_2) = $20 + 273 = 293 \text{ K}$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{100}{300} = \frac{V_2}{293}$$

$$V_2 = \frac{100 \times 293}{300}$$

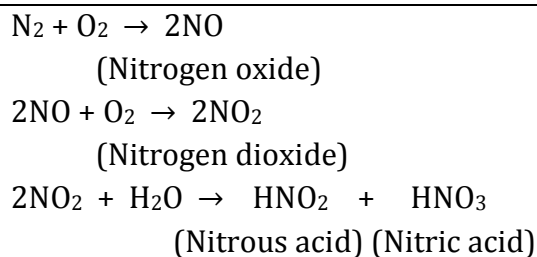
$$= 97.66 \text{ cm}^3$$

(c) Causes of acid rain

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

Formation of nitric acid and nitrous acid

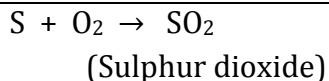
- Nitrogen and oxygen combine in the presence of thunder and lightning to form nitrogen oxide.
- Nitrogen oxide then gets oxidised in the atmosphere to form nitrogen dioxide. Nitrogen dioxide combines with water to form a mixture of nitrous acid and nitric acid.



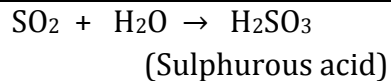
- They are also produced by internal combustion engines (automobile engines).

Formation of sulphuric acid and sulphurous acid

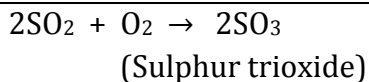
1. Impurities in coal: Coal used in power plants contains up to 4% sulphur. On combustion, it forms pollutant sulphur dioxide (i.e. oxides of sulphur).



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



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



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

