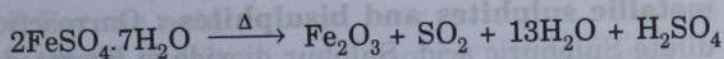


Sulphuric Acid

IMPORTANT POINTS TO REMEMBER

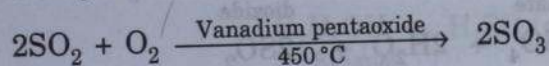
1. Sulphuric acid is called as **king of chemicals**. It is commonly called as **oil of vitriol**.
2. It was prepared during the **distillation of green vitriol** ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$)



3. Sulphuric acid is manufactured by **Contact process**.

(a) Catalytic oxidation of Sulphur dioxide in Catalytic chamber :

The gases entering the catalytic chamber must be pure, otherwise it would poison the catalyst.



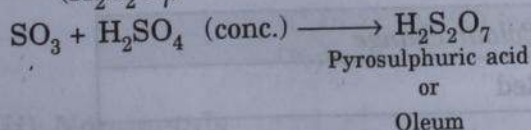
The catalyst **glows red hot** because the reaction is **exothermic** in nature. So, only initial heating of the catalyst is required.

(b) Absorption tower :

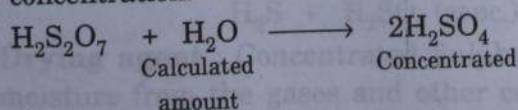
SO_3 formed in **catalytic chamber** is **not directly absorbed** in **Water** because :

- (i) The reaction is highly **exothermic** in nature.
- (ii) It forms a **homogeneous mixture**, a **dense mist** of minute particles of **Sulphuric acid** is formed which is **not easily condensed**.

Instead Sulphur trioxide formed is absorbed in concentrated Sulphuric acid to form Pyrosulphuric acid or Oleum ($\text{H}_2\text{S}_2\text{O}_7$)



- (c) **Dilution of Oleum** : It is diluted by adding calculated amount of water to obtain concentrated Sulphuric acid of desired concentration.

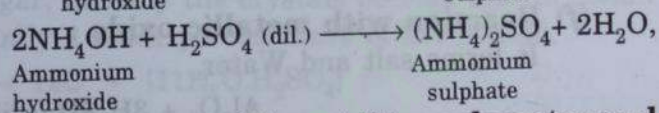
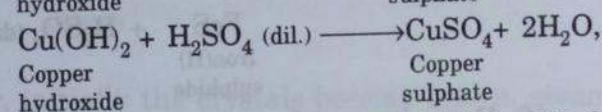
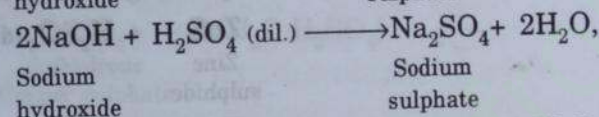
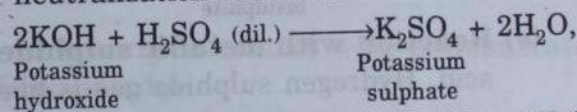


4. Concentrated Sulphuric acid is **colourless, odourless, viscous hygroscopic liquid** which is **soluble** in **Water** in all proportions.

5. It is a **strong dibasic acid**. The salts of Sulphuric acid are called as **Sulphates** and **Bisulphates**. Dilute Sulphuric acid shows the typical properties of dilute acids.

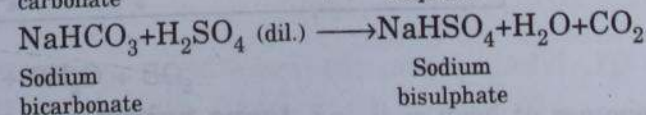
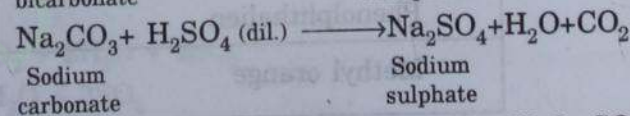
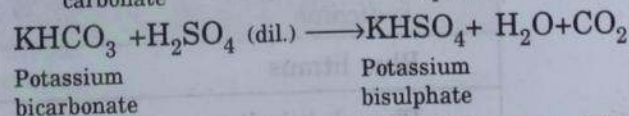
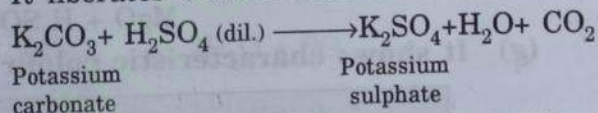
(a) Reaction with bases :

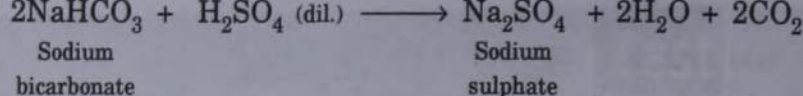
It forms salt and Water. It undergoes neutralization reaction.



