# Past-paper walk-through

## Diffusion ▪ 1.2

eXercise

# Questions in this set

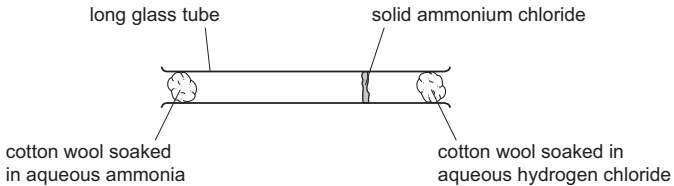
- 0620/21 N25 Q2 ▪ 1 mark
- 0620/22 N25 Q3 ▪ 1 mark
- 0620/23 N25 Q2 ▪ 1 mark
- 0620/22 M25 Q3 ▪ 1 mark

# Question 2

0620/21 N25 ▪ Q2 ▪ 1 mark

**2** Ammonia gas is reacted with hydrogen chloride gas using the apparatus shown.

Solid ammonium chloride is produced.




Which statement explains why the solid ammonium chloride is formed nearer to the hydrogen chloride?

**A** Aqueous ammonia is a base and aqueous hydrogen chloride is an acid.

# Question 2

**B** Ammonia molecules diffuse more slowly than hydrogen chloride molecules.

**C** Hydrogen chloride has a greater molecular mass than ammonia.

**D** Only ammonia molecules diffuse in all directions at the same time.

# Solution 2

Answer: **C**

**Why**

- Both gases diffuse along the tube and the white solid forms where they meet.
- Ammonia has the smaller relative molecular mass ($17$ against $36.5$), so it travels faster.
- The ring therefore forms nearer the hydrogen chloride end, not in the middle.

# Question 3

0620/22 N25 ▪ Q3 ▪ 1 mark

**3** A student investigates the diffusion of ammonia gas, $NH_3$, and hydrogen chloride gas, $HCl$.

Two sets of apparatus are set up as shown at room temperature and pressure.


The damp red litmus paper in apparatus 1 changes colour after 30 seconds.

How long does it take for the damp blue litmus paper in apparatus 2 to change colour?

# Question 3

**A** 21 seconds

**B** 30 seconds

**C** 64 seconds

**D** The damp blue litmus paper does **not** change colour.

# Solution 3

Answer: **C**

**Why**

- Ammonia is alkaline and turns damp red litmus blue; hydrogen chloride is acidic and turns damp blue litmus red.
- Ammonia has the smaller relative molecular mass ($17$ against $36.5$), so it diffuses faster.
- So the ammonia apparatus shows its colour change sooner and further from the source.

# Question 2

0620/23 N25 ▪ Q2 ▪ 1 mark

**2** Which gas diffuses most quickly at room temperature and pressure?

**A** $CH_4$ **B** $C_2H_6$ **C** $CO$ **D** $SO_2$

# Solution 2

Answer: **A**

**Why**

- Lighter molecules diffuse faster at the same temperature.
- Relative molecular masses: $CH_4$ 16, CO 28, $C_2H_6$ 30, $SO_2$ 64.
- Methane is the lightest, so it diffuses most quickly.

# Question 3

0620/22 M25 ▪ Q3 ▪ 1 mark

**3** Samples of four gases are released in a room at the same time.

The gases are carbon dioxide, $CO_2$, hydrogen chloride, $HCl$, hydrogen sulfide, $H_2S$, and nitrogen dioxide, $NO_2$.

Which gas diffuses fastest?

**A** carbon dioxide

**B** hydrogen chloride

**C** hydrogen sulfide

**D** nitrogen dioxide

# Solution 3

Answer: **C**

**Why**

- Lighter molecules diffuse faster at the same temperature.
- Relative molecular masses: $H_2S$ $34$, HCl $36.5$, $CO_2$ $44$, $NO_2$ $46$.
- $H_2S$ is the lightest, so it diffuses fastest.