Diffusion Expansion and Brownian Motion

KS3 Physics · Follows the national curriculum

Name _____ Class _____ Date _____

1. Worked example

Why can you smell perfume across a room?

Step 1 · Evaporation

Some perfume evaporates into gas particles.

Step 2 · Random movement

These particles move randomly and collide with air particles, gradually spreading out.

Step 3 · Diffusion

They spread from where there are lots (high concentration) to where there are few (low concentration) — until some reach your nose.

Answer: Diffusion of perfume particles through the air

Check: No one needs to blow it across: random particle motion is enough.

2. Now try one with the steps

A drop of food colouring is added to hot water and to cold water. Where does it spread faster?

Step 1 · Temperature

Step 2 · Result

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. What is diffusion? [1]

2. Is diffusion faster in a gas or a liquid? [1]

3. Why does diffusion happen faster at higher temperatures? [1]

4. Why does diffusion hardly happen in solids? [1]

5. What happens to the particles in a solid when it is heated? [2]

6. What is Brownian motion? [2]

7. What does Brownian motion provide evidence for? [1]

8. Why do bridges have expansion joints? [1]

9. A 10 m steel rail grows 1.2 mm for each 10 °C rise in temperature. How much does it grow, in mm, for a 30 °C rise? [2]

10. How does a liquid-in-glass thermometer work? [2]

11. A metal jar lid is stuck. Why does running it under hot water help? [2]

12. A smell spreads across a 6 m room in 2 minutes. What is the average speed of spreading, in m per minute? [1]

13. Air particles move at about 500 m/s, yet a smell takes minutes to cross a room. Explain why. [2]

14. Plan an investigation into how temperature affects the rate of diffusion of food colouring in water. [4]

4. Before you hand it in

"Particles expand when heated."
Particles move or vibrate more and spread slightly further apart, so the material expands.

"Diffusion needs stirring or a breeze."
Stirring and wind speed up mixing, but diffusion happens without them.

"In Brownian motion we can see the air particles."
We see the larger smoke or pollen particles being knocked about by the invisible air or water particles.