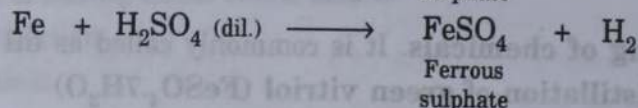
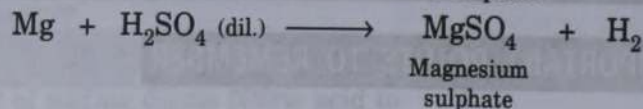
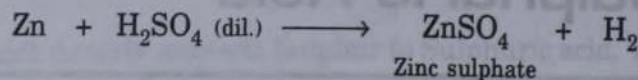
(b) Reaction with metallic carbonates and bicarbonates :

It liberates Carbon dioxide.

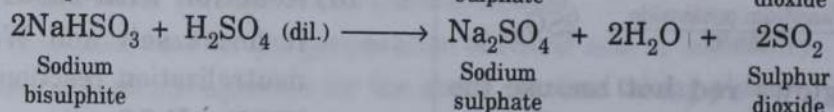
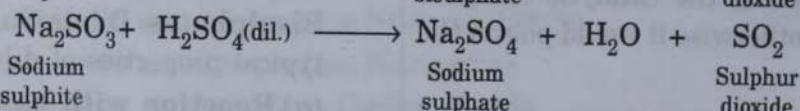
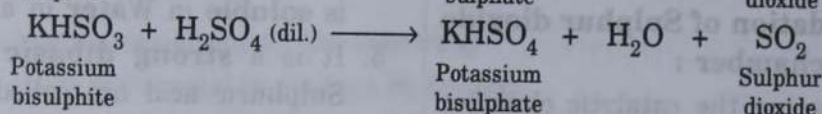
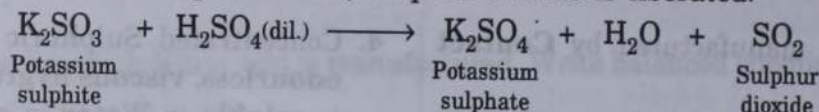




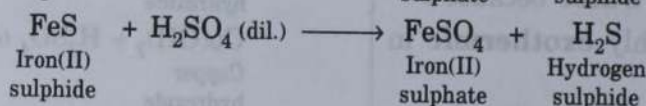
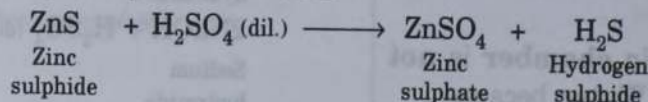
(c) **Reaction with Active metals :** On reaction of active metals with dilute acids hydrogen gas is liberated.



(d) **Reaction with metallic sulphites and bisulphites :** On reaction of metallic sulphites and bisulphites with dilute Sulphuric acid, Sulphur dioxide is liberated.

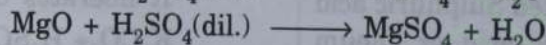
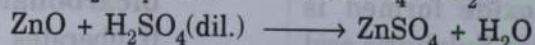
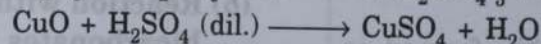
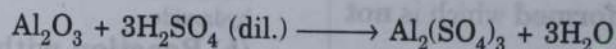


(e) **Reaction with metallic sulphides :** On reaction with metallic sulphides with dilute Sulphuric acid, Hydrogen sulphide gas is liberated.



(f) **Reaction with metallic oxide :**

It forms salt and Water.

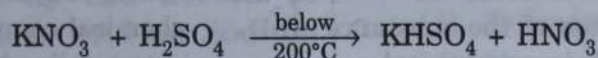
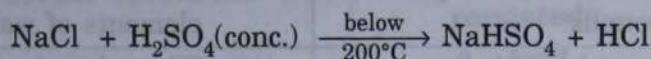


(g) **It shows characteristic colour change with indicators :**

Indicator	Colour change
Blue litmus	Red
Phenolphthalien	Remains colourless
Methyl orange	Red or Pink

6. Concentrated Sulphuric acid acts as

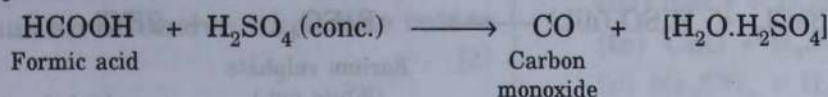
(a) **Least volatile acid** : Nitrates and chlorides on reaction with concentrated sulphuric acid form their corresponding acids, which are **more volatile** than sulphuric acid.



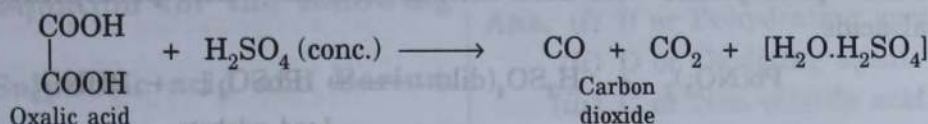
(b) Dehydrating agent :

Concentrated Sulphuric acid acts as dehydrating agent as it has strong affinity for Water. Dehydrating agent is a chemical compound which removes chemically combined elements of Water, Hydrogen and Oxygen in the ratio of 2 : 1.

