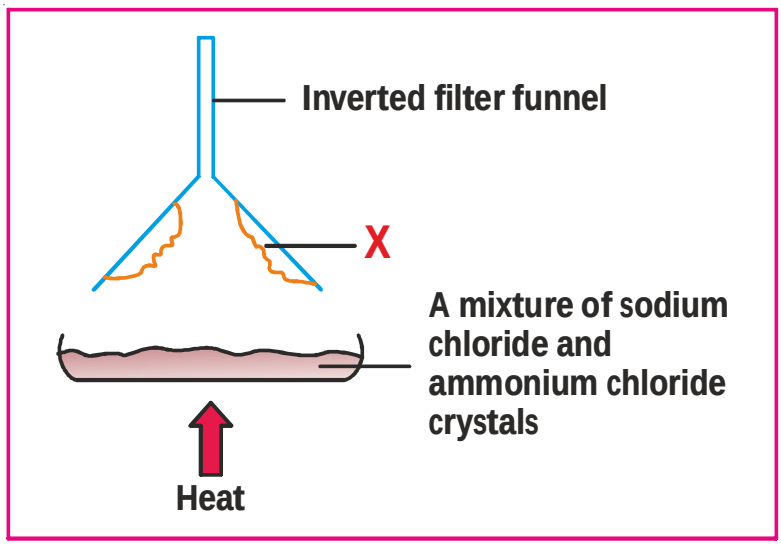
**01** **The diagram given below shows a process of separating a mixture of two solids.**




**During heating, ammonium chloride crystals turn into vapour. The vapour condenses and crystallises on the cool surface of the inverted filter funnel.**

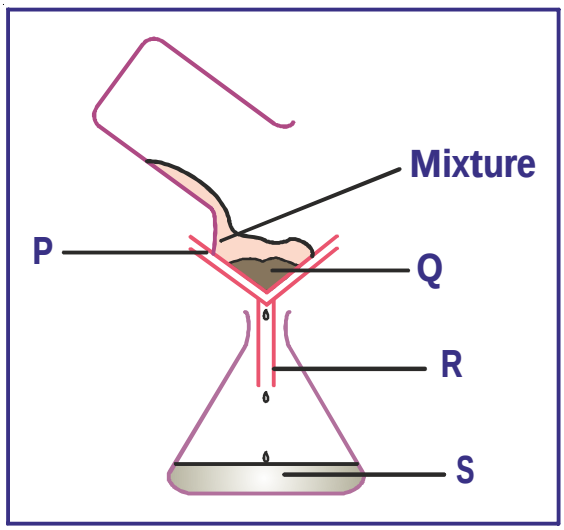
**(i) Identify crystals X.**

**(ii) Name two other substances which can be separated by this method.**

(i) Crystals X are of ammonium chloride

(ii) Iodine crystals/mothballs (naphthalene)/dry ice can also be separated by this method of sublimation.

02 **Diagram I given below shows a method of purification.**




(a) **What type of mixture is separated by this technique ?**

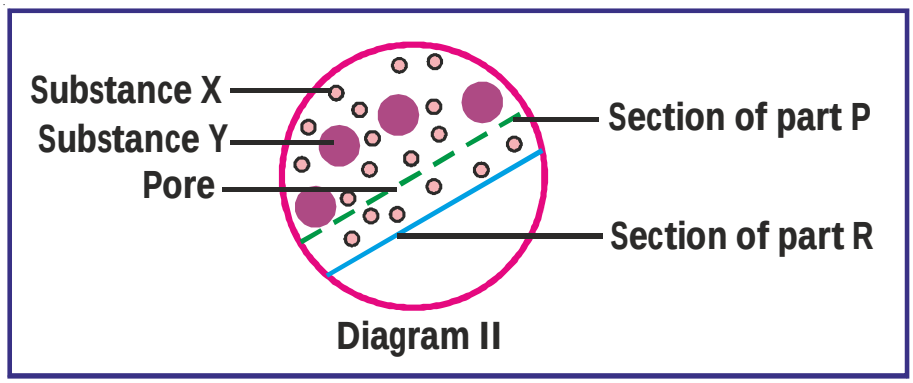
(b) **Name labelled parts P to S.**

(c) **If the mixture contains tea grains and sugar solution, what would be present in**

