Exercise walk-through

Diffusion ▪ 1.2

eXercise

You must be able to

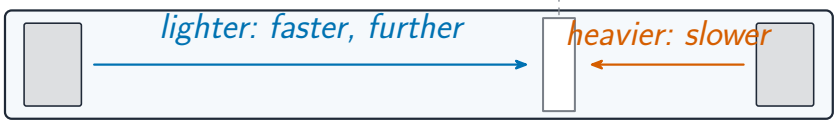
- describe diffusion as spreading from high to low concentration
- explain diffusion using the random motion of particles
- explain why lighter molecules diffuse faster (the NH /HCl experiment)

Method — The NH /HCl experiment

- **diffusion:** particles spread from high to low concentration because they move randomly.
- happens in gases and liquids, **not** solids (particles can't move from place to place).
- lighter molecules (smaller M_r) diffuse **faster**.

Method — The NH /HCl experiment

white ring of
ammonium chloride, NH_4Cl

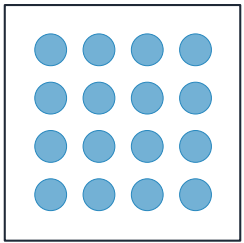


cotton wool soaked
in ammonia
NH_3 ($M_r = 17$)

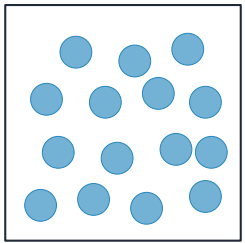
cotton wool soaked in
hydrogen chloride
HCl ($M_r = 36.5$)

A glass tube: NH from the left, HCl from the right, white ring nearer the HCl end

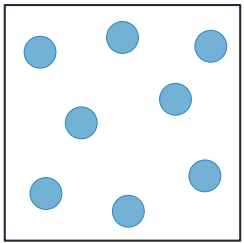
Method — The NH /HCl experiment



solid
regular, touching
vibrate in place



liquid
close, random
slide past
each other



gas
far apart,
random
move fast

Diffusion is the random movement of particles

Practice 2.1 ▪ 1 mark

Define diffusion.

Solution 2.1

Worked steps

the spreading of particles from a region of high concentration to a region of low concentration B1.

Practice 2.2 ▪ 1 mark

State why diffusion does not occur in solids.

Solution 2.2

Method: The NH /HCl experiment

Worked steps

the particles in a solid cannot move from place to place (only vibrate) B1.

Exam-style 3.1 ▪ 1 mark

Two gases diffuse along a tube. The one that travels faster has the:

A larger relative molecular mass

B smaller relative molecular mass

C higher density

D larger molecules

Solution 3.1

Method: The NH /HCl experiment

A larger relative molecular mass

B smaller relative molecular mass ✓

C higher density

D larger molecules

Worked steps

B. The gas with the smaller relative molecular mass diffuses faster.

Exam-style 3.2 ▪ 2 marks

In the experiment, ammonia ($M_r = 17$) and hydrogen chloride ($M_r = 36.5$) diffuse from opposite ends of a tube and form a white ring.

(a) State, with a reason, at which end the white ring forms nearer.

(b) Name the white solid formed.

Solution 3.2

Method: The NH /HCl experiment

Worked steps

(a) nearer the hydrogen chloride end **M1**; because ammonia is lighter, so it diffuses faster and travels further **A1**.
(b) ammonium chloride (NH_4Cl) **B1**.

Exam-style 3.3 ▪ 2 marks

Explain, in terms of particles, why you can smell perfume from across a room.

Solution 3.3

Worked steps

the perfume particles move randomly in all directions (M1); they diffuse and mix with the air until they reach your nose (A1).