

## Purification Techniques

### Desiccants :

A desiccant is a substance which has the ability to combine with moisture from the surrounding atmosphere.

### Classification :

Desiccants can be classified into two types, 1) those which react with water reversibly and 2) those which react with water chemically by an irreversible process.

CaC<sub>2</sub> Calcium carbide, phosphorous chemically by an irreversible process. Calcium carbide, phosphorous pentoxide and sodium belong to the second type. Anhydrous salts like calcium sulphate and magnesium sulphate belong to the first type.

### Determination of the relative efficiencies of various desiccants:

Humidified nitrogen is passed over the desiccant. The desiccant removes water from nitrogen. The escaping nitrogen is tested for water content which is measured by trapping it in liquid nitrogen. The smaller amount of the moisture remaining per litre of nitrogen the more efficient is the desiccant.

E.g.,  $P_2O_5$  is the most efficient drying agent. On absorbing water, it forms a syrupy sheet of phosphoric acid which reduces the rate of drying. Hence, it must be removed occasionally.  $CaCl_2$  is poor with regard to equilibrium water vapour pressure. so, it is not really a good drying agent. But it is often adequate to maintain a dry atmosphere in the desiccator.  $CaCl_2$  is also inexpensive and frequently used as desiccant. Conc.  $H_2SO_4$  (about 5% water) also belongs to this class.

### Effect of temperature on the efficiency of a desiccant :

The efficiency of desiccants decreases with an increase in temperature.

**Reason :**

The vapour pressures of desiccants, which are hydrate systems, increase with temperature. As the vapour pressure increases the ability to hold moisture by a desiccant decreases. So, we should not place hot objects in a desiccator.

**Choice of desiccant :**

The principle underlying the choice of desiccant is

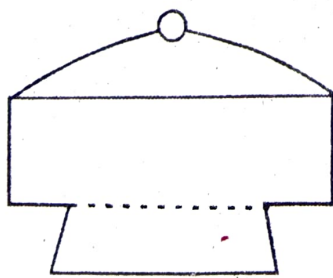
- i. The degree of drying required.
- ii. The nature of drying agent
- iii. The nature of the substance to be dried.
- iv. The speed of drying required.
- v. The cost of the desiccant.

We should choose a desiccant such that it does not react chemically with the substance to be dried. Eg.,  $H_2SO_4$  is not used to dry ammonia or amine as it reacts with them.

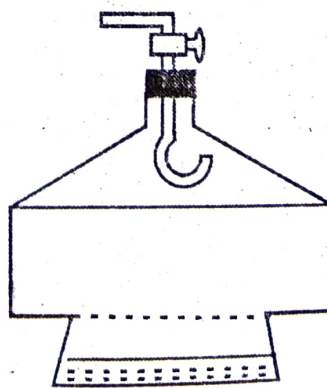
**Vacuum Drying**

The best method to remove water (and also solvents of relatively low boiling point) Adhering to solids is drying under reduced pressure. A vacuum desiccator is used for this purpose.

The charge of the desiccator depends on the exact nature of the substance to be absorbed. An effective acid in the lower half and flask sodium hydroxide in the inverted glass collar supported on the shoulders of the desiccator. The collar is covered with a zinc gauza or glazed porcelain perforated plate as shown in the figure.



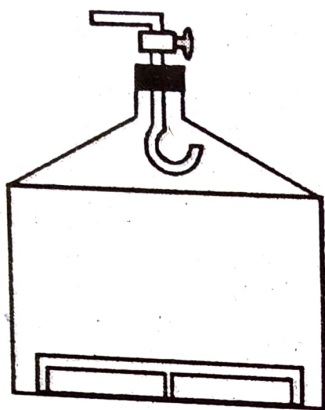
Ordinary desiccator



Vacuum desiccator

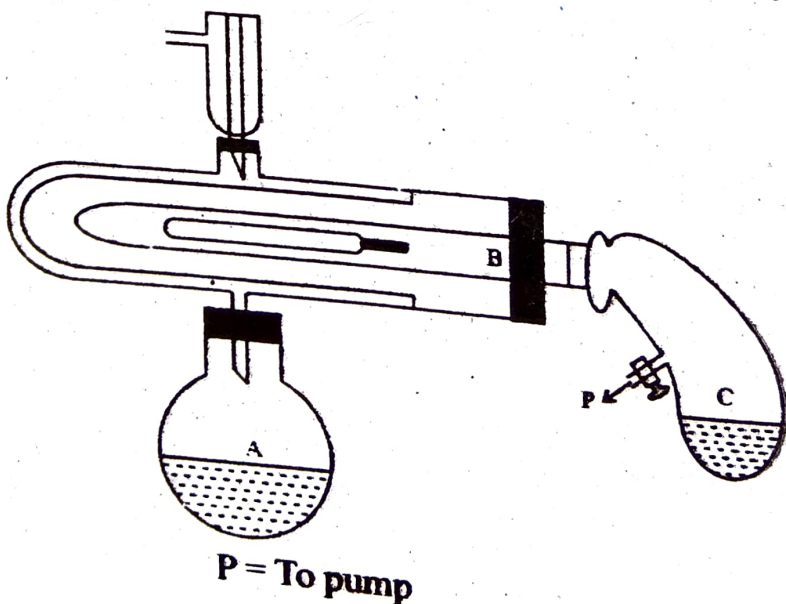
If ether, chloroform, carbon tetrachloride, benzene, toluene and similar vapours are to be absorbed, some freshly cut shavings or paraffin was should be placed on sodium hydroxide.

Alternatively, granular calcium chloride may be placed in the bottom of the desiccator and silica gel in the shallow porcelain container. If acid vapours are likely to be present, the latter may be charged with flask or pellet sodium hydroxide.



