Rosary School – Marj Elhamam
Study Sheet (1)

Name: _____ Date: / / 2025

Grade: 6 (A,B,C,D,E) Subject : Science

7E: Mixtures & separation

7Ea: mixtures.

A mixture consists of two or more substances mixed together. The substances in a mixture can often be separated from each other.

Example→ Waste water is not a **pure** substance. It is a **mixture** of water and solid substances.

There are different kinds of mixtures:

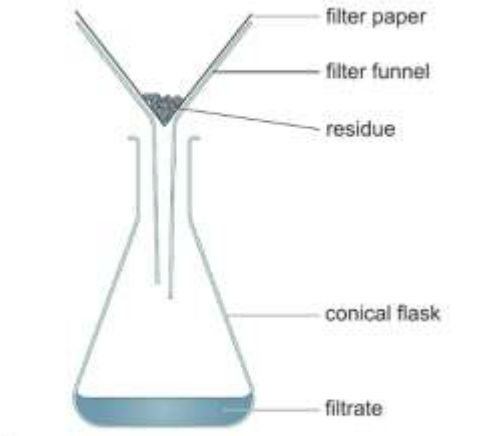
1) A **Solution** is a mixture in which solids dissolve in liquids, and the mixture is clear **(transparent).**

2) **Suspension** is a mixture of two substances that separate if the mixture is **not** stirred. These two substances are often solids and liquids.

The solids settle out of the mixture over time.

Example→ sand mixed with water

Filtration is the process by which insoluble solids (**residue**) can be removed from a liquid (**the filtrate**) by using **filter paper**.



C | filtering apparatus

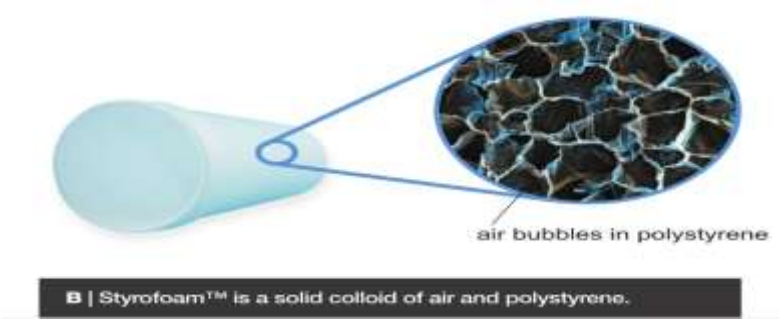
Note: Suspension can be separated using the filtration method.

3) **Colloid** is a mixture of a solid, liquid, or gas in a solid liquid or gas, where substances do not settle out if left to stand. The mixture looks **cloudy** or **opaque**.

Example→ milk and paint.

***Question**: Give three other examples of colloids.

Hair spray, hand cream, fog



B | Styrofoam™ is a solid colloid of air and polystyrene.

- Complete the table:

Type of mixture	Solution	Suspension	Colloid
Description of solid	Dissolved	Suspended	Dispersed
Appearance	Clear/ transparent	Solid particles suspended	Cloudy/ opaque
Separated if not stirred(yes ,no)	No	Yes	No
Example	Salt + water	Sand + water	Milk, paint
Separation process	Evaporation, distillation, chromatography	Filtration	Chromatography

Waste water **contains large solids such as leaves, rubbish and lumps of human waste in addition to small solids.

The stages of waste water treatment:

1) Waste water from homes, offices, and street drains passes through a screen, which acts as a sieve to remove large solids.

2) Water is passed through filters (filtration) or by using settlement to remove smaller solids.

3) Water is treated with chemicals to clump the finest solids.

4) Clumps are removed by using filtration or settlement.

