1. a. The solubilities of some compounds are shown in the table.

Compound	Solubility g / 100 cm^3 water	Compound	Solubility g / 100 cm^3 water
calcium hydroxide	0.113	potassium nitrate	37.9
calcium nitrate	102.1	silver chloride	0.0002
iron(II) hydroxide	0.00003	silver nitrate	241.3

i. What type of metal compound is very soluble in water?

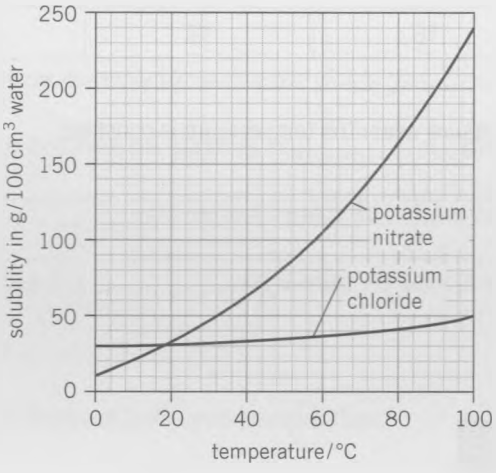
..... [1]

ii. Which compounds are insoluble in water?

..... [2]

iii. Which compound is sparingly soluble? ..... [1]

b. The graph shows the solubility of two compounds at different temperatures.



i. Deduce the solubility of potassium nitrate at 70 °C. ..... [1]

ii. Which compound is more soluble in water at 10 °C? ..... [1]

iii. Deduce the maximum mass of potassium nitrate that dissolves in 100 cm^3 of water at 60 °C.

..... [1]

iv. At what temperature is the solubility of potassium nitrate the same as that of potassium chloride?

..... [1]

Extension

v. A saturated solution of potassium nitrate in 200 g of water is cooled from 80 °C to 20 °C. What mass of solute crystallises? Show your working. [4]

vi. What is the minimum volume of water needed to dissolve 50 g of potassium nitrate at 90 °C? Show all your working. [3]

1. a. Which two of these substances are most likely to be pure?
Underline the correct answers.

air	aspirin tablets	orange juice
oxygen gas	sodium chloride crystals	tap water

[2]

b. Why should pure substances be used to make a medical drug?

..... [1]

c. i. Seawater is a mixture.
What is the meaning of the term *mixture*?

..... [2]

ii. Suggest a value for the melting point of seawater. ..... [1]

2. a. Sulfur melts at 119 °C and boils at 445 °C.
Draw lines between the boxes on the left and the boxes on the right to complete four sentences.

	.....melts over a 4 °C temperature range.
Pure sulfur.....	.....turns to a vapour at 450 °C.
Impure sulfur.....	.....solidifies at 119 °C.
	.....has a sharp boiling point.

[2]

b. Solder is a mixture of tin and lead that is used to join metals.
The melting point of tin is 232 °C. The melting point of lead is 328 °C.
Solder melts at 183 °C.

i. Why does solder have a lower melting point than either tin or lead?

..... [2]

ii. Suggest an advantage of the low melting point of solder.

..... [1]

3 Name the separation method you could use to separate:

a. Sand from a mixture of water and sand. ..... [1]

b. Water from a solution of copper sulfate in water. ..... [1]

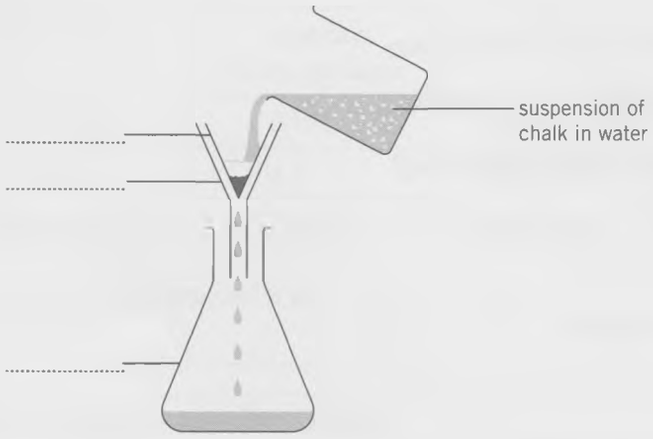
c. Two liquids with different boiling points. ..... [1]

4 Use books or the internet to answer these questions:

a. Explain why salt is put on the roads in icy weather. [3]

b. Use ideas about vapour pressure to explain how impurities increase the boiling point of water. [5]

1. a. i. Complete the diagram by writing the correct labels on the dotted lines.



[3]

ii. On the diagram above label the residue and the filtrate. [2]

b. i. Put these statements about the crystallisation of zinc sulfate in the correct order.

A Filter off the crystals.