When using a vacuum desiccator the vessel containing the substance (clock glass, etc.,) should be covered with an inverted clock glass. This will protect the finer crystals from being swept away, if by accident any air is rapidly admitted into the desiccator.

Frequently the water or other solvent is so firmly held that it cannot be completely removed in a vacuum desiccator at the ordinary temperature.





A convenient laboratory form of a vacuum oven is the so called drying pistol. The vapour from a boiling liquid in the flask A rises through the jacket surrounding the drying chamber B (holding the substance) and is returned by the condenser. The drying chamber B is connected by means of a ground glass joint to the vessel C containing the drying agent. C is attached to a suction pump.

The liquid in A is selected according to the temperature desired.

**Example :**

Chloroform (62°C), water (100°C) etc., The charge in C consists of phosphorus pentoxide distributed on glass wool when water is to be removed, or potassium hydroxide flakes or pellets for removal of acid vapours and of silica gel or thin layers of paraffin wax for removal of organic solvents, such as chloroform, carbon tetrachloride, benzene and toluene.

**Drying of solid :**

The solid (both organic and inorganic) after filtering with a Buchner funnel is pressed with a flat spatula. As much solvent as possible is removed in this step. If the solid is insoluble in alcohol it is washed with alcohol to remove water. Steam or hot air should not be used for drying solid because at high temperatures the solids may melt or decompose. Then it is dried in a desiccator over calcium chloride.

But this process is slow. Vacuum drying can be done which is efficient and safe.

**Drying of liquids :**

Liquids are dried by direct contact with a suitable powdered drying agent. Anhydrous sodium sulphate, magnesium sulphate, potassium carbonate, phosphorus pentoxide, calcium sulphate, (Drierite) are the common drying agents.

1. Phosphorus pentoxide is the most efficient drying agent. It is used when extreme dryness is required. It may be used for aromatic hydrocarbons, ethers, alkylhalides, but not for alcohols, acids and ketones.



2. Calcium chloride can be used for aliphatic saturated hydrocarbons, alcohols, phenols, esters or amine. But it is not advisable for acidic liquids since ordinary calcium chloride always contains some calcium hydroxide due to partial hydrolysis during preparation.
3. Calcium oxide (quicklime) is generally used for alcohols. But it cannot be used for acidic substances or esters.
4. Potassium hydroxide is particularly suitable for amines. It cannot be used for acids, phenols and esters.
5. Anhydrous sodium sulphate can be used on almost all occasions but its drying action is very slow.
6. Anhydrous calcium sulphate is rapid in its action and is chemically inert. It is applicable to all liquids.
7. Anhydrous magnesium sulphate is a neutral drying agent. Like sodium sulphate, it can be used for most occasions. Its drying action is more rapid than that of sodium sulphate.
8. Metallic sodium is particularly used for ethers. It cannot be used for compound that are affected by alkalies or easily subject to reduction (owing to the hydrogen evolved during dehydrations).

From the above we see that desiccants are specific in their usage.

## **DISTILLATION**

### ***Principle :***

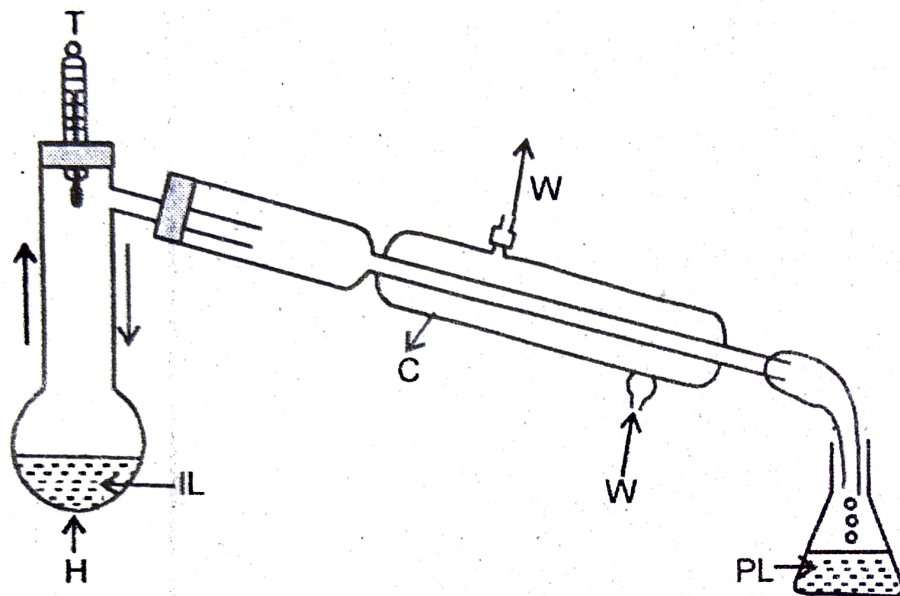
On heating under constant pressure, say under atmospheric pressure a liquid boils at a temperature at which its total vapour pressure becomes equal to the atmospheric pressure. The temperature of the liquid remains constant till all the liquid distils over. The constant temperature is termed as the boiling point. The distillation process is used for the purification of liquids from non - volatile impurities.

### ***Technique :***

The distillation apparatus is shown in figure. It consists of a round bottomed flask with a side tube. The flask is fitted with an one holed bark cork. A thermometer is inserted ~~through the hole~~ so that its bulb is near the opening of the side tube. A water condenser is attached to the tube. The impure liquid is taken in the flask. A few porcelain bits are added to avoid bumping of the liquid. The liquid is heated. When the liquid starts

boiling, the thermometer reading attains a constant value equal to the boiling point of the liquid. A receiver is now placed near the end of the condenser and the distillate is collected. The collection of liquid is stopped when the thermometer reading starts to rise.