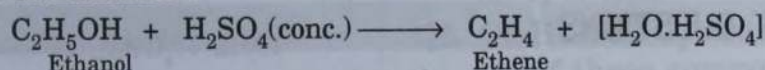
(i) Dehydration of Formic acid :



(ii) Dehydration of Oxalic acid :

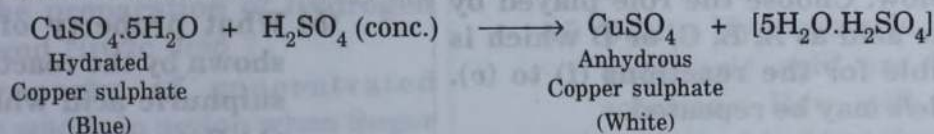


(iii) Dehydration of Ethanol :



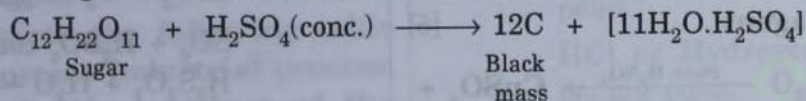
(iv) Dehydration of Blue vitriol ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) :

Blue coloured crystalline Copper sulphate on coming in contact with **concentrated H_2SO_4** becomes **white** and **crumbles** down to form **powder**.



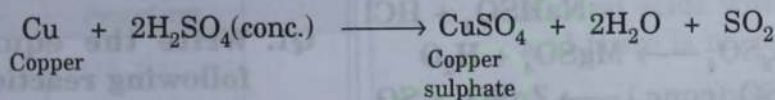
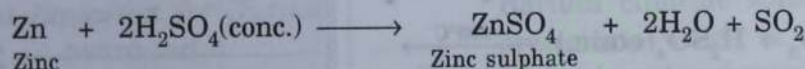
(v) Dehydration of Sugar :

On adding concentrated Sulphuric acid to Sugar, initially the crystals become brown, steam is released causing a lot of frothing and finally a black porous mass is left behind.

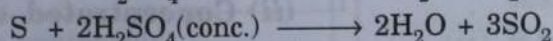


(c) Oxidizing agent : It oxidises

(i) Metals



(ii) Non-metals



(iii) Inorganic compounds



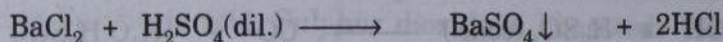
(d) **Drying agent** : Concentrated Sulphuric acid acts as a **drying agent**, i.e., it is used to remove moisture from the gases and other compounds, without undergoing any chemical reaction.

7. Difference between drying agent and dehydrating agent :

Drying agent	Dehydrating agent
(i) It removes moisture from the gases and other compounds.	(i) It removes chemically combined elements of water in the ratio of 2 : 1
(ii) When drying agent is used, the chemical composition of the substance remains unaltered, i.e., a physical change takes place.	(ii) When dehydrating agent is used, the chemical composition of the substance gets totally changed or altered, i.e., a chemical change takes place.

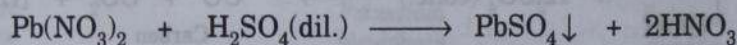
8. Test for Sulphuric acid :

- (a) It gives a **white precipitate** with **Barium chloride** solution. **White precipitate** is **insoluble** in all the **mineral acids**.



Barium sulphate
(White ppt.)

- (b) It gives a **white precipitate** with Lead nitrate solution. **White precipitate** is **insoluble** in all the mineral acids.



Lead sulphate
(White ppt.)

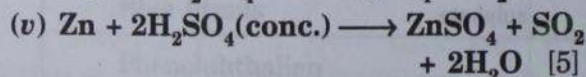
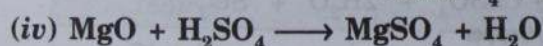
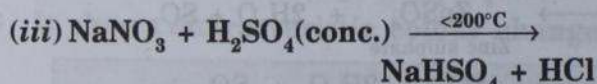
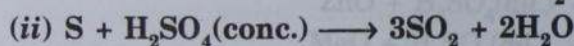
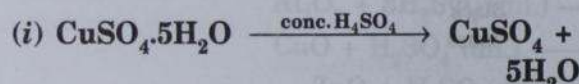
PREVIOUS YEARS' QUESTIONS

2012

- Q1. Some properties of sulphuric acid are listed below. Choose the role played by sulphuric acid as A, B, C, or D which is responsible for the reactions (i) to (v). Some role/s may be repeated.