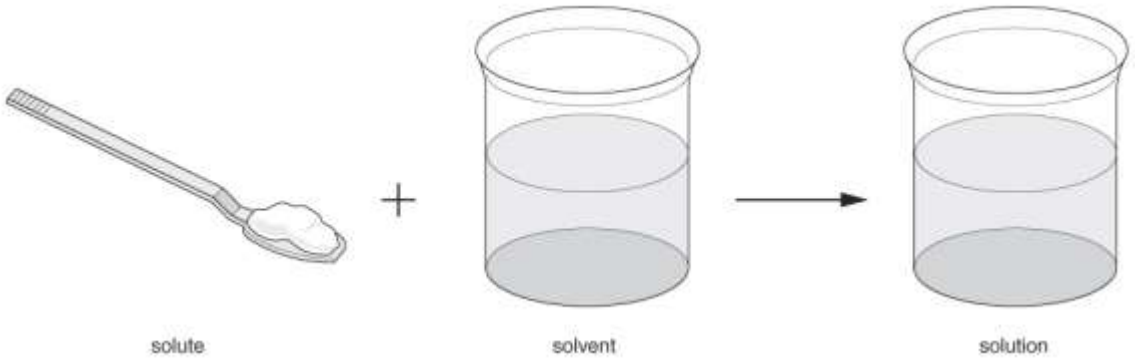
<u>Questions</u> :

Course book : Q3, Q5 & Q6 pages 72 & 73.

Workbook pages 53 & 54.

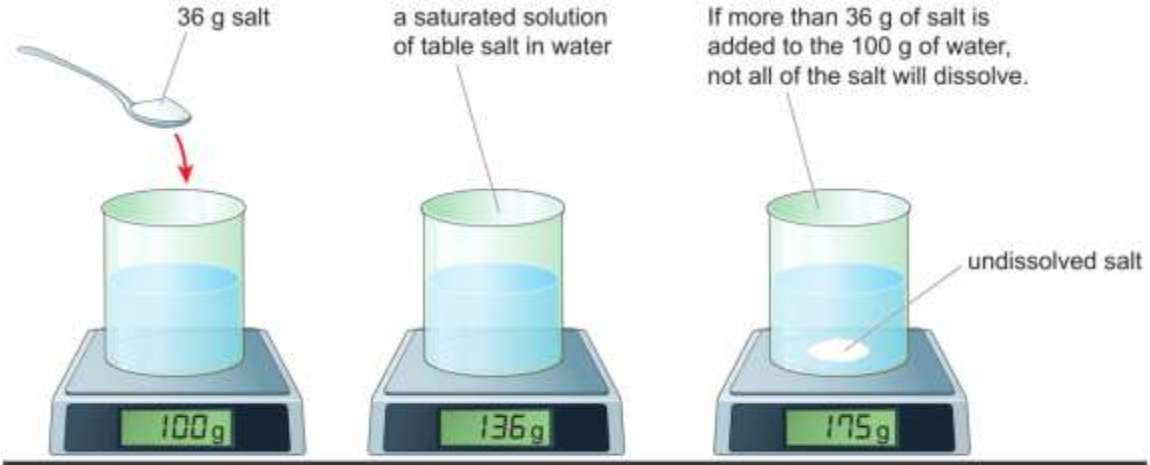
7Eb: solutions

Some solids dissolve in water to make a solution. These solids are **soluble**. A solution is made from a **solute** (usually a solid) and a **solvent** (liquid). Some gases, such as oxygen and carbon dioxide, can also dissolve in water.



Substances that do not dissolve in a solvent are **insoluble**. When an insoluble substance is mixed with water, the mixture formed may be a suspension or a colloid.

The total **mass** of a solution equals the mass of solvent added to the mass of solute.



E | The total mass of a solution is the mass of the solid plus the mass of the liquid. A saturated solution is formed when 36 g of table salt is dissolved in 100 g of water.

The amount of solute dissolved a certain volume of solvent is the **concentration** of the solution. The higher the concentration, the more solute is dissolved.

Water dissolves many different solutes. Other liquids (e.g. white spirit, ethanol) can also be used as solvents. Solutes that are insoluble in water may dissolve in other solvents.

If you keep adding solutes to a solvent, you will get to a point where no more will dissolve. The solution is **saturated** with solute. More solid may dissolve if you add more solvent (e.g. water) or increase the temperature.