The procedure is repeated with the distillate. We get the liquid in pure form.



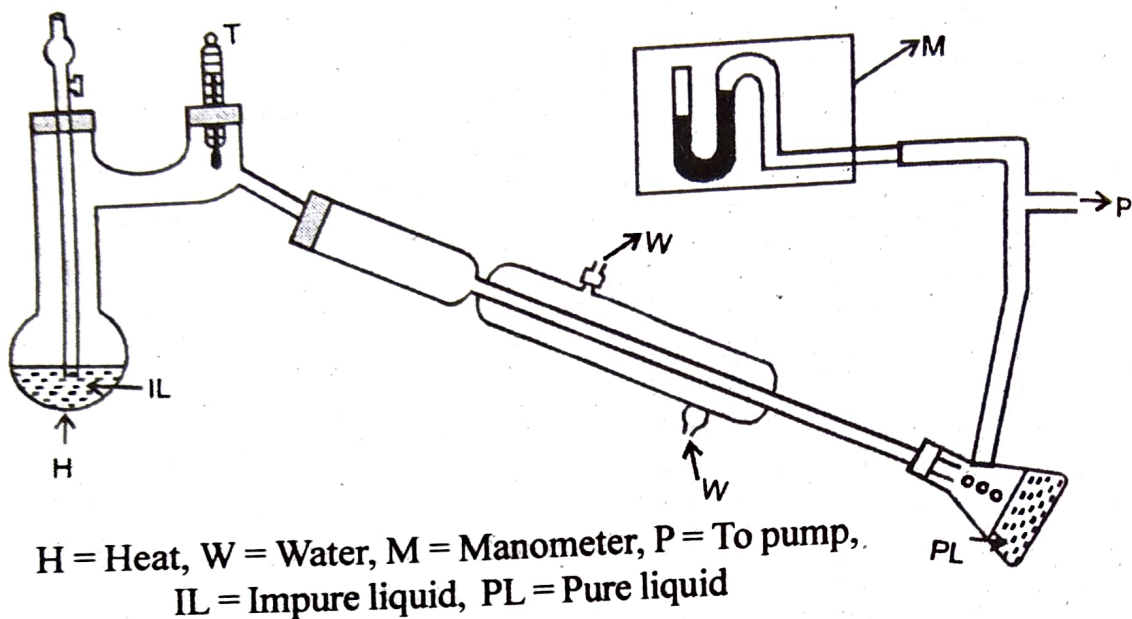
H = Heat, W = Water, IL = Impure liquid,  
PL = Pure liquid, T = Thermometer, C = Water condenser

### Distillation under reduced pressure :

The apparatus for distillation under reduced pressure is shown in figure. It consists of a Claisen flask having two necks. Through one neck a long jet is inserted so that it dips in the liquid to be purified. During distillation the vapours of the liquid bubble up through the capillary of this jet. This prevents bumping. One end of a water condenser is connected to the Claisen flask. The other end of the condenser is connected to a filtration flask, which serves as the receiver. The receiver is connected to a pump and mercury manometer. The pressure in the apparatus is carried out in reduced pressure.

This method is used to purify liquids which decompose near their boiling points. For example, glycerol from spent - lye in soap industries is recovered by this method. Glycerol decomposes at its boiling point ( $298^{\circ}\text{C}$ ) but can be distilled unchanged at 12 mm pressure when it boils at  $180^{\circ}\text{C}$ .





## Fractional distillation :

### Principle :

A mixture of two or more volatile liquids can be separated by fractional distillation.

When their boiling points differ by more than  $40^\circ$ , they can be separated by fractional distillation. The more volatile liquid passes over first and is collected in a receiver. When the temperature begins to rise for the second time, the first receiver is disconnected, a new receiver is attached as soon as the temperature becomes constant once again. Thus the distillate is collected in fractions and the process is termed fractional distillation. When the liquids present in the mixture have their boiling points close to each other, the separation is best effected by fitting the distillation flask with a fractionating column.

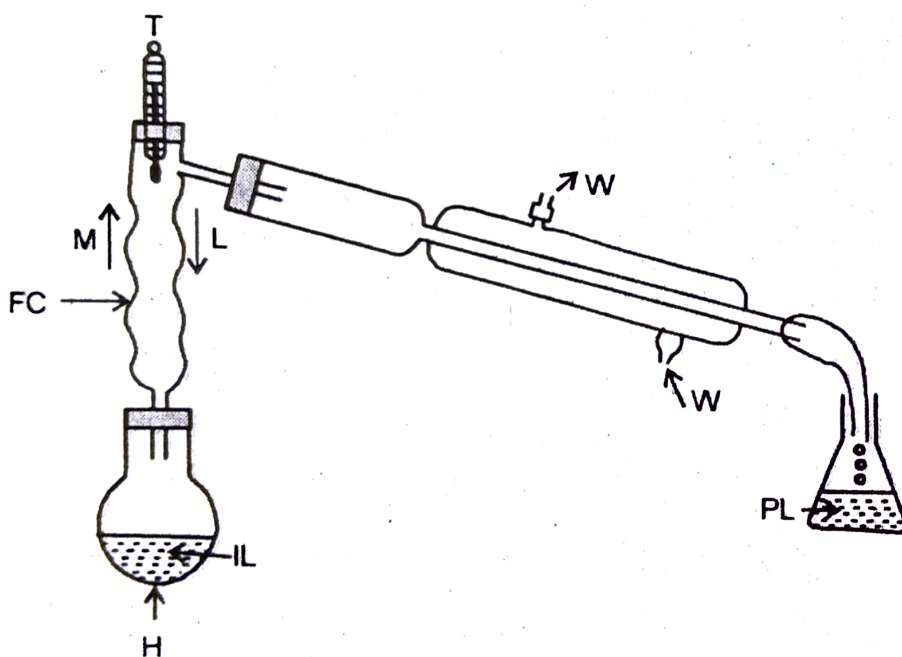
### Techniques :