- A. Dilute acid
B. Dehydrating agent
C. Non-volatile acid
D. Oxidising agent

[5]



Ans. (i) B (ii) D (iii) C (iv) A (v) D

2011

- Q1. What do you observe when sugar crystals are added to a hard glass test tube containing concentrated sulphuric acid.

Ans. Sugar chars to give black porous mass.

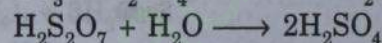
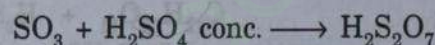
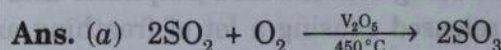
- Q2. (a) With the help of equations, give an outline for the manufacture of sulphuric acid by contact process.

- (b) What property of sulphuric acid is shown by the reactant of concentrated sulphuric acid when heated with

(A) Potassium nitrate

(B) Carbon

[2]



- (b) (A) – non-volatile nature

(B) – oxidizing agent

2010

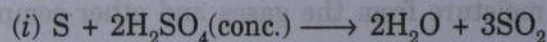
- Q1. Write the equation for each of the following reactions :

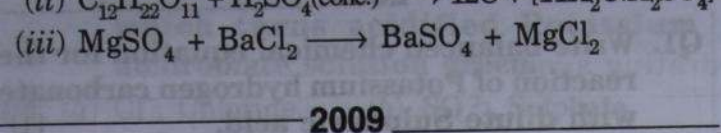
- (i) Sulphur is heated with concentrated sulphuric acid.

- (ii) Concentrated sulphuric acid is poured over sugar.

- (iii) Magnesium sulphate solution is mixed with barium chloride solution. [3]

Ans.





Q1. Name the gas evolved (formula not acceptable).

The gas produced by the action of concentrated Sulphuric acid on Sodium chloride. [1]

Ans. Hydrogen chloride gas.

2008

Q1. Identify the substance :

Gas (C) has an offensive smell like rotten eggs. [1]

Ans. Hydrogen sulphide

Q2. Write the equation for the following reactions :

(i) Dilute Sulphuric acid and Barium chloride

(ii) Dilute Sulphuric acid and Sodium sulphide [2]

Ans. (i) $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \longrightarrow \text{BaSO}_4 + 2\text{HCl}$

(ii) $\text{Na}_2\text{S} + \text{H}_2\text{SO}_4 \longrightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{S}$

Q3. (i) What is the property of concentrated Sulphuric acid which allows it to be used in the preparation of Hydrogen chloride and Nitric acid ?

(ii) What property of concentrated Sulphuric acid is in action when Sugar turns black in its presence ? [2]

Ans. (i) Least volatile acid

(ii) Dehydrating agent

Q4. Copy and complete the following table relating to important industrial process. Output refers to the product of the process not the intermediate steps. [3]

Name of Process	Inputs	Catalyst	Equation for catalysed reaction	Output
Contact process	Sulphur dioxide + Oxygen			

Ans. Catalyst : Vanadium pentaoxide

Equation : $2\text{SO}_2 + \text{O}_2 \xrightarrow[450^\circ\text{C}]{\text{V}_2\text{O}_5} 2\text{SO}_3$

Output : Sulphuric acid.

Q1. Some properties of sulphuric acid are listed below. Choose the property A, B, C, or D which is responsible for the reactions (i) to (v). Some properties may be repeated :

A. Acid

B. Dehydrating agent

C. Non-volatile acid

D. Oxidizing agent

(i) $\text{C}_{12}\text{H}_{22}\text{O}_{11} + n\text{H}_2\text{SO}_4 \longrightarrow 12\text{C} + 11\text{H}_2\text{O} + n\text{H}_2\text{SO}_4$

(ii) $\text{S} + 2\text{H}_2\text{SO}_4 \longrightarrow 3\text{SO}_2 + 2\text{H}_2\text{O}$

(iii) $\text{NaCl} + \text{H}_2\text{SO}_4 \longrightarrow \text{NaHSO}_4 + \text{HCl}$

(iv) $\text{CuO} + \text{H}_2\text{SO}_4 \longrightarrow \text{CuSO}_4 + \text{H}_2\text{O}$

(v) $\text{Na}_2\text{CO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O} + \text{CO}_2$ [5]

Ans. (i) B or Dehydrating agent

(ii) D or Oxidizing agent

(iii) C or Non-volatile acid

(iv) A or Acid

(v) A or Acid

Q2. (i) HCl , HNO_3 and H_2SO_4 are the formulae of three compounds.

Which of these compounds has the highest boiling point and which has the lowest ?

(ii) Dilute Hydrochloric acid and dilute Sulphuric acid are both colourless solutions. How will the addition of Barium chloride solution to each help to distinguish between the two ? [3]

Ans. (i) H_2SO_4 or Sulphuric acid has highest boiling point.

HCl or Hydrogen chloride has lowest boiling point.

(ii) Dilute Sulphuric acid on reaction with Barium chloride solution gives a white precipitate which is insoluble in all the mineral acids whereas with Hydrochloric acid there is no reaction.

