



Mixtures and Separation Techniques

Topic Summary

- A mixture is produced when two or more different substances are combined but have not (fully) reacted.
- Mixtures are common: most chemical reactions produce mixtures rather than single pure products, so chemists need separation techniques.
- Types of mixtures:
 - Heterogeneous mixtures – substances are physically distinct (e.g., sand and salt).
 - Homogeneous mixtures – substances are mixed at the atomic level (e.g., alloys like steel, solutions like saltwater).
- Separating heterogeneous solid–liquid mixtures: Use filtration e.g. filtering sand from water.
- Separating homogeneous solid–liquid mixtures (solutions):
 - Evaporation/crystallisation to obtain the solid.
 - Distillation to obtain the liquid (condensing the evaporated solvent).
- Separating complex mixtures:
 - Chromatography for multiple dissolved substances - useful for analysis and for small scale separations - slow and expensive.
 - Fractional distillation for mixtures of liquids, ideal for large scale industrial processes, This process is used for the separation of fractions in crude oil (refining).



Quick Checks to Build Recall

5g of sugar completely dissolves in a glass of water. Is the resulting solution a heterogeneous or a homogeneous mixture?

.....HOMOGENEOUS.....(1 mark)

In the sugar/water solution described above, which component is the solvent and which is the solute?

The solvent isWATER.....(1 mark)

The solute isSUGAR.....(1 mark)

What process would be used to separate an undissolved solid from a liquid?

.....FILTRATION.....(1 mark)

What process would be used to recover the dissolved solid from a solution?

.....EVAPORATION.....(1 mark)

In distillation two processes occur, first one of the components is boiled/evaporated to turn it into the gas state, what is the name of the second process?

.....CONDENSATION.....(1 mark)



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Exam Style Questions

1. A solution is made up of two parts - the solvent and the solute. Define these two terms (2 marks)

SolventThe liquid in which the solid dissolves / which dissolves the solid.....
(1 mark)

SoluteThe solid that gets dissolved / which is dissolved(1 mark)

2. A student has a mixture of sand, salt and water.
Describe the steps they should take to separate and collect both the sand and the salt. Explain why each step works. (4 marks)

- Add water to dissolve the salt (1 mark) – salt is soluble, sand is not.
- Filter the mixture to separate sand (1 mark) – sand is trapped in the filter paper because it is insoluble/ too large to pass through the holes/pores.
- Wash sand with a little extra water (credit if stated) – ensures all salt is dissolved (not essential but creditworthy).
- Evaporate the water from the filtrate (1 mark) – leaves solid salt behind because it does not evaporate.

Maximum of 3 marks if the reason for the steps is not explained.

- Fourth mark - Suitable explanation of why at least two of the steps work (1 mark)



Do this later...

Give your brain a break and come back to these questions later. Cover the rest of the sheet while you have a go. By doing this 24-48 hours after watching the video you will boost your chances of remembering the key points in an exam. If you struggle with these questions, re-watch the video and then try again.

1. Salt crystals and sand grains mixed together are a (**heterogeneous**) mixture
Heterogeneous
2. Which technique would be best to remove the soil particles from a heterogeneous mixture of soil and water?
Filtration
3. Which technique is used to separate the components in mixture of crude oil?
Fractional Distillation
4. Describe, in as much detail as possible, how you would separate a mixture of salt and sand.
See Qn 2 above