The apparatus for fractional distillation is shown in figure. It consists of a round bottomed flask. The flask is fitted with an one holed bark cork. A fractionating column consisting of a long glass tube blown into bulbs is inserted through the hole. A thermometer is inserted so that its bulb is near the opening of the side tube of the fractionating column. A water condenser is attached to the side tube of the fractionating column. A

receiver is placed near the other end of the condenser. The mixture of liquids to be separated by fractional distillation is taken in the flask. A few porcelain bits are added to avoid bumping of the liquid mixture. The mixture is heated. The vapours of the liquid (A) with lower boiling point along with a little of the vapours of the liquid (B) with higher boiling point rise up and come in contact with the large cooling surface of the fractionating column. The vapours of B condense first and those of A pass on. The condensed B flows down the column. It meets the hot ascending vapour mixture. The condensed liquid remove more of B from the vapour mixture and gives up any A present in it. This process is repeated in every bulb of the fractionating column. Thus the vapour coming out at its top consists of nearly pure A. The liquid in the flask is nearly pure B.

**Example :**

A mixture of benzene and toluene can be separated by this method.



I = Impure liquid, M = More volatic liquid , H = Heat,  
 L = Less Volatile liquid, FC = Fractionating Column,  
 W = Water, PL = Pure Liquid



## Differences between distillation and fractional distillation

<i>Distillation</i>	<i>Fractiona distillation</i>
It is a technique for purifying a liquid from non - volatile impurities.	It is a technique for the separation of a mixture of two or more liquids.
Eg., Pure phenol is obtained by distilling impure phenol.	Eg. A mixture of benzene and toluene is separated by fractional distillation.

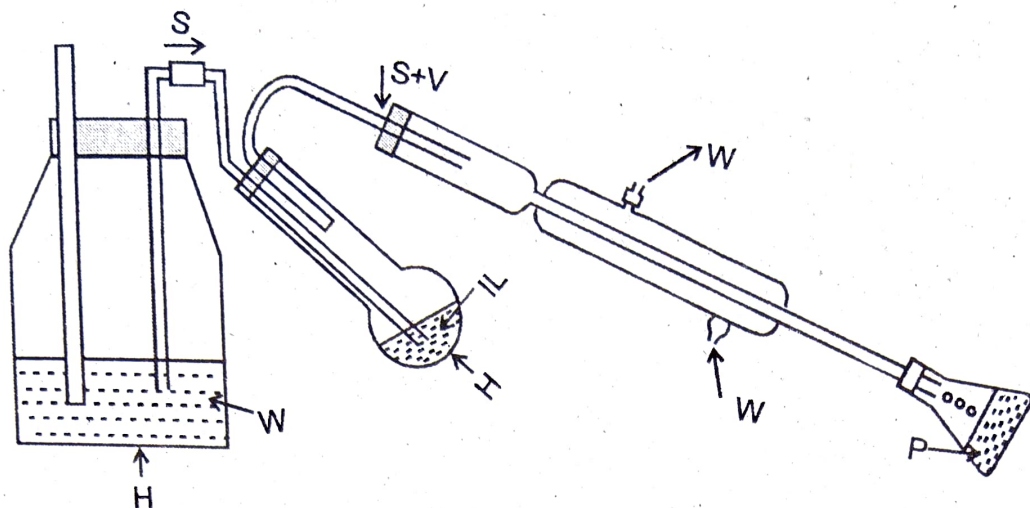
## Steam distillation

### *Principle (Theory)*

Many substances that are insoluble in water and are volatile in steam, can be purified by distillation in a current of steam (steam distillation). The non - volatile impurities are left behind, in the distillation flask. A liquid boils when its vapour pressure is equal to the atmospheric pressure. In steam distillation, a mixture of water and an organic liquid is heated. The mixture boils when the combined vapour pressure of water ( $P_1$ ) and that of the organic liquid ( $P_2$ ) is equal to the atmospheric pressure ( $P$ ) i.e.,  $P = P_1 + P_2$ . Naturally, the boiling temperature of the mixture would be lower than the boiling temperature of the pure organic liquid when the vapour pressure of this liquid alone would be equal to the atmospheric pressure. Thus in steam distillation, the liquid is distilled at a lower temperature than its boiling point, when it might decompose. It serves the same purpose as distillation under reduced pressure.

### *Techniques*

The apparatus for steam distillation is shown in figure. It consists of a round bottomed flask with a two holded bark cork. Through one hole it is connected to a steam generator. Through another hole a water condenser and receiver are attached. The flask is placed in a slanting position in such a way that the mixture which is steam through it. The mixture is taken in the flask and is gently heated to maintain the required temperature so that unnecessary steam condensation in the flask is avoided. Steam is passed through it.



H = Heat, W = Water, S = Steam, I = Impure Organic Liquid,  
 S + V = Steam + Vapour of Organic Liquid,  
 P = Pure Organic Liquid + Water

The steam carries with it the steam volatile constituent in the mixture and enters the condenser where it condenses. The condensed water and the steam distilled liquid collect in the receiver as two immiscible layers.