2006

Q1. (i) Name the process used for the large scale manufacture of Sulphuric acid.

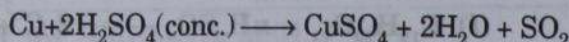
(ii) Which property of Sulphuric acid accounts for its use as a dehydrating agent ?

an oxidizing agent and a non-volatile acid. Write one equation each to illustrate the above mentioned properties of Sulphuric acid. [4]

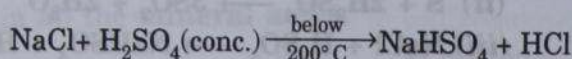
Ans. (i) Contact process

(ii) Concentrated Sulphuric acid has strong affinity for water.

(iii) Oxidizing agent :



Non-volatile acid :



Q2. Give reason for the following :

Carbon dioxide and Sulphur dioxide cannot be distinguished by using Lime water. [1]

Ans. Carbon dioxide and Sulphur dioxide cannot be distinguished by using Lime water because both turn Lime water milky.

IMPORTANT QUESTIONS

Q1. What do you see when Barium chloride solution is added to dilute Sulphuric acid ?

Ans. A white precipitate is formed which is insoluble in all the mineral acids.

Q2. What would you see when a crystal of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ is placed in concentrated Sulphuric acid ? What is the reason for the observation ?

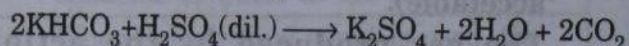
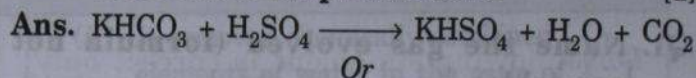
Ans. Blue coloured crystals crumble down to form white powder. Concentrated Sulphuric acid is a dehydrating agent and it removes Water of crystallization from hydrated Copper sulphate thereby leading to above changes.

Q3. (a) Name two acids other than Sulphuric acid which can be prepared by using Sulphuric acid.

(b) In using Sulphuric acid to prepare the acids as mentioned in (a) which property of Sulphuric acid is used ?

(c) Sulphuric acid can be used to prepare a number of gases in the laboratory. Write balanced equations for the reactions in which the following gases

Q1. Write balanced chemical equation for the reaction of Potassium hydrogen carbonate with dilute Sulphuric acid. [1]



Q2. A, B, C and D summarize the properties of Sulphuric acid depending on whether it is dilute or concentrated. Choose the property (A, B, C or D) depending on which is relevant to each of the preparations (i) to (iii).

A. Dilute acid (typical acid property)

B. Non-volatile acid

C. Oxidizing agent

D. Dehydrating agent.

(i) Preparation of Hydrogen chloride

(ii) Preparation of Ethene from Ethanol

(iii) Preparation of Copper sulphate from Copper oxide. [3]

Ans. (i) Non-volatile acid

(ii) Dehydrating agent

(iii) Dilute acid (typical acid properties).

are obtained using dilute Sulphuric acid as one of the reactants :

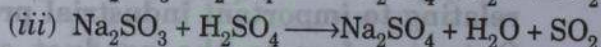
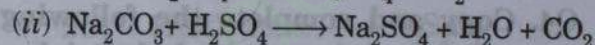
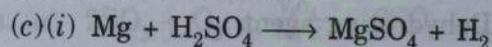
(i) Hydrogen

(ii) Carbon dioxide

(iii) Sulphur dioxide

Ans. (a) Nitric acid and Hydrochloric acid.

(b) Least volatile acid.



Q4. Name the ions present in each of the following compounds :

(a) Compound 'A' when warmed with concentrated Sulphuric acid, gives a gas which fumes in moist air and which gives dense white fumes with Ammonia.

(b) When Barium chloride solution is added to a solution of compound 'B', a white precipitate insoluble in Hydrochloric acid is formed.

(c) Compound 'C' when warmed with dilute Sulphuric acid, gives a gas

which turns acidified Potassium dichromate solution green.

Ans. (a) Cl^- , Chloride. (b) SO_4^{2-} , Sulphate.
(c) SO_3^{2-} , Sulphite.

Q5. The following statement is correct only under certain conditions. Rewrite statement including the appropriate conditions underlined in your answer.

Oxalic acid reacts with Sulphuric acid to produce Carbon monoxide and Carbon dioxide.

Ans. Oxalic acid reacts with concentrated Sulphuric acid to produce Carbon monoxide and Carbon dioxide.

Q6. Write balanced chemical equation for the following :

Sulphur dioxide acting as an oxidizing agent.

Ans. $2\text{H}_2\text{S} + \text{SO}_2 \longrightarrow 2\text{H}_2\text{O} + 3\text{S}$

Q7. Name the following :

(a) A neutral oxide of Carbon formed when Formic acid reacts with concentrated Sulphuric acid.

(b) Acidic gas which cannot be dried by passing through concentrated Sulphuric acid.

(c) A gas which turns acidified Potassium dichromate from orange to green.

