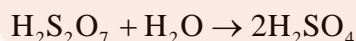
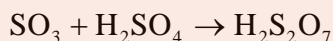
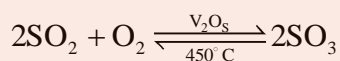
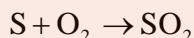


*Book Name: Selina Concise***Solution 1:**

- (a) Sulphuric acid is called King of Chemicals because there is no other manufactured compound which is used by such a large number of key industries.
- (b) Sulphuric acid is referred to as Oil of vitriol as it was obtained as an oily viscous liquid by heating crystals of green vitriol.

Solution 2:

- (a) Two balanced equations to obtain SO_2 is:
- (i) $4\text{FeS}_2 + 11\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3 + 8\text{SO}_2$
- (ii) $\text{S} + \text{O}_2 \rightarrow \text{SO}_2$
- (b) The conditions for the oxidation of SO_2 are:
- (i) The temperature should be as low as possible. The yield has been found to be maximum at about $410^\circ\text{C} - 450^\circ\text{C}$
- (ii) High pressure (2 atm) is favoured because the product formed has less volume than reactant.
- (iii) Excess of oxygen increases the production of sulphur trioxide.
- (iv) Vanadium pentoxide or platinised asbestos is used as catalyst.
- (c) Sulphuric acid is not obtained directly by reacting SO_3 with water because the reaction is highly exothermic which produce the fine misty droplets of sulphuric acid that is not directly absorbed by water.
- (d) The chemical used to dissolve SO_3 is concentrated sulphuric acid. The product formed is oleum.
- (e) Main reactions of this process are:



Solution 3:

Water is not added to concentrated acid since it is an exothermic reaction. If water is added to the acid, there is a sudden increase in temperature and the acid being in bulk tends to spurt out with serious consequences.

Solution 4:

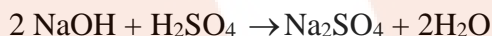
Impurity of ARSENIC poisons the catalyst [i.e. deactivates the catalyst]. So, it must be removed before passing the mixture of SO₂ air through the catalytic chamber.

Solution 5:

Balanced reactions are:

(a) Acidic nature:

(i) Dilute H₂SO₄ reacts with basic oxides to form sulphate and water.



(ii) $\text{CuO} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O}$

(iii) It reacts with carbonate to produce CO₂.

**(b) Oxidising agent:**

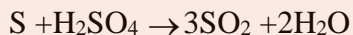
Nascent oxygen oxidizes non-metals, metals and inorganic compounds.

For example,

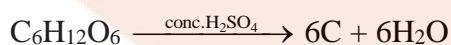
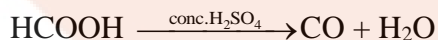
Carbon to carbon dioxide



Sulphur to sulphur dioxide

**(c) Hygroscopic nature:**

It has great affinity for water. It readily absorbs moisture from atmospheric air.



(d) Non-volatile nature:

It has a high boiling point (356°C) so it is considered to be non-volatile. Therefore, it is used for preparing volatile acids like hydrochloric acid, nitric acid from their salts by double decomposition reaction.

**Solution 6:**

- (a) Bring a glass rod dipped in Ammonia solution near the mouth of each test tubes containing dil. HCl and dil. H_2SO_4 each.

Dil HCl	Dil. H_2SO_4
White fumes of ammonium chloride	No such fumes

(b)

1. Dilute sulphuric acid treated with zinc gives Hydrogen gas which burns with pop sound. Concentrated H_2SO_4 gives SO_2 gas with zinc and the gas turns Acidified potassium dichromate paper green.
2. Barium chloride solution gives white ppt. with dilute H_2SO_4 , This white ppt. is insoluble in all acids.
Concentrated H_2SO_4 and NaCl mixture when heated gives dense white fumes if glass rod dipped in Ammonia solution is brought near it.

Solution 7:

- (a) When sulphuric acid reacts with sulphur the product formed is Sulphur dioxide is formed.
$$\text{S} + 2\text{H}_2\text{SO}_4 \rightarrow 3\text{SO}_2 + 2\text{H}_2\text{O}$$
- (b) When sulphuric acid reacts with sodium hydroxide it neutralizes base to form sodium sulphate.
$$2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$$
- (c) When sulphuric acid reacts with sugar it forms carbon
$$\text{C}_{12}\text{H}_{22}\text{O}_{11} \xrightarrow{\text{conc. H}_2\text{SO}_4} 12\text{C} + 11\text{H}_2\text{O}$$
- (d) When sulphuric acid reacts with carbon it forms carbon dioxide and sulphur dioxide gas.
$$\text{C} + 2\text{H}_2\text{SO}_4 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O} + 2\text{SO}_2 \uparrow$$
- (e) When sulphuric acid reacts with copper it forms copper sulphate and sulphur dioxide.
$$\text{Cu} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + 2\text{H}_2\text{O} + \text{SO}_2 \uparrow$$

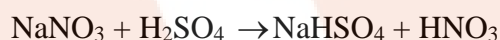
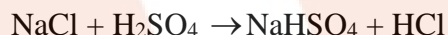
Solution 8:

(a) Concentrated sulphuric acid is hygroscopic substance that absorbs moisture when exposed to air. Hence, it is stored in air tight bottles.