The distillate is then treated to recover the organic substance by a suitable method. In case it is a solid, the substances may be separated by simple filtration. If it is a liquid, it can be removed by means of a separating funnel. The aqueous layer in both cases may be extracted with a solvent.

Thus is steam distillation, the liquid is distilled at a lower temperature than its boiling point, when it might decompose. It serves the same purpose as distillation under reduced pressure. Eg., Aniline is purified by this method.

### **Examples / Applications :**

Steam distillation is employed in industry for the recovery of various essential oils from plants and flowers. It is also used in the manufacture of aniline and turpentine oil.

### **Azeotropic distillation**

#### **Principle**

Azeotropic mixtures are mixtures that contain two or more miscible liquids which have constant boiling point and constant composition. The



composition of the vapour phase and the liquid phase of an azeotropic mixture are the same so that an azeotropic mixture behaves as a single liquid. When an azeotropic mixture is distilled it distils over as such, without a change in its composition. The components of an azeotropic mixture cannot be separated by ordinary distillation process. Eg.,

<i>Mixture</i>	<i>Composition</i>	<i>Boiling point</i>
Water - Ethanol	95.6% of ethyl Alcohol	78.13°C
Chloroform - Acetone	80% chloroform	64.7°C
HCl - Water	20.24% HCl	108.5°C

Azeotropic distillation is a distillation process in which the formation of azeotropes is used to separate a liquid component from an azeotropic mixture. It is a process of breaking azeotropes and getting the pure components from an azeotropic mixture.

#### ***Technique / Procedure***

Azeotropic mixtures of suitable components are mixed and distilled. 100% pure components are got.

#### ***Example :***

Production of 100% alcohol / Preparation of absolute alcohol / Method of breaking azeotropes : Ethyl alcohol and water from an azeotropic mixture containing 95.6% alcohol which boils at 78.13°C. This is called rectified spirit. This is mixed with benzene and distilled. At 64.6°C a tertiary azeotropic mixture of benzene, water and alcohol distils. At 67.8°C a binary azeotropic mixture of alcohol and benzene distils. The residue in the flask is 100% ethanol which distils at 78.2°C.

Thus we get pure alcohol. In this way we break azeotropes.

### **Crystallisation :**

This is another method of purification of solids.

#### ***Principle :***

This process is commonly employed for the purification of solid compounds. The impure solid is dissolved in the minimum volume of a suitable solvent. The soluble substances pass into solution while the

insoluble ones are left behind. The hot solution is then filtered and allowed to cool undisturbed till crystallisation is complete. The crystals are then separated from the mother liquor by filtration and dried.

The efficiency of the process of crystallization depends on

1. choice of the solvent
2. preparation of solution
3. filtration of the solution
4. crystallisation and
5. separation and drying of crystals.

### **Technique**

#### *Simple use of miscible solvents :*

In this method, the impure solid is dissolved in enough hot solvent so as to get a super saturated solution. The solution is hot filtered to remove insoluble articles and dust. The filtrate is cooled. Pure crystals of the solid separate out. The impurities remain in solution. Some solvents used for this purpose are : Benzene, petroleum ether, methyl alcohol, ethyl alcohol, acetone etc.,

#### **Fractional crystallization :**

This is a process used to separate two or more substances from a solution. When a hot solution containing two or more solids is cooled, the solid with lesser solubility crystallise out first. The other solids crystallize out in the order of their increasing solubilities.

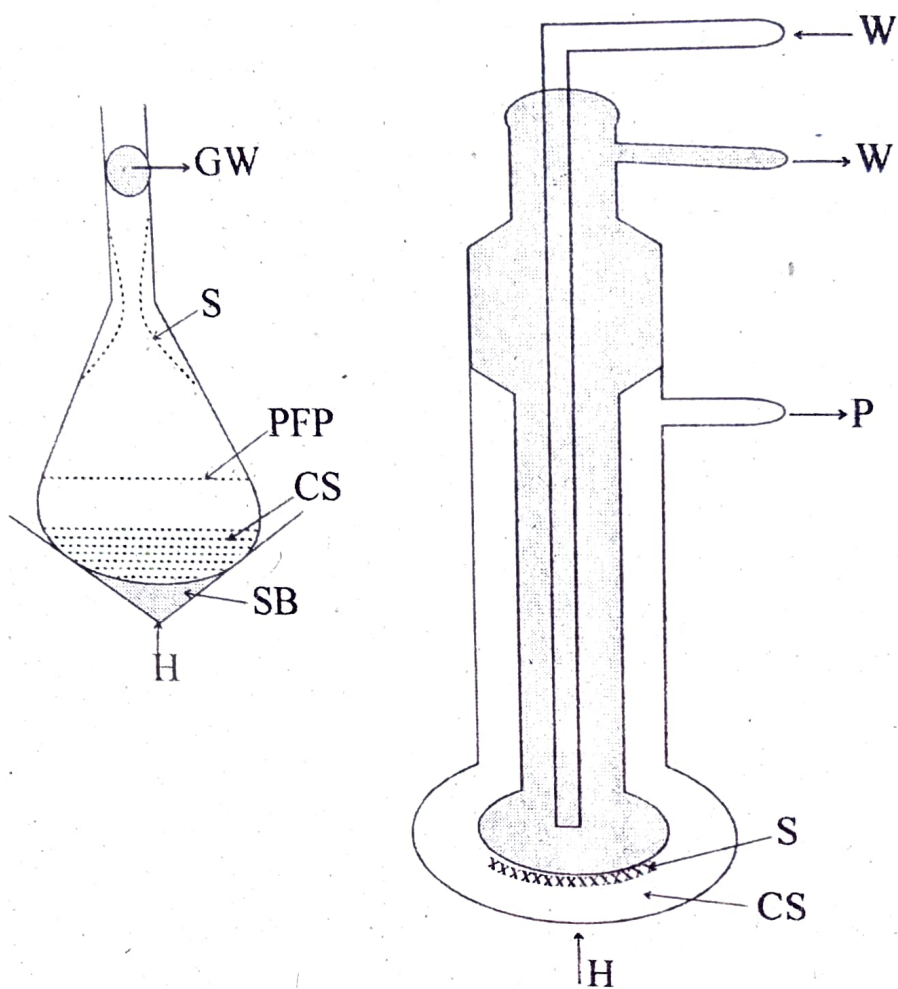
#### **Sublimation :**

Sublimation is a process in which a solid, when heated passes directly into the vapour state without melting and the vapours when cooled, become solid directly without condensing into a liquid.