(d) The solution which turns black on coming in contact with Hydrogen sulphide.

(e) Catalyst used during Contact process.

(f) Basicity of Sulphuric acid.

(g) Normal salt and acid salt of Sulphuric acid.

(h) Gas obtained by dehydration of Ethanol.

(i) A black coloured substance formed when Sugar is dehydrated.

(j) Gas obtained on roasting Galena.

(k) Gas having burning Sulphur smell.

(l) An organic acid which on reaction with concentrated Sulphuric acid, produces two oxides of Carbon.

(m) Green coloured compound formed when SO_2 is passed through acidified Potassium dichromate.

Ans. (a) Carbon monoxide

(b) Hydrogen sulphide

(c) Sulphur dioxide

(d) Lead acetate or Lead nitrate solution

(e) Vanadium pentaoxide

(f) Two/Dibasic

(g) Sulphate and Bisulphate

(h) Ethene or Ethylene

(i) Carbon / Sugar Charcoal

(j) Sulphur dioxide.

(k) Sulphur dioxide

(l) Oxalic acid.

(m) Chromium sulphate

Q8. Write balanced chemical equations for the following :

(a) Sulphur dioxide is passed through acidified Potassium dichromate solution.

(b) Sulphur dioxide is passed through Hydrogen sulphide solution.

(c) Sulphur dioxide is passed through Ferric chloride solution.

(d) Magnesium reacts with dilute Sulphuric acid.

Ans. (a) $3\text{SO}_2 + \text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 \longrightarrow \text{K}_2\text{SO}_4 + \text{Cr}_2(\text{SO}_4)_3 + \text{H}_2\text{O}$

(b) $2\text{H}_2\text{S} + \text{SO}_2 \longrightarrow 2\text{H}_2\text{O} + 3\text{S}$

(c) $\text{SO}_2 + 2\text{FeCl}_3 + 2\text{H}_2\text{O} \longrightarrow 2\text{FeCl}_2 + 2\text{HCl} + \text{H}_2\text{SO}_4$

(d) $\text{Mg} + \text{H}_2\text{SO}_4 \longrightarrow \text{MgSO}_4 + \text{H}_2$

Q9. In what capacity Sulphuric acid and Sulphur dioxide are acting in these reactions ?

(a) Reaction of concentrated Sulphuric acid with Rock salt to prepare HCl.

(b) Reaction of concentrated Sulphuric acid with Formic acid to produce Carbon monoxide.

(c) Reaction of dilute Sulphuric acid with active metals to liberate Hydrogen.

(d) Hydrogen sulphide passed through concentrated Sulphuric acid to produce Sulphur.

(e) Moist Sulphur dioxide is passed through concentrated Sulphuric acid.

(f) Concentrated Sulphuric acid reacts with Zinc to liberate Sulphur dioxide.

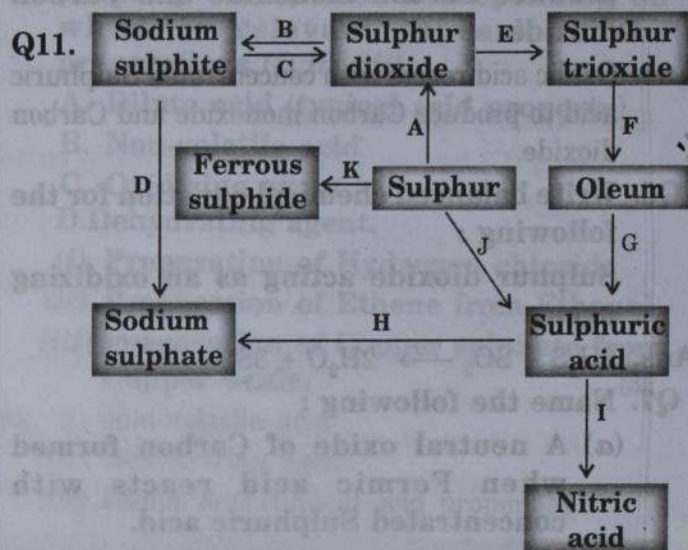
- Ans.** (a) Concentrated Sulphuric acid is acting as **least volatile acid**.
 (b) Concentrated Sulphuric acid is acting as **dehydrating agent**.
 (c) Dilute Sulphuric acid is acting as a **typical acid**.
 (d) Concentrated Sulphuric acid is acting as **oxidizing agent**.
 (e) Concentrated Sulphuric acid is acting as **drying agent**.
 (f) Concentrated Sulphuric acid is acting as **oxidizing agent**.

Q10. What will you observe when

- (a) Dilute Sulphuric acid reacts with Iron(II) sulphide ?
 (b) Dilute Sulphuric acid reacts with Magnesium ?
 (c) Concentrated Sulphuric acid is exposed to atmosphere ?
 (d) Water is added to concentrated Sulphuric acid in order to make it dilute ?
 (e) Lead nitrate solution is mixed with dilute Sulphuric acid ?
 (f) Ferrous sulphate crystals come in contact with concentrated Sulphuric acid ?
 (g) Sulphur is heated with Zinc and the product thus formed is treated with dilute HCl ?

