CAMBRIDGE
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Chemistry

For the IB Diploma

Brighter Thinking
Better Learning

Chapter 1

Introduction to the particulate nature of matter

Definitions

Element: a chemical substance that cannot be broken down into a simpler substance by chemical means. Each atom has the same number of protons in the nucleus.

Compound: a pure substance formed when two or more elements combine chemically in a fixed ratio.

Mixture: two or more substances mixed together. The components of a mixture can be mixed together in any proportion (although there are limits for solutions). The components of a mixture are not chemically bonded together, and so, retain their individual properties. The components of a mixture can be separated from each other by physical processes.

Homogeneous and heterogeneous mixtures

A homogeneous mixture has the same (uniform) composition throughout the mixture, and therefore, consists of only one phase. The different components can be separated by physical means.

Figure 1.1: A solution of sodium chloride.

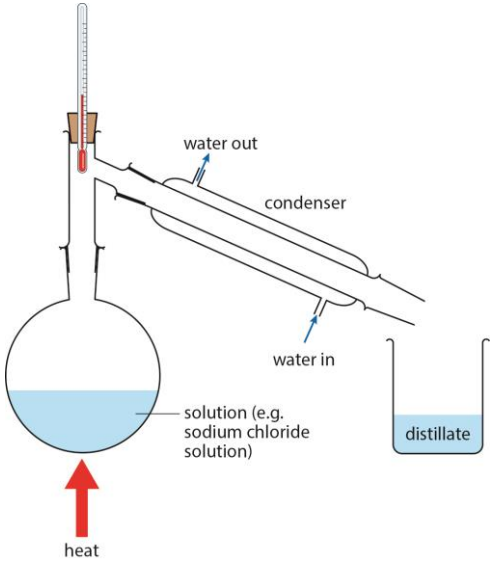

Figure 1.2: The experimental set-up for distillation.

Homogeneous and heterogeneous mixtures

A heterogeneous mixture does not have uniform composition – it consists of separate phases. The different components can be separated by mechanical means.

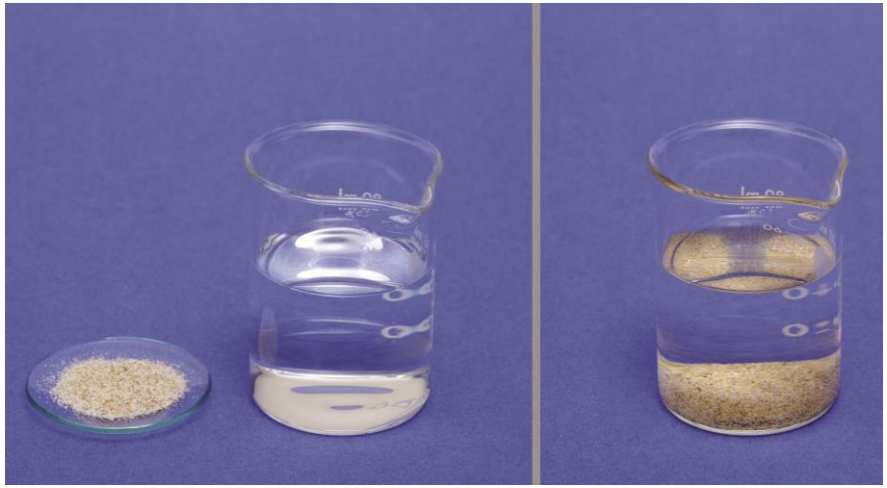

Figure 1.3: Sugar, sand and salt solutions.

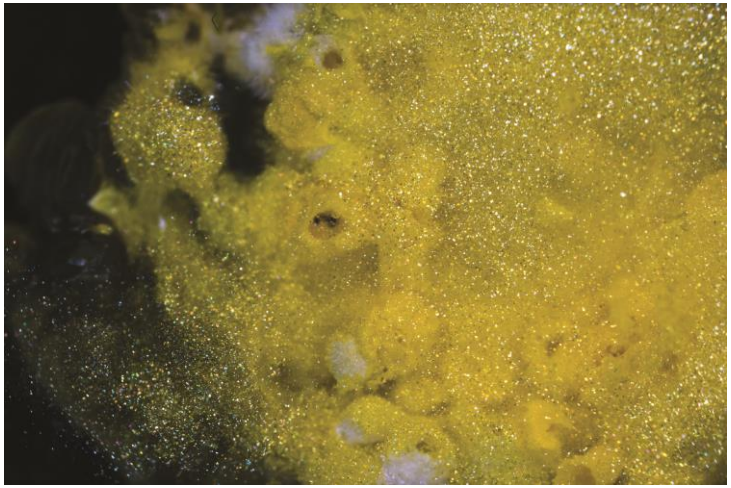

Figure 1.4: Lead iodide in solution.

Techniques for separating mixtures

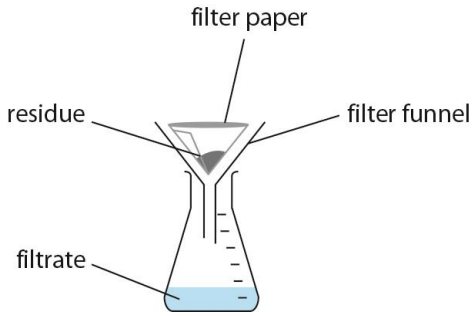

Figure 1.5: Filtration can be used to separate a solid from a liquid.