#### **Principle :**

Certain substances when heated, pass directly from solid to vapour state without melting. The vapours when cooled give back the solid substance. This process is known as sublimation. The process of sublimation is used in the purification of volatile solids like naphthalene, camphor etc., from non - volatile solids.





H = Heat, SB = Sand Bath, CS = Crude Sample, W = Water,  
 GW = Glass Wool, PFP = Perforated Filter Paper, P = To Pump,  
 S = Sublimate

### Technique

#### 1. Sublimation under ordinary pressure :

The solid to be purified by sublimation is placed in a china dish placed on a sand bath figure. The china dish is covered with a perforated filter paper. A funnel is inverted over the china dish. The china dish is gently heated. The sublimable solid evaporates, passes through the pores of the filter paper and is deposited as a pure solid on the walls of the funnel. The filter paper prevents the sublimed solid from falling back into the china dish and prevents the funnel from getting the heat and thus keep it cool.

## 2. *Sublimation under reduced pressure :*

Substances having low vapour pressure and substances which decompose on heating cannot be purified by direct sublimation. For such substances, sublimation under reduced pressure is effected. The apparatus for this is shown in figure. In this apparatus there is a small space between a large heating surface and a large cooling surface. On heating the solid sublimes and condenses as a solid at the bottom of the surface cooled by water.

### **Use :**

This technique is used for the purification of sublimable solids like camphor, naphthalene, benzoic acid etc.,

### **Test of purity :**

The purity of a compound can be analysed by noting its melting point or boiling point. Pure compounds have a sharp and definite melting point or boiling point. Therefore these methods can be used to identify the purity of a compound.

## **Determination of Melting Point of Solid**

### ***Aim :***

To determine the melting point of a solid.

### ***Principle :***

A small amount of pure solid is finely powdered and taken in a capillary tube and heated in a bath containing concentrated sulphuric acid or liquid paraffin. The temperature of the bath when the compound melts is noted.

### ***Apparatus :***

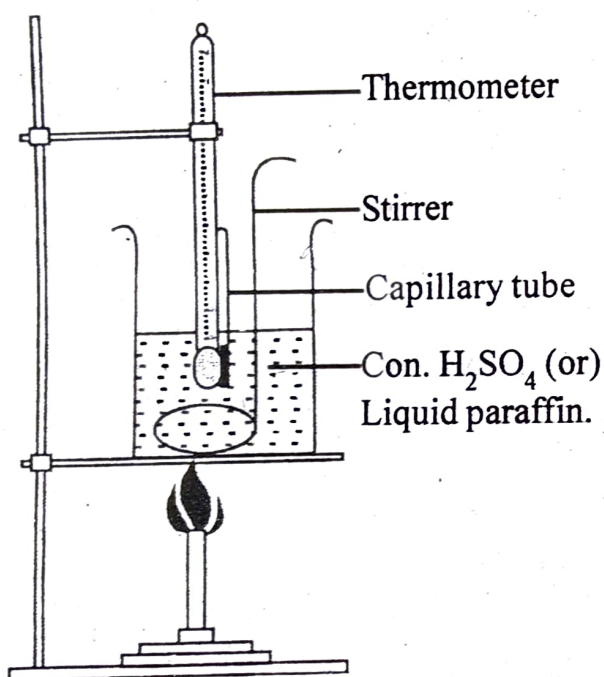
- |                        |                     |
|------------------------|---------------------|
| i. Thermometer (150°C) | ii. Capillary tubes |
| iii. Beaker (100 ml)   | iv. Stirrer         |
|                        | v. Stand.           |

### ***Procedure :***

A capillary tube of about 6 to 8 cm. length and about 1 mm in diameter is taken and fused at one end by inserting into the edge of the flame. The solid whose melting point is to be determined is powdered well using a



nickel spatula in a porcelain tile and then introduced into the capillary tube to get a column of the substance of length about 0.5 to 1 cm. A 100 ml beaker is filled three fourth with concentrated sulphuric acid (or) liquid paraffin. A glass stirrer is placed inside the bath. A 150°C thermometer is inserted into a one holed cork and clamped on an iron stand such that the bulb of the thermometer is well within sulphuric acid and is a little above the bottom of the beaker.



The capillary tube is carefully allowed to cling to the thermometer (by capillary action) so that the portion of the capillary tube with the substance is between upper and lower ends of the bulb of the thermometer. The open end of the capillary tube must be above the surface of the liquid. The bath is gradually heated over a wire gauze with constant stirring, without disturbing the capillary tube attached to the thermometer. The heating is regulated so that the temperature rises slowly. As the temperature rises, the solid in the capillary tube shrinks suddenly and melts. The temperature at which the solid just turns from opaque to transparent gives the melting point of the substance. The experiment is repeated to get concordant result.

