# Particles of Matter Are Continuously Moving

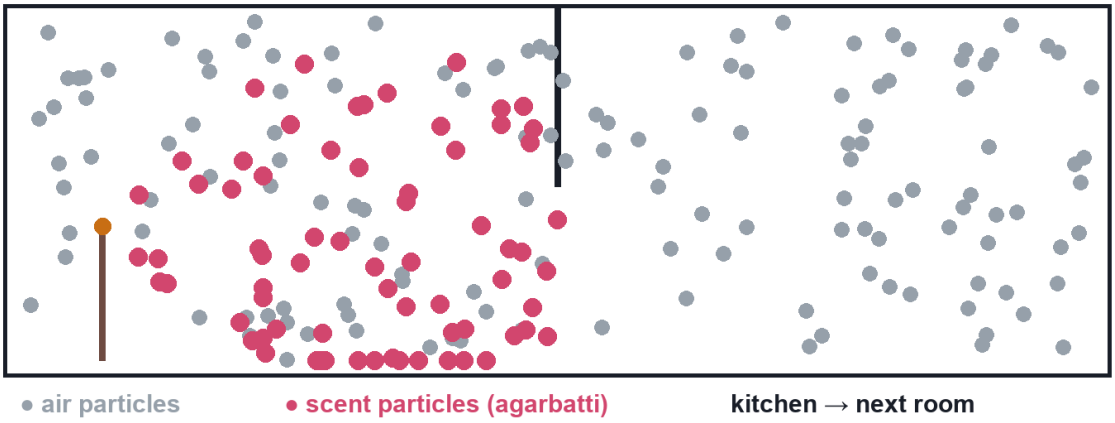
**Class 9 Chemistry · Chapter: Matter in Our Surroundings**
🎬 **Video explanation (PrayogX reel):** https://www.instagram.com/reel/DfFvP_2gnzB/

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## 1. The everyday puzzle

Light an agarbatti (incense stick) in the kitchen and in a few minutes you can smell it in the next room, even with the fan off. Nothing pushed the smell. It travelled because the **particles of matter are always moving**.

**Diffusion: scent particles spread into the spaces between air particles**




## 2. Key definitions

| Term | Meaning |
|---|---|
| **Particles of matter** | The tiny particles that all matter is made of; they have spaces between them and attract each other. |
| **Kinetic energy** | The energy a particle has because it is moving. |
| **Diffusion** | The intermixing of particles of two different types of matter on their own, as particles move into the spaces between each other. |

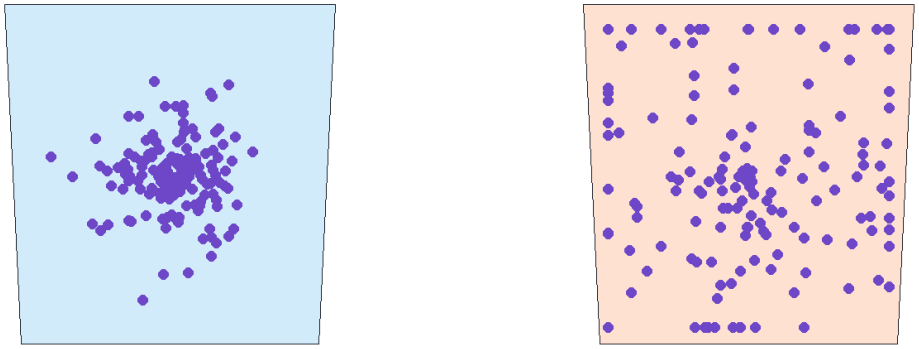
# 3. What the moving particles explain

- Particles of matter **never stop** moving: they possess kinetic energy.
- Scent particles slip into the **spaces between air particles** and spread out: diffusion.
- Diffusion is fastest in gases, slower in liquids and slowest in solids (particles move most freely in gases).

# 4. The ink experiment (cold vs hot water)

Put a drop of ink (or a crystal of potassium permanganate) into a glass of cold water and another into hot water. The colour spreads **much faster in hot water**.

**One drop of ink: cold water vs hot water**



**Cold water (about 10 °C): spreads slowly** **Hot water (about 70 °C): spreads fast**

**Higher temperature → more kinetic energy → particles move faster → faster diffusion**

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# 5. Examples from daily life

- The smell of hot food reaches you from far away; cold food must be brought close.
- Perfume sprayed in one corner is soon smelt across the room.
- A drop of honey or a crystal of copper sulphate colours water slowly on its own.
- Oxygen and carbon dioxide diffuse into and out of water, which aquatic life depends on.

# 6. Solved examples

**Example 1.** Why does the smell of hot sizzling food reach us several metres away, but we must go close to cold food to smell it?
At a higher temperature the particles of the food's vapour have more kinetic energy and move faster, so they diffuse into the air faster and reach us sooner.
**Example 2.** A crystal of potassium permanganate is placed at the bottom of a beaker of water without stirring. What will you see after some hours, and why?
The purple colour spreads through the whole water, because the permanganate particles move and diffuse into the spaces between water particles.

# 7. Key takeaways

- Particles of matter are **continuously moving**.
- Their mixing on their own is **diffusion**.
- Temperature ↑ → kinetic energy ↑ → speed of particles ↑ → diffusion faster.

# Practice questions (CBSE style)

1. What is diffusion? (1 mark)
2. Name the energy possessed by particles due to their motion. (1 mark)
3. Why does a drop of ink spread faster in hot water than in cold water? (2 marks)
4. The smell of an agarbatti reaches the next room even when there is no breeze. Explain. (2 marks)
5. Arrange solids, liquids and gases in increasing order of their rate of diffusion and give a reason. (2 marks)
6. Describe an activity to show that particles of matter are continuously moving. (3 marks)
7. Why do we smell hot food from far away but must go close to cold food? (2 marks)

# Answer key with worked solutions

1. The intermixing of particles of two different types of matter on their own is called diffusion.
2. Kinetic energy.
3. Hot water particles have more kinetic energy and move faster, so the ink particles mix (diffuse) into the water faster.
4. The scent particles are always moving; they diffuse into the spaces between the air particles and spread to the next room.
5. Solids < liquids < gases. Particles in gases have the most space and move most freely; in solids they are tightly packed.
6. Drop a crystal of potassium permanganate (or a drop of ink) into a beaker of still water and leave it. The colour slowly spreads through the water without stirring, showing that the particles move and intermix. Repeating it with hot water shows faster spreading.
7. At a higher temperature the vapour particles of hot food move faster, so they diffuse through the air quickly and reach us from far away.