- Ans.** (a) Black coloured compound dissolves to give a pale green or light green solution with the liberation of colourless gas having rotten egg smell which turns Lead acetate solution black.
 (b) Magnesium dissolves to give a clear solution with the liberation of colourless and odourless gas which burns with a popping sound.
 (c) The volume of concentrated Sulphuric acid increases after sometime.
 (d) The first drop of water coming in contact with acid dangerously spurts out.

- (e) A white precipitate is formed which is insoluble in all the mineral acids.
 (f) The green crystals of hydrated Ferrous sulphate change to white powder.
 (g) A dirty white coloured compound is formed which dissolved in dil. HCl to give a clear solution with the liberation of colourless gas with rotten egg smell which turns Lead acetate solution black.



Give balanced chemical equations for the conversions A to K.

- Ans.** A: $S + O_2 \xrightarrow{\text{burning}} SO_2$
 B: $2NaOH + SO_2 \longrightarrow Na_2SO_3 + H_2O$
 C: $Na_2SO_3 + H_2SO_4(\text{dil}) \longrightarrow Na_2SO_4 + H_2O + SO_2$
 D: $Na_2SO_3 + H_2SO_4(\text{dil.}) \longrightarrow Na_2SO_4 + H_2O + SO_2$
 E: $2SO_2 + O_2 \xrightarrow[450^\circ C]{V_2O_5} 2SO_3$
 F: $SO_3 + H_2SO_4(\text{conc.}) \longrightarrow H_2S_2O_7$
 G: $H_2S_2O_7 + H_2O \xrightarrow[\text{calculated amount}]{\text{calculated amount}} 2H_2SO_4$
 H: $2NaOH + H_2SO_4(\text{dil}) \longrightarrow Na_2SO_4 + 2H_2O$
 I: $KNO_3 + H_2SO_4(\text{conc.}) \xrightarrow[200^\circ C]{\text{below}} KHSO_4 + HNO_3$
 J: $S + 6HNO_3(\text{conc.}) \longrightarrow H_2SO_4 + 6NO_2 + 2H_2O$
 K: $Fe + S \xrightarrow{\Delta} FeS$

Fill Your Answer in the Space Given for Each Question.

Q1. Match the following

A.

Column -I

- (i) Sulphur dioxide
- (ii) Oil of vitriol
- (iii) Oleum
- (iv) Sulphur trioxide
- (v) Hydrogen sulphide

Column-II

- (a) Sulphuric acid
- (b) Burning sulphur smell
- (c) Rotten egg smell
- (d) Pyrosulphuric acid
- (e) Anhydride of sulphuric acid.

Ans. (i) ☐

(ii) ☐

(iii) ☐

(iv) ☐

(v) ☐

B.

Column -I

- (i) Laboratory preparation of nitric acid
- (ii) Laboratory preparation of sulphur dioxide on reaction with copper
- (iii) Conversion of hydrogen sulphide to sulphur
- (iv) Loss of colour of blue vitriol
- (v) Absorption of moisture from gases

Column-II

- (a) Drying agent concentrated H_2SO_4
- (b) Reducing property of SO_2
- (c) Dehydrating property of conc. H_2SO_4
- (d) Concentrated Sulphuric acid as oxidizing agent
- (e) Concentrated Sulphuric acid as least volatile acid.

Ans. (i) ☐

(ii) ☐

(iii) ☐

(iv) ☐

(v) ☐

Q2. Complete and balance the following equations :

- (i) $Mg + H_2SO_4 \longrightarrow$ ----- + -----
- (ii) $ZnO + H_2SO_4 \longrightarrow$ ----- + -----
- (iii) $NaHCO_3 + H_2SO_4 \longrightarrow$ ----- + ----- + -----
- (iv) $K_2CO_3 + H_2SO_4 \longrightarrow$ ----- + ----- + -----
- (v) $FeS + H_2SO_4 \longrightarrow$ ----- + -----
- (vi) $Na_2SO_3 + H_2SO_4 \longrightarrow$ ----- + ----- + -----
- (vii) $NaCl + H_2SO_4 \longrightarrow$ ----- + -----
- (viii) $C_{12}H_{22}O_{11} + H_2SO_4 \longrightarrow$ ----- + -----
- (ix) $Cu + H_2SO_4 \longrightarrow$ ----- + ----- + -----
- (x) $H_2S + H_2SO_4 \longrightarrow$ ----- + ----- + -----
- (xi) $C + H_2SO_4 \longrightarrow$ ----- + ----- + -----
- (xii) $S + H_2SO_4 \longrightarrow$ ----- + -----

Q3. Fill in the blanks.