(i) **part Q:**

(ii) **part S:**

(d) **Diagram II given below shows an enlarged view of a section from Diagram I.**




**Based on Diagram II, explain how this technique is able to separate a mixture containing substances X and Y.**

a) A solid-solid mixture containing an insoluble solid

b) P: filter paper, Q: residue, R: filter funnel, S : filtrate

c) (i) Tea grains

(ii) Sugar solution

d) The filter paper has tiny pores. The size of substance X is small enough to pass through the pores. However, the size of substance Y is bigger than the pores, so it cannot pass through the pores and remains in the filter paper.

03 **Identify the appropriate keywords in the following description.**

**(a)** **Evaporation to dryness and crystallisation are used to obtain (soluble/insoluble) solid from a solution. If the solid is (heat-stable/not heat-stable), the solvent is evaporated completely on strong heating. If the solid is (heat-stable/not heat-stable), the solvent is evaporated to saturation.**

**(b)** **Give an example of a solid which can be recovered by evaporation to dryness.**

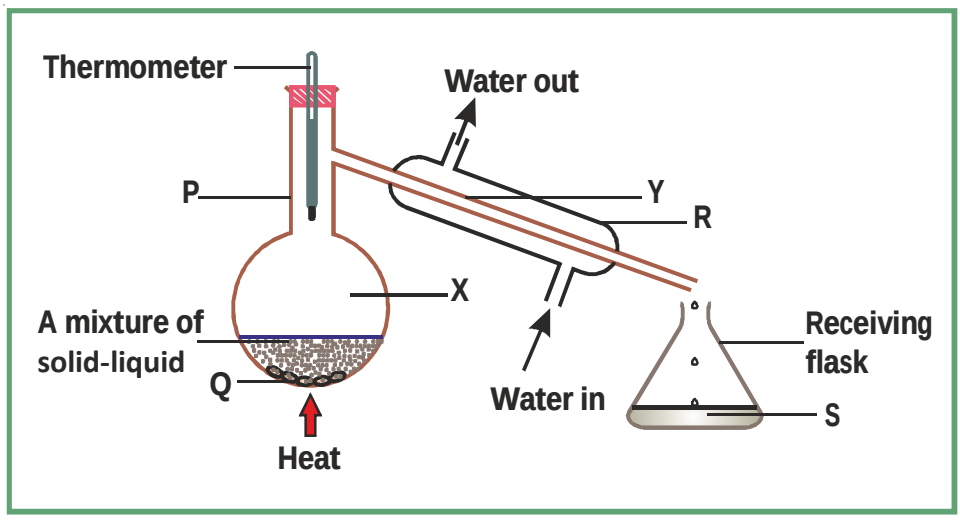
**(c)** **It is not advisable to evaporate the sugar solution to dryness to obtain sugar crystals. Explain why it is so.**

a) Soluble; heat-stable; not heat-stable

b) Sodium chloride (or table salt)

c) It decomposes upon strong heating because it is not a heat-stable compound.

**04** **The diagram given below shows a simple distillation.**




**(a)** **Name the labelled parts P, Q, R and S.**

**(b)** **Describe the physical changes taking place in X & Y.**

**(c)** **What is the function of substance Q in this technique ?**

**(d)** **(i)** **State one mistake in the experimental setup.**

**(ii)** **How would this mistake affect the experimental result ?**

**(e)** **Explain why the following precautions are taken for this separation technique.**

**(i)** **The conical flask is used as a receiving flask instead of a beaker.**

**(ii)** **The flow of water in apparatus R is against the flow of vapour.**

**(f)** **(i)** **This setup is not suitable for separating a volatile liquid. Explain why it is so.**

**(ii)** **How would this technique be modified to distillate this type of liquid ?**

a) P is distillation flask

Q is boiling chips/porcelain chips/marble chips

R is condenser

S is distillate

b) Liquid changes to gas in X whereas gas changes into liquid in Y

c) To ensure smooth boiling/To prevent bumping of the liquid.

d) (i) The bulb of the thermometer is not placed near the outlet of apparatus P

(ii) The boiling point of the vapour will not be measured accurately.