The **solubility** of a solute is the amount that will dissolve in 100 g of a solvent at a particular temperature.

The solubility depends on

1) **The solvent** :
   For example, 36 g of table salt will dissolve in water at 20 ℃ but only 0.1 g will dissolve in ethanol at the same temperature.
2) **Temperature**: It usually increases with temperature.

Question:

1- The Solubility of blue copper sulfate is 40 grams per 100 grams of water at 60 degrees Celsius.

A) State the largest mass of copper sulfate that would dissolve in 300 grams of water at 60 degrees Celsius.

40g → 100g 40 x 3 = 120g of Copper Sulfate will dissolve in 300g of water at 60 ºC

?? → 300g

B) A saturated solution of copper sulfate at 60 degrees Celsius is cooled to 30 degrees Celsius. Describe what you see when the solution cools. Explain your answer.

As the liquid cools, the Copper Sulfate will start to crystalise out. This is because the solubility of the Copper Sulfate decreases and so less of it can stay dissolved in the solvent

2- The solubility of copper chloride in ethanol is 53 g in 100 cm^3 at 15 º C.

What would you see if you added the following amounts of copper chloride to ethanol and stirred? Explain your answers.

a- 48 g copper chloride to 100 cm^3 ethanol at 15 ºC.

All of the Copper Chloride would dissolve because the mass is lower than the solubility

b- 60 g copper chloride to 100 cm^3 ethanol at 15 ºC.

Most of the Copper Chloride will dissolve but 7g of Copper Chloride would remain undissolved at the bottom of the beaker because this mass is greater than the solubility at this temperature

c- 48 g copper chloride to 50 cm^3 ethanol at 15 ºC.

53g → 100g

?? → 50g

Some of the Copper Chloride would remain undissolved at the bottom of the beaker because

50g can only dissolve 26.5g Copper Chloride at this temperature

2- 22g of silver sulfate is added to 200g of water. What is the mass of the solution formed? Show your working

Mass of solution = mass of the solute + mass of the solution

= 22 + 200

= 222g

Questions:

- Course book: Q4 & Q5 page 75

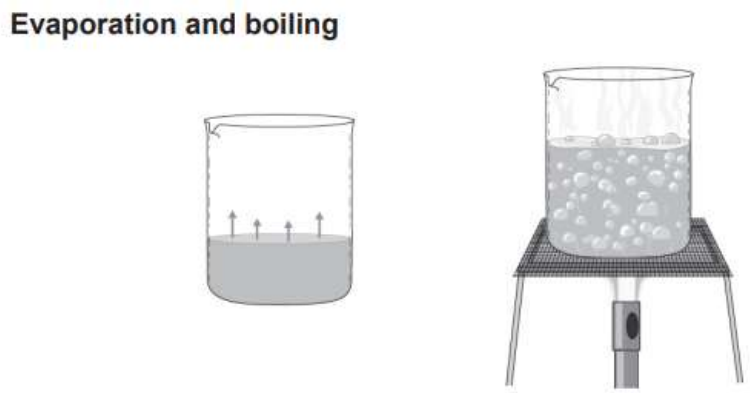
- Work book page 55

7Ec: Evaporation

During the evaporation of a solution, the **liquid** turns into a **gas,** which escapes into the air, **leaving behind** the solids that were dissolved in it.

Evaporation is used to separate solid substances from a solution.

Example→ separating salt from a salt solution.



Evaporation is when a liquid turns to a gas at its surface.	**Boiling** is when a liquid turns to a gas throughout its volume.

It happens at any temperature.	Gas formed inside the liquid makes bubbles that rise to the surface.
It is faster when the temperature is higher.	Pure liquids have a distinct boiling point, which can be used to identify a liquid or to test whether a known liquid is pure. The boiling point of pure water is 100 °C.