**Example :**

Acetanilide -  $114^{\circ}\text{C}$ , Urea -  $132^{\circ}\text{C}$

**Determination of Boiling Point of Liquid****Aim :**

To determine the boiling point of a liquid.

**Principle :**

A small amount of liquid is taken in a test tube with a side tube and fitted with a thermometer. The liquid in the test tube is heated slowly and temperature at which the liquid boils is noted.

**Apparatus :**

- |                               |   |           |
|-------------------------------|---|-----------|
| i. Test tube with a side tube | ii. Thermometer ( $110^{\circ}\text{C}$ ) |           |
| iii. Adapter                  | iv. Receiver                              | v. Stand. |

**Procedure :**

The boiling point apparatus is usually a pyrex test tube with a side tube. The given liquid is taken to about one third of tube with side tube. To promote uniform heating some porcelain pieces are introduced into it. The mouth of the tube is closed with one holed cork carrying the thermometer. The thermometer is so arranged that the tip of the bulb is in level with the side tube of the test tube. The side tube of the apparatus is connected to an adapter which in turn is introduced into a receiver.

The tube is then slowly heated on a wire gauze. The temperature rises gradually and finally the liquid boils and the vapour escapes through the side tube and collects in the receiver in drops. The constant temperature at which the liquid distils steadily is the boiling point of the liquid. When the whole of the liquid has been distilled away heating is stopped. The apparatus is cooled. The experiment is repeated with the collected liquid to get concordant results.



**Example :**

Carbon tetrachloride - 77°C, Water - 100°C

## Purification Techniques

**Purification of solid organic compounds :**

**Extraction using immiscible solvents :**

The principle used here is Nernst distribution law. According to this law, at constant temperature, a solute distributes itself between two immiscible solvents only in a particular ratio. The ratio of the concentrations in the solvents is called the partition coefficient or distribution coefficient.

If  $C_A$  and  $C_B$  are the concentrations in liquids A and B then at constant temperature,  $C_A/C_B = K = \text{constant}$ . Larger the value of K, more efficient is the extraction.

When a substance distributes itself between two solvents without the complications of dissociation or association, it is possible to calculate the weight of the substance which can be removed by a series of extractions. If  $V_1$  ml of a solution contains Wg of a substance and if the substance repeatedly extracted with  $V_2$  ml of another solvent, the weight of the substance  $W_n$  remaining in the first solvent after n extractions is given by

$$W_n = W \left[ \frac{KV_1}{KV_1 + V_2} \right]^n$$

Where K is the distribution coefficient.

From the equation we find that, in order to make  $W_n$  as small as possible for a given value of K, n should be as large as possible. But  $n \times V_2$  is equal to the total volume of the extracting liquid available. i.e.,  $n \times V_2$  is a constant. Therefore, if n should be large  $V_2$  should be small. Thus for a given volume of extracting solvent, the extraction process is more efficient when the extracting solvent is added in small portions instead of using the whole of it, in one lot.

**i. Separation of one constituent from a solid mixture :**

If one constituent in a solid mixture is soluble in a solvent while the other constituents are not, then that soluble solid can be separated from that mixture by solvent extraction.

**ii. Separation of unwanted impurities from substances :**

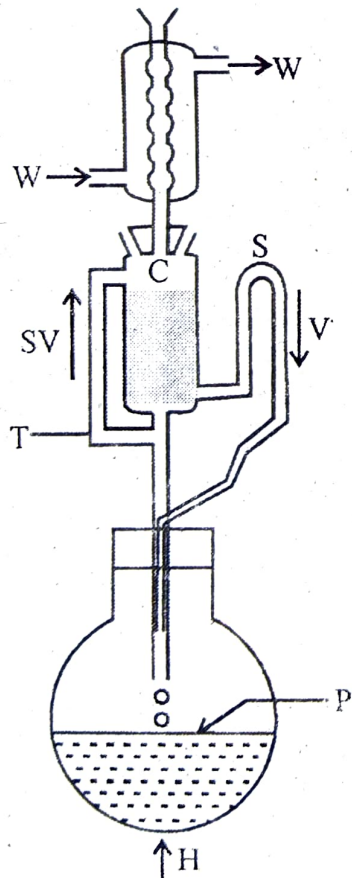
When the impurities are soluble in a solvent then they may be extracted with that solvent.

**Soxhlet Extraction : (Continuous process)**

It is the extraction of a solid with an organic solvent, in which the impurities are insoluble, using the Soxhlet extractor.

**Principle :** The substance to be extracted should be soluble in a particular solvent while all the other constituents in the mixture should be insoluble. After extraction the solvent should be easily separable.

**Procedure :** Soxhlet extractor consists of a glass cylinder C with a side tube T and a syphon S. A water condenser is attached at the top of C. (Figure)



SV = Solvent vapour

H = Heat

V = Solvent after extraction

P = Solvent + Substance to be extracted

C = Glass Cylinder

W = Water



The sample from which the solid to be extracted is powdered. It is placed in a thimble made of a thick filter paper. The thimble is placed at the bottom of the water condenser. The extracting solvent is taken in the boiling flask. The solvent is boiled. Its vapour rise through T and enters the water condenser. There, the vapours condense. The condensed solvent falls on the sample in the thimble. The substance to be extracted dissolves while the impurities don't. The solution is filtered by the thimble and collects at the cylinder C. When C becomes full, the solution reaches the flask through T. The extracted solid remains in the flask. Thus the solvent extracts the solid continuously from the sample and brings it to the flask. Finally the solution from the flask is distilled. The solvent distills off, leaving behind the organic substance.

### **Superiority over conventional solvent extraction technique:**

1. This method provides a through contact and heating with the solvent.
2. A small quantity of the solvent is enough to extract a maximum amount of solid as the solvent is recycled. In conventional methods it is not possible.
3. This is a continuous process. So the efficiency of extraction is more in this method.