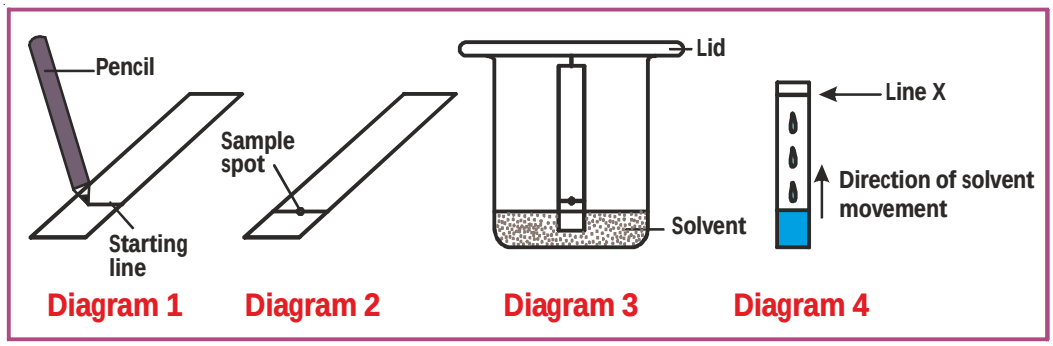
e) (i) To minimise the loss of distillate from splashing out of the flask as the conical flask has a narrow neck.

(ii) To ensure a permanent cold surface on which all vapour can condense into liquid before exiting the condenser.

f) (i) The distillate can evaporate easily due to heating effect from the flame.

(ii) Place a water bath at the receiving flask to minimise the heating effect from the flame

**05** **Read the separation technique shown below.**




**(a)** **(i)** **Name the type of separation technique.**

**(ii)** **State three uses of this technique.**

**(b)** **Describe how this technique is able to separate different substances in a mixture.**

**(c)** **Name the following.**

**(i)** **The results of the separated components on a chromatography paper.**

**(ii)** **Line X**

**(d)** **State the reason for each of the following actions.**

**(i)** **A pencil is used instead of a pen to draw the starting line as shown in Diagram 1.**

**(ii)** **A very small amount of sample is placed on the starting line as shown in Diagram 2.**

**(iii)** **The container is covered with a lid as shown in Diagram 3.**

**(iv)** **The starting line must be above the solvent as shown in Diagram 3.**

**(v)** **Line X should be near the top of the paper as shown in Diagram 4.**

**(e)** **State three advantages of this technique.**

a) (i) Paper chromatography

(ii) To separate different components in a mixture/To identify the components of a mixture/To test the purity of a substance.

b) As the solvent slowly travels up the paper, it dissolves these substances. Different substances have different solubilities in the same solvent, so they travel at different rates. The components of the mixture that are most soluble in the solvent travel the farthest.

c) (i) Chromatogram

(ii) Solvent front

d) (i) A pencil contains lead element that does not dissolve in the solvent. Pen ink contains a mixture of dyes which can dissolve in the solvent and be separated, so it can affect the results of the chromatography

(ii) To prevent the overlapping of components when they separate and travel upwards

(iii) To make the air in the container become saturated with solvent vapour so that it can prevent the solvent from evaporating as it rises up the paper.

(iv) To allow the solvent flows through the components and move them upwards instead of dissolving them in it.

(v) To ensure a complete separation of different components in a mixture

e) Produces quick and accurate analysis of sample/Able to separate complex mixtures/Requires a small sample size