CIE Chemistry IGCSE

Topic 1 - The Particulate Nature of Matter

Flashcards

Describe the arrangement and movement of particles in solids

Describe the arrangement and movement of particles in solids

- Tightly packed together in a regular arrangement.
- Vibrate in fixed positions.

Describe the arrangement and movement of particles in liquids

Describe the arrangement and movement of particles in liquids

- Closely packed together but able to move past each other.
- Vibrate and move around each other.

Describe the arrangement and movement of particles in gases

Describe the arrangement and movement of particles in gases

- Well separated in a random arrangement.
- Vibrate and move freely at high speeds.

Compare the relative energies of particles in solids, liquids and gases

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Particles in a solid have the least amount of energy and particles in a gas have the most energy.

What are the names for the state changes from solid to liquid and vice versa?

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Solid → liquid: Melting

Liquid → solid: Freezing

What are the names for the state changes from liquid to gas and vice versa?

What are the names for the state changes from liquid to gas and vice versa?

Liquid → gas: Evaporation

Gas → liquid: Condensation

What is the term describing when a solid changes straight into a gas?

What is the term describing when a solid changes straight into a gas?

Sublimation

Describe the forces between particles in solids, liquids and gases

Describe the forces between particles in solids, liquids and gases

Solids - Strong forces of attraction between particles which keeps them in fixed positions.

Liquids - Weaker attractive forces than in solids.

Gases - No intermolecular forces so particles move randomly.

Use kinetic theory to describe what happens when a solid melts (extended only)

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Particles in the solid absorb thermal energy when heated and convert into kinetic energy. This causes the particles to vibrate more. The solid then expands until the structure breaks, and it becomes a liquid.

Use kinetic theory to describe what happens when a liquid freezes (extended only)

Use kinetic theory to describe what happens when a liquid freezes (extended only)

When cooled, the liquid particles slow down. Eventually, the particles move slow enough for forces to hold the particles in a regular solid structure.

Use kinetic theory to describe what happens when a liquid evaporates (extended only)

Use kinetic theory to describe what happens when a liquid evaporates (extended only)

Particles near the surface of the liquid gain sufficient energy from the surroundings to overcome the forces between molecules and evaporate.

Use kinetic theory to describe what happens when a liquid boils (extended only)

Use kinetic theory to describe what happens when a liquid boils (extended only)

When heated, the particles gain energy and will eventually move fast enough to overcome the forces between them.

Use kinetic theory to describe what happens when a gas condenses (extended only)

Use kinetic theory to describe what happens when a gas condenses (extended only)

When cooled, the gas particles slow down and get closer together. Eventually, the forces between the particles will be great enough for the substance to become a liquid.

Use kinetic theory to describe what happens during sublimation (extended only)

Use kinetic theory to describe what happens during sublimation (extended only)

Particles on the surface of a solid gain sufficient energy to overcome all forces between them and become a gas. This is similar to evaporation, but occurs with solids rather than liquids.

Substance A melts at -183ºC and boils at -50ºC. What state is A at -90ºC?

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Liquid

How does pressure affect the motion of gas particles?

How does pressure affect the motion of gas particles?

As pressure increases, the motion of the gas particles increases.

How does temperature affect the motion of gas particles?

How does temperature affect the motion of gas particles?

As temperature increases, pressure and the kinetic energy of the particles increases which causes the particles to move more.

Fluids are what state of matter?

Fluids are what state of matter?

Liquid or gas

True or false?
‘Particles in fluids move randomly’

True or false?
‘Particles in fluids move randomly’

TRUE

This is Brownian Motion.

Explain Brownian motion (refer to random molecular bombardment) (extended only)

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Particles in a fluid move randomly because they are bombarded by other randomly moving particles in the fluid.

What is evidence for the kinetic particle model of matter?

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The random motion of particles in a suspension (brownian motion).

State evidence for Brownian motion (extended only)

State evidence for Brownian motion (extended only)

Robert Brown looked at pollen grains moving in water. The random movement of the pollen grains could not be explained until Brownian motion was developed. This explained that there were separate particles moving randomly in water, causing the pollen grains to move randomly.

Explain the process of diffusion

Explain the process of diffusion

The net movement of particles from an area of high concentration to an area of low concentration. Diffusion is a passive process (requires no energy).

Which states of matter does diffusion occur in?

Which states of matter does diffusion occur in?

Liquids and gases (fluids).

The particles don’t move in a solid so diffusion isn’t possible.

How does the diffusion rate depend on molecular mass? (extended only)

How does the diffusion rate depend on molecular mass? (extended only)

Particles with a smaller molecular mass have a higher average speed.

The rate of diffusion is quicker for molecules with a smaller molecular mass as they can move to different regions faster.