### **Uses :**

This method is used for the extraction of oils and fats from flowers and seeds and alkaloids from plants.

### **Crystallisation :**

This is another method of purification of solids.

### **Principle :**

This process is commonly employed for the purification of solid compounds. The impure solid is dissolved in the minimum volume of a suitable solvent. The soluble substances pass into solution while the insoluble ones are left behind. The hot solution is then filtered and allowed to cool undisturbed till crystallisation is complete. The crystals are then separated from the mother liquor by filtration and dried.

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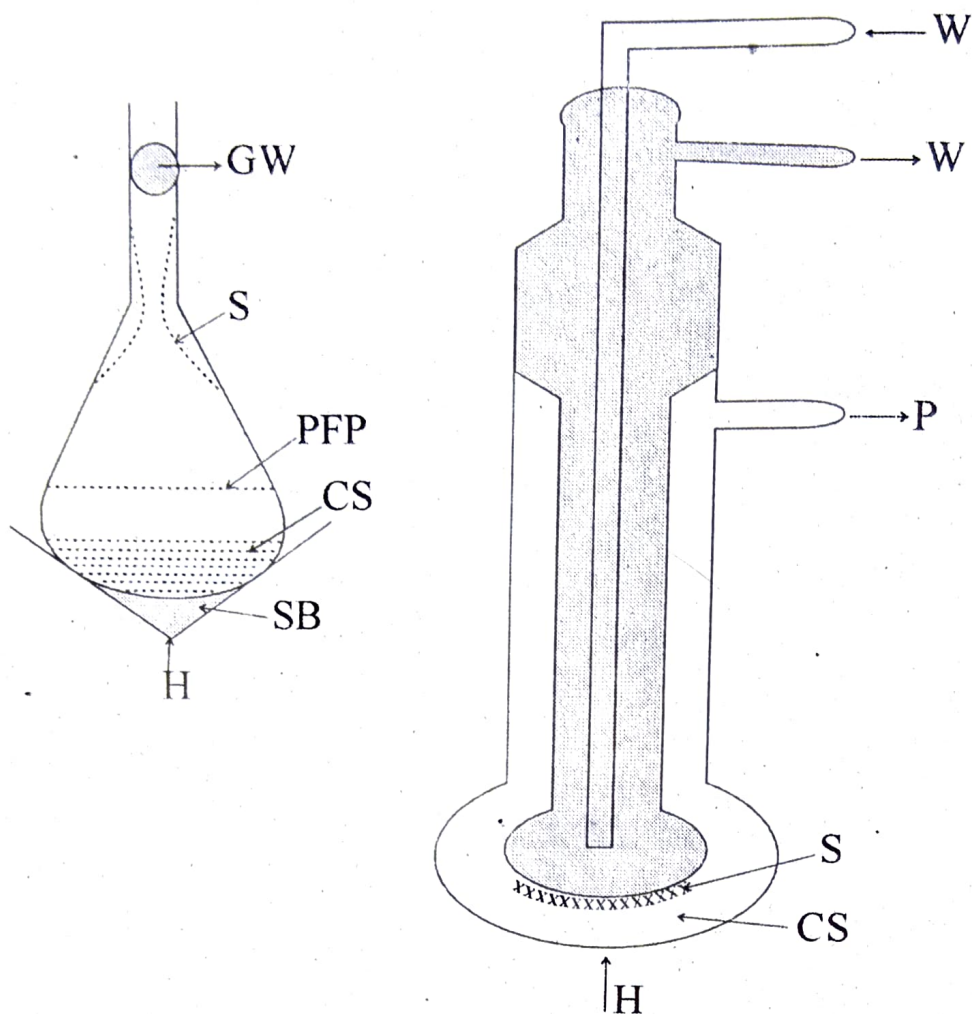
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The solid to be purified by sublimation is placed in a china dish placed on a sand bath figure. The china dish is covered with a perforated filter paper. A funnel is inverted over the china dish. The china dish is gently heated. The sublimable solid evaporates, passes through the pores of the filter paper and is deposited as a pure solid on the walls of the funnel. The filter paper prevents the sublimed solid from falling back into the china dish and prevents the funnel from getting the heat and thus keep it cool.

#### 2. Sublimation under reduced pressure :

Substances having low vapour pressure and substances which decompose on heating cannot be purified by direct sublimation. For such

substances, sublimation under reduced pressure is effected. The apparatus for this is shown in figure. In this apparatus there is a small space between a large heating surface and a large cooling surface. On heating the solid sublimes and condenses as a solid at the bottom of the surface cooled by water.

**Use :**

This technique is used for the purification of sublimable solids like camphor, naphthalene, benzoic acid etc.,

**University questions**

1. How are desiccants classified? Indicate the method by which the efficiencies of different desiccants may be determined. How does the efficiency vary with temperature? Illustrate.
2. Give an example for a powerful desiccant.
3. Give the name of an efficient desiccant.
4. Name two desiccants mention three substances used as desiccants. Show how they are specific in their usage?
5. Why sulphuric acid is not suitable for drying aniline?
6. Give the principle underlying the choice of desiccants.
7. Write a note on desiccants and their choice.
8. Write short notes on : Desiccants.
9. Highlight the role of desiccants.
10. Write a note on the methods to be adopted for drying organic solids.
11. Why is it not advisable to place hot objects inside a desiccator? Name any two desiccants?
12. What do you understand by vacuum drying? How would you effect the same? Write a note on vacuum drying.
13. Explain the vacuum desiccator and list its uses.
14. Define the term distillation.