12 Separating and purifying – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
solute	溶质			
solvent	溶剂			
solution	溶液			
residue	残渣			
filtrate	滤液			
titration	滴定			
pipette	移液管			
indicator	指示剂			
burette	滴定管			
end-point	终点			
filtration	过滤			
crystallisation	结晶			
simple distillation	蒸馏			
fractional distillation	分馏			
Paper chromatography	纸色谱法			

English	中文	Write it 3 times (English)		
R value	比移值			
Impurities	杂质			
melting point	熔点			
boiling point	沸点			

Recall

These words come up in every practical:

- A **solute** 溶质 dissolves in a **solvent** 溶剂 to make a **solution** 溶液.
- The **residue** 残渣 is the solid left on the filter paper; the **filtrate** 滤液 is the liquid that passes through.

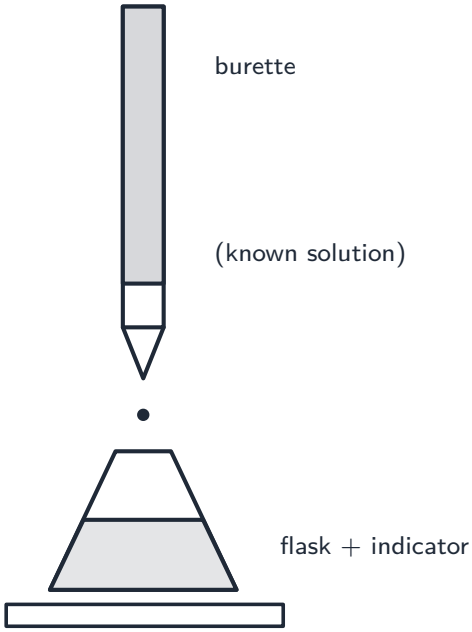
New ideas

Read these first, then do the Practice.

1 Titration

A **titration** 滴定 finds the exact volume of one solution that reacts with another.

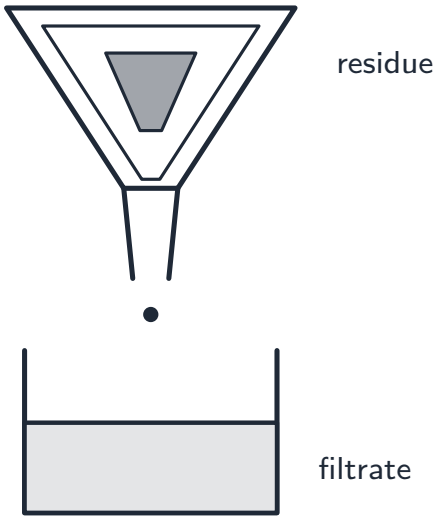
- Measure a fixed volume of one solution into a flask with a **pipette** 移液管, and add a few drops of **indicator** 指示剂.
- Run the other solution in from a **burette** 滴定管 until the colour just changes — the **end-point** 终点.



■ 2 Separating mixtures

Choose the method to match the mixture:

Method	Separates
filtration 过滤	an insoluble solid from a liquid
crystallisation 结晶	a soluble solid from its solution
simple distillation 蒸馏	a solvent (liquid) from a solution
fractional distillation 分馏	two liquids with different boiling points

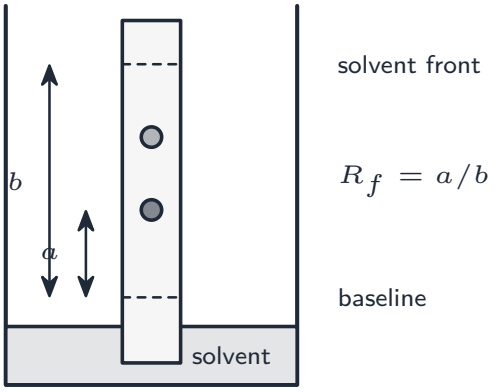


■ 3 Chromatography

Paper chromatography 纸色谱法 separates a mixture of soluble, coloured substances. A spot of the mixture is placed on a pencil baseline; as the solvent rises up the paper, each substance travels a different distance and so separates.

The spots are compared using the $\mathbf{R}_f$ **value** 比移值:

$$R_f = \frac{\text{distance moved by the substance}}{\text{distance moved by the solvent}}$$



■ 4 Checking purity

A pure substance melts and boils at sharp, fixed temperatures. **Impurities** 杂质 lower the **melting point** 熔点 and raise the **boiling point** 沸点 — so a thermometer can check purity.

Watch out: match the method to the mixture — **filtration** (insoluble solid from a liquid), **crystallisation** (soluble solid from solution), **distillation** (a liquid from a solution / two liquids). The R_f value is *substance distance* ÷ *solvent distance*, so it is always **less than 1**.

Practice

Try these in order.

12.1 Name the apparatus used to measure a fixed, accurate volume of solution into a flask. [1]

12.2 In a titration, what is the *end-point*? [1]

12.3 Which method would separate an insoluble solid from a liquid? [1]

12.4 In a chromatography run, a spot moves 4 cm while the solvent moves 8 cm. Work out the R_f value. [1]

12.5 How does the melting point change if a substance is impure? [1]

12.6 Challenge. In a chromatogram, substance A moves 3 cm and substance B moves 6 cm while the solvent moves 8 cm. Calculate the R_f of each, and state which travelled further. [3]