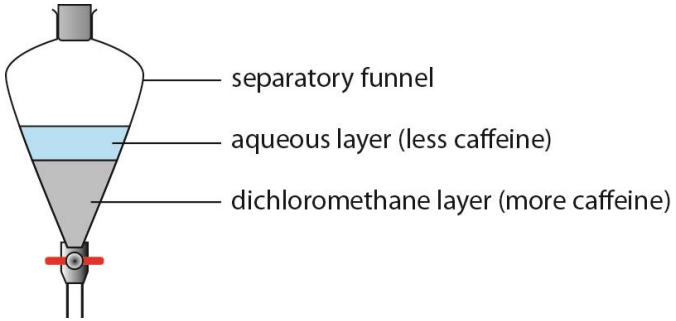

Figure 1.6: A separatory funnel is used in the extraction of caffeine from tea.

Techniques for separating mixtures

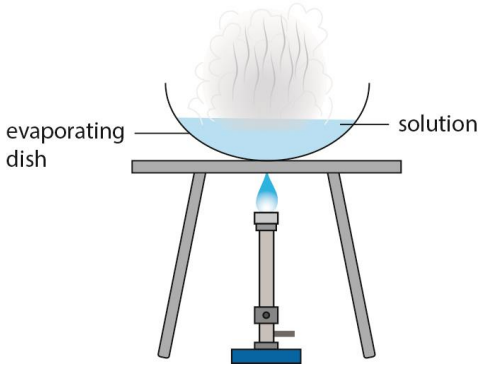

Figure 1.7: Evaporation of the solvent can be used to obtain a solute from a solution. If larger crystals are required, only some of the water should be boiled off and then the solution should be left to crystallise.

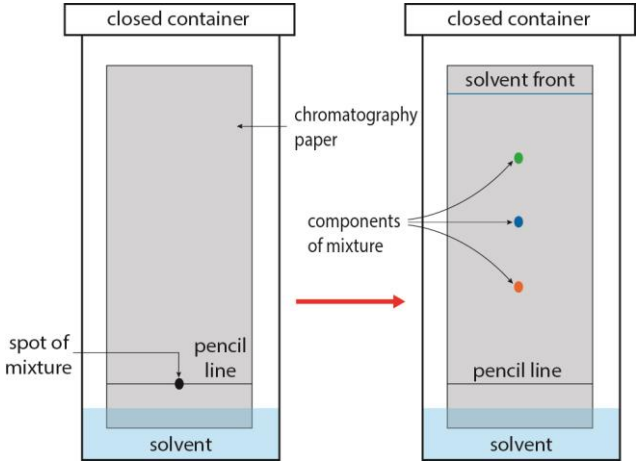

Figure 1.8: A paper chromatography experiment.

Changes of states of matter

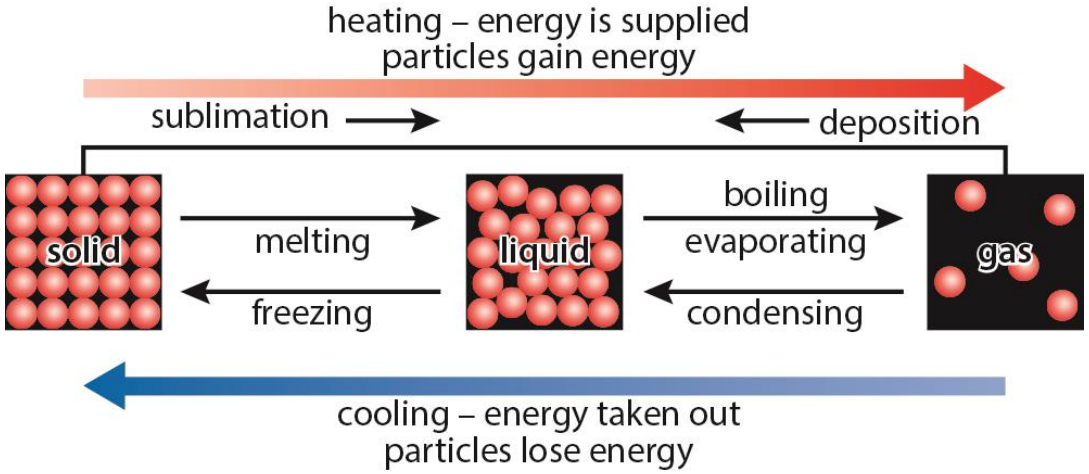

Figure 1.9: The three states of matter.

Changes of states of matter

The heating curve

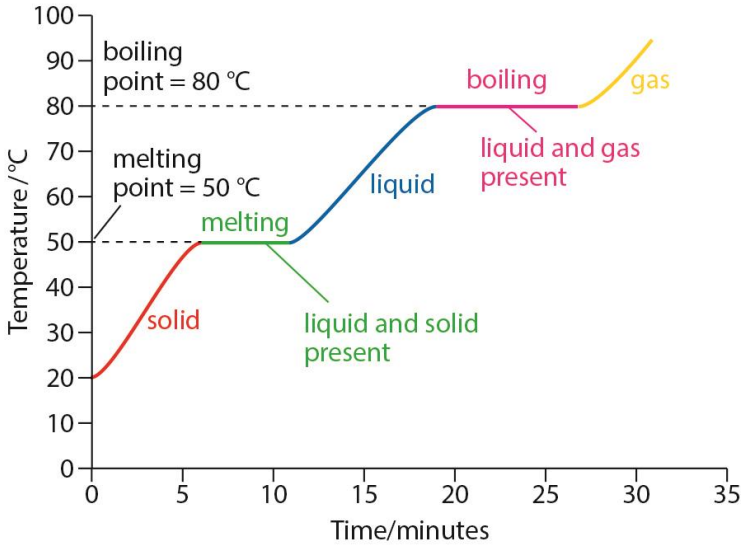

Figure 1.10: A heating curve showing changes of state.