Questions:

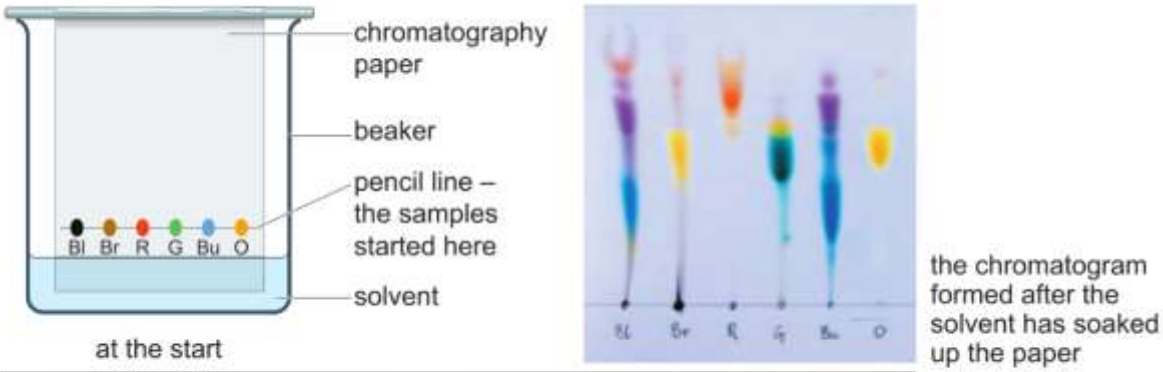
- **Course book: Q1, Q4, Q6 page 79**
- **Workbook page 58**

7Ed: Chromatography

Chromatography is used to separate substances dissolved in a mixture (individual solutes from a mixture of solutes in a solvent).

This method makes it easier to **identify** and **analyze** each substance.

Paper chromatography is the simplest method of chromatography; it can be **used** to find out which colours are mixed together in different paints, dyes and inks.



D | Six different inks were tested in this chromatography experiment: black (Bl), brown (Br), red (R), green (G), blue (Bu), orange (O).

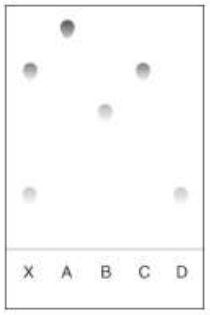
Question: Describe how the experiment is set up.

1) Dots of ink were placed on the base of the paper.

2) The paper was placed in the beaker.

3) A small amount of solvent was placed in the beaker, so the level of solvent was below the ink dots on the paper.

→ The solvent carries the coloured substances in the ink up the paper to form a pattern called a **chromatogram**.



Interpreting a chromatogram

Chromatograms help to identify substances in a mixture.

This paper chromatogram shows that A, B, C and D are all single substances and that X is a mixture of C and D.

Note: Chromatography can be done with colourless substances. Ultraviolet light might make the substances glow. This makes the substances visible.

Question:

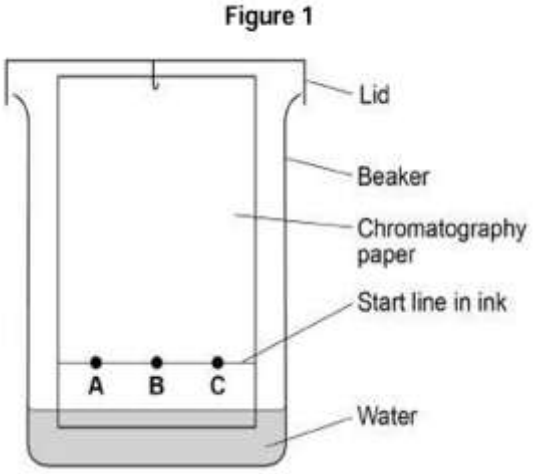
A student investigated the colours in three different flowers, A, B and C.

The colours are soluble in ethanol but are insoluble in water.

This is the method used.

1. Crush flower
2. Add ethanol to flower
3. Filter the mixture.
4. . Put spots of the coloured filtrate on to the chromatography paper.
5. Repeat steps 1-4 with flowers B and C.

Figure 1 shows the apparatus used.

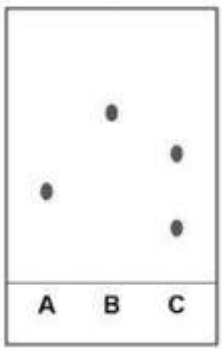


(a)The student made many mistakes in setting up the apparatus. Name two mistakes that the students made.