B Heat the solution to concentrate it.

C Dry the crystals with filter paper.

D Wash the crystals with a small amount of solvent.

E Leave the solution to cool and form crystals.

F By seeing if crystals form on a cold surface.

G Check that a saturated solution has formed.

Order ..... [2]

2. Calcium carbonate is insoluble in water. Sodium sulfate is soluble in water.
Describe how you could separate a mixture of powdered calcium carbonate and powdered sodium sulfate to obtain a sample of each pure solid.

.....

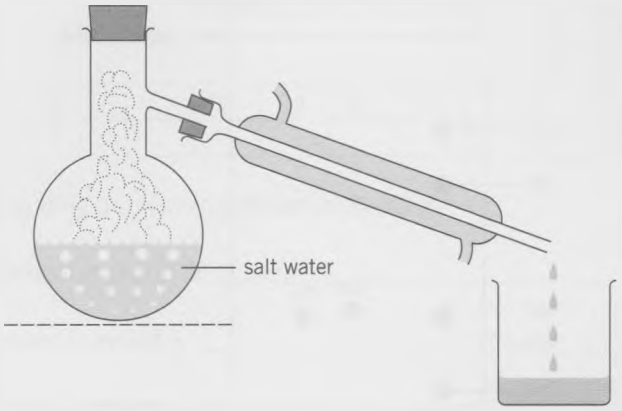
.....

..... [4]

Extension

3. Use books or the internet to describe the process of fractional crystallisation. [5]

1. a. i. Label the diagram of the distillation apparatus to show: (i) the distillation flask; (ii) the distillate; (iii) the condenser; and (iv) where cold water enters the condenser.



[4]

ii. On the diagram above, draw an arrow to show where heat is applied. [1]

b. i. Explain why this method can be used to separate salt from salty water.

..... [1]

ii. Explain why this method cannot be easily used to separate two liquids that have similar boiling points.

..... [1]

2. Complete the following sentences about fractional distillation of alcohols using words from the list.

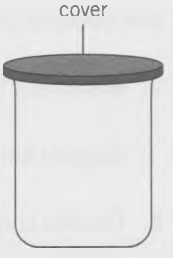
boiling **condenser** **further** **higher** **liquid**
lower **receiver** **temperatures** **vaporised** **volatile**

There is a range of ..... in the distillation column, ... at the top and ..... at the bottom. When ..... the more ..... alcohols move ..... up the column than the less volatile alcohols.

In the ..... the alcohol changes from vapour to .....

The alcohols are collected one by one in the ....., those with the lower ..... points condensing before those with higher ones. [10]

3. Paper chromatography can be used to separate a mixture of dyes. Complete the diagram on the right to show the apparatus set up for chromatography. Label your diagram. [3]



Extension

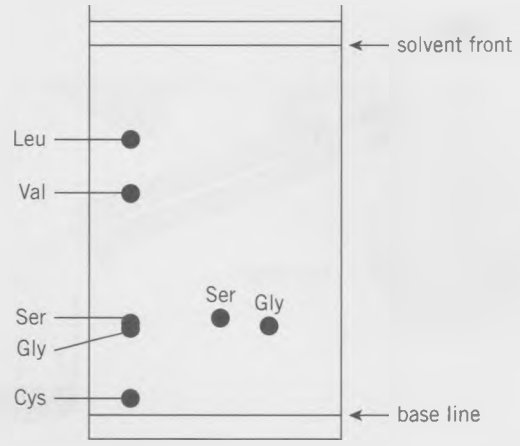
4. Use books or the internet to find out about steam distillation.

a Give two examples of the use of steam distillation. [2]

b Explain why steam distillation is used rather than simple distillation. [1]

c Describe how steam distillation is carried out. [3]

1. a. A paper chromatogram of some amino acids from a mixture of amino acids is shown. Two pure amino acids, Ser and Gly, were also run on the same piece of paper.



i. Why was the base line drawn in pencil and not in ink?

..... [1]

ii. How many amino acids have been completely separated? ..... [1]

iii. Which amino acids have not been separated? ..... [1]

iv. Suggest how you could you separate these amino acids.

..... [1]

v. Calculate the R_f value of Val. ..... [1]

vi. Lysine has an R_f value of 0.14. On the diagram above, draw the approximate position of Lys. Label it Lys. [1]

b. Amino acids are colourless. How can you make the spots show up?

.....

..... [2]

Extension

2. Use books or the internet to answer the following:

a. Metal ions from a coin, e.g. Ag^+, Ni^{2+}, Cu^{2+}, can be identified by paper chromatography.

Suggest how a solution of these ions can be made from the coin. [1]

b. Column chromatography can be used to check the contents of mixtures used in medical drugs. Explain briefly how column chromatography is used. [6]