- (i) Concentrated Sulphuric acid converts Ethanol to ----- as it is a ----- agent.
- (ii) Sulphuric acid is commonly called -----.
- (iii) The salts of Sulphuric acid are ----- and -----.
- (iv) Sulphuric acid is a -----, ----- acid.
- (v) The catalyst employed during Contact process is -----.

Q4. State whether the following statements are True or False.

- (i) Drying agent undergoes chemical reaction with the gases. ☐

(ii) Sulphur dioxide acts as a least volatile acid.

(iii) Dehydration of Sugar produces Carbon dioxide.

(iv) Hydrogen sulphide is dried by using concentrated Sulphuric acid.

(v) Sulphuric acid is a dibasic acid.

Q5. Each question has four options out of which only one option is correct. Darken the bubble for correct answer.

(i) The catalyst used during contact process is

(a) Vanadium pentoxide

(b) Copper

(c) Platinum

(d) None of these

Ans.

(a)

(b)

(c)

(d)

(ii) Dilute Sulphuric acid acts as

(a) Dehydrating agent

(b) Typical acid

(c) Drying agent

(d) Least volatile acid

Ans.

(a)

(b)

(c)

(d)

(iii) Hydrated Copper sulphate loses its colour

(a) On adding conc. H_2SO_4

(b) On heating

(c) Both of them

(d) None of these

Ans.

(a)

(b)

(c)

(d)

(iv) Select the pair of gases which turn lime water milky.

(a) CO_2 and NH_3

(b) SO_2 and SO_3

(c) SO_2 and CO_2

(d) CO_2 and SO_3

Ans.

(a)

(b)

(c)

(d)

(v) The anhydride of Sulphuric acid is

(a) basic oxide

(b) neutral oxide

(c) amphoteric oxide

(d) sulphur trioxide

Ans.

(a)

(b)

(c)

(d)

ANSWERS

1. A(i) b (ii) a (iii) d (iv) e (v) c
B(i) e (ii) d (iii) b (iv) c (v) b
2. (i) $Mg + H_2SO_4 \longrightarrow MgSO_4 + H_2$ (ii) $ZnO + H_2SO_4 \longrightarrow ZnSO_4 + H_2O$
(iii) $NaHCO_3 + H_2SO_4 \longrightarrow NaHSO_4 + H_2O + CO_2$ (iv) $K_2CO_3 + H_2SO_4 \longrightarrow K_2SO_4 + H_2O + CO_2$
(v) $FeS + H_2SO_4 \longrightarrow FeSO_4 + H_2S$ (vi) $Na_2SO_3 + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O + SO_2$
(vii) $NaCl + H_2SO_4 \longrightarrow NaHSO_4 + HCl$ (viii) $C_{12}H_{22}O_{11} + H_2SO_4 \longrightarrow 12C + [11H_2O.H_2SO_4]$
(ix) $Cu + 2H_2SO_4 \longrightarrow CuSO_4 + 2H_2O + SO_2$ (x) $H_2S + H_2SO_4 \longrightarrow 2H_2O + SO_2 + S$
(xi) $C + 2H_2SO_4 \longrightarrow CO_2 + 2H_2O + 2SO_2$ (xii) $S + 2H_2SO_4 \longrightarrow 2H_2O + 3SO_2$
3. (i) ethene, dehydrating (ii) oil of vitriol (iii) sulphate, bisulphate
(iv) strong, dibasic (v) vanadium pentaoxide
4. (i) False (ii) False (iii) False (iv) False (v) True
5. (i) a (ii) b (iii) c (iv) c (v) d

- Q1.** Give two equations each to show that sulphur dioxide acts as
 (i) Reducing agent. 1
 (ii) Oxidizing agent. 1
- Q2.** Differentiate between drying agent and dehydrating agent. 1
- Q3.** What do you observe when
 (i) concentrated Sulphuric acid is added to Sugar crystals ? 2
 (ii) concentrated sulphuric acid is added to Copper sulphate crystals ? 2
- Q4.** Give one equation each to show that sulphuric acid acts as
 (i) Least volatile acid,
 (ii) Dehydrating agent,
 (iii) Oxidizing agent. 3
- Q5.** Name two acids which can be prepared by using concentrated sulphuric acid. Write balanced chemical equation in support of your answer.
- Q6.** The following questions are related with the manufacture of sulphuric acid. 2+2
 (i) Name the process by which sulphuric acid is manufactured.
 (ii) Give equation for the catalytic oxidation of sulphur dioxide.
 (iii) During the process the direct combination between oxide of sulphur and water is prevented why ?
 (iv) Name the compound in which oxide of sulphur is absorbed. Name the product formed.
 (v) Give equation for the formation of final product. 7
- Q7.** Write balanced chemical equations for the reaction of sulphuric acid with
 (i) Iron
 (ii) Potassium bicarbonate
 (iii) Sodium carbonate
 (iv) Sodium sulphate
 (v) Iron (II) sulphide
 (vi) Copper
 (vii) Lead nitrate 7