1. Using water as a solvent but it's insoluble in water
2. Using ink to draw the start line

(b) Another student set up the apparatus correctly. Figure 2 represents the student's results.

Figure 2



i. Which flower colours is contain only one dye? A,B

ii. Which flower colour was the most soluble? Explain your answer.

B, it was the highest on the chromatogram

→Solve questions:
Course book: Q4, Q5, Q7 & Q8 page 81.
Workbook page 59.

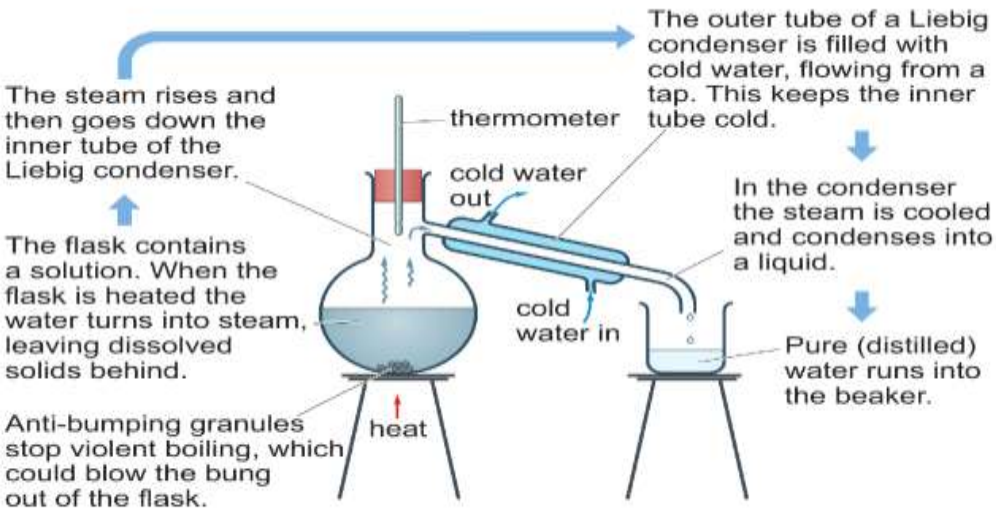
7Ee: Distillation

Distillation is the process of separating a liquid from a mixture by **evaporating** the liquid and then **condensing** it so that it can be collected.

→ Example: distillation of pure water from a salt solution

Desalination is the process of removing dissolved solutes from seawater to make it suitable for drinking.

Apparatus used:



C | This apparatus can be used to distil mixtures in the lab, including solutions such as salty water.

Question:

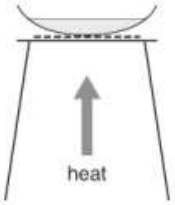
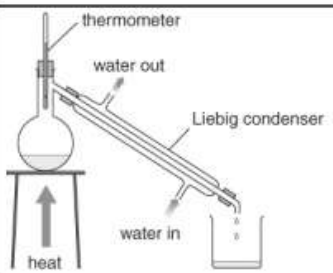
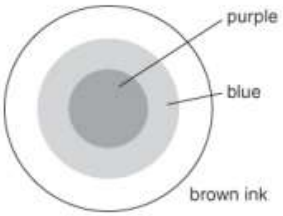
Explain why desalination plants are usually built next to the sea.

They use sea water to produce fresh water by desalination

Questions: Workbook page 60 & 61

Summary:

Mixtures and solutions can be separated using different methods.

Method	Used to separate	Apparatus used	Examples
filtering (filtration)	solids from a suspension (i.e. large pieces of solids that have not dissolved in a liquid)		• sand from a mixture of sand and water
evaporation	solid substances from a solution or colloid		• salt from a salt solution
distillation (evaporation followed by condensation)	liquid from a mixture		• pure water from a salt solution
chromatography	individual solutes from a mixture of solutes in a solvent		• colours found in ink