(b) Sulphuric acid is not a drying agent for H_2S because it reacts with H_2S to form sulphur.



(c) Concentrated sulphuric acid has high boiling point (356°C). So, it is considered to be non-volatile. Hence, it is used for preparing volatile acids like Hydrochloric acid and Nitric acids from their salts by double decomposition.

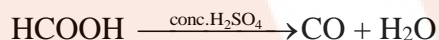
**Solution 9:**

(a) Due to its reducing property. i.e, it is a non-volatile acid.

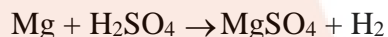


(Conc.)

(b) It is a dehydrating agent.



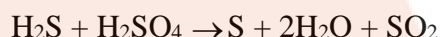
(c) Magnesium is present above hydrogen in the reactivity series so sulphuric acid is able to liberate hydrogen gas by reacting with magnesium strip.



(d) Due to its oxidizing character



(e) Due to its oxidizing property Hydrogen sulphide gas is passed through concentrated sulphuric acid to liberate sulphur dioxide and sulphur is formed.

**Solution 10:**

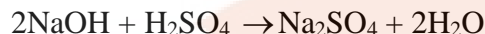
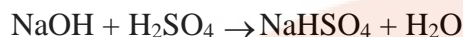
The name of the salt of

(a) Hydrogen sulphites and Sulphites.

(b) Sulphate and bisulphate.

Solution 11:

- (a) Two types of salts are formed when sulphuric acid reacts with NaOH because sulphuric acid is dibasic.



- (b) When hydrogen bromide reacts with sulphuric acid the bromine gas is obtained which produce red brown vapours.



- (c) A piece of wood becomes black when concentrated sulphuric acid is poured on it because it gives a mass of carbon.

- (d) When sulphuric acid is added to sodium carbonate it liberates carbon dioxide which produces brisk effervescence.

**Solution 12:**

Column 1 Substance reacted with acid	Column 2 Dilute or concentrated acid	Column 3 Gas
Substance reacted with acid	Dilute or concentrated sulphuric acid	Gas
Zinc	Dilute sulphuric acid	Hydrogen
Calcium carbonate	Concentrated sulphuric acid	Carbon dioxide
Bleaching power CaOCl_2	Dilute sulphuric acid	only chlorine

Solution 1(2004):

Hydrogen sulphide (H_2S) can be oxidized to sulphur.

Solution 2(2004):

When sodium sulphide is added to solution of HCl, Hydrogen sulphide gas is produced. It has rotten egg like smell.

Solution 3(2004):

- (a) The catalyst which helps in the conversion of sulphur dioxide to sulphur trioxide in step C is Vanadium pentoxide.
- (b) The two steps for the conversion of sulphur trioxide to sulphuric acid is:
- (i) $\text{SO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{H}_2\text{S}_2\text{O}_7$
- (ii) $\text{H}_2\text{S}_2\text{O}_7 + \text{H}_2\text{O} \rightarrow 2\text{H}_2\text{SO}_4$
- (c) The substance that will liberate sulphur dioxide in step E is dilute H_2SO_4 .
- (d) The equation for the reaction by which sulphur dioxide is converted to sodium sulphite in step F is:
- $$\text{SO}_2 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_3 + \text{H}_2\text{O} \quad \text{Or}$$
- $$\text{Na}_2\text{O} + \text{SO}_2 \rightarrow \text{Na}_2\text{SO}_3$$

Solution 1(2006):

- (a) The process used for the large-scale manufacture of sulphuric acid is Contact process.
- (b) Sulphuric acid has great affinity for water. It readily removes element of water from other compound. Thus it acts as a dehydrating agent.
- (c) Concentrated acid is non-volatile thus it is used for the preparation of volatile acids:
- $$\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{NaHSO}_4 + \text{HCl}$$
- Concentrated acid act as an oxidizing agent:
- $$\text{C} + 2\text{H}_2\text{SO}_4 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O} + 2\text{SO}_2$$

Solution 1(2007):

- (i) B
- (ii) D
- (iii) C
- (iv) A
- (v) A

Solution 2(2007):

- (a) The acid formed when sulphur dioxide dissolves in water is sulphurous acid.
- (b) Carbondioxide gas is released when sodium carbonate is added to solution of sulphur dioxide.

Solution 1(2008):

- (a) Concentrated sulphuric acid is non-volatile; hence it is used for the preparation of higher volatile acids.
- (b) Due to its dehydrating nature sugar turns black in the presence of concentrated sulphuric acid.