KNOWLEDGE ORGANISER · EDEXCEL IGCSE CHEMISTRY

1.1 Solids, Liquids & Gases

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1. KEY VOCABULARY

TERM	MEANING
State of matter	Solid, liquid or gas — defined by particle arrangement, separation and motion.
Kinetic energy	Energy a particle has because of its motion. More KE = faster movement.
Intermolecular force	Force of attraction between particles.
Melting point	Temperature at which a solid changes to a liquid.
Boiling point	Temperature at which a liquid boils throughout.
Evaporation	Liquid → gas, surface only, below the boiling point.
Condensation	Gas → liquid.
Sublimation	Solid → gas directly (skips liquid).
Plateau	Flat section on a heating/cooling curve.
Compress	To force into a smaller volume.

2. THE THREE STATES

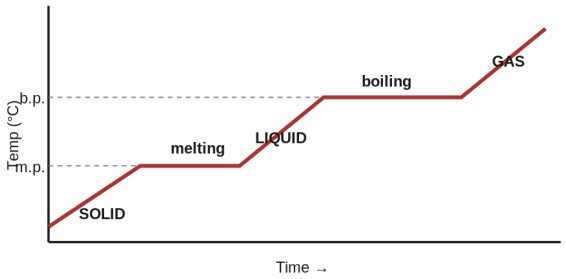
	SOLID	LIQUID	GAS
Arrangement	Regular	Random, close	Random, far apart
Movement	Vibrate	Slide past	Fast, all directions
Energy	Lowest	More	Highest
Shape	Fixed	Container shape	Fills container
Volume	Fixed	Fixed	Not fixed
Compress?	No	No	Yes

3. THE SIX CHANGES OF STATE

Melting solid → liquid
Freezing liquid → solid
Boiling liquid → gas (throughout, at b.p.)
Evaporating liquid → gas (surface only, below b.p.)
Condensing gas → liquid
Subliming solid → gas (direct)

▲ **Heat in:** particles gain KE, forces are overcome.
▼ **Heat out:** particles lose KE, forces re-form.

4. HEATING & COOLING CURVES



Sloped sections: temperature rises, particles gain KE.
Plateaus: energy breaks forces — temp stays constant until the change of state is complete.
Cooling curve = mirror image: plateaus are where forces re-form and energy is released.

5. GAS LAWS (T, P, V)

TEMPERATURE ↑ → VOLUME ↑ (at constant P)
Hotter particles move faster, hit walls harder, push outwards. Volume expands.

PRESSURE ↑ → VOLUME ↓ (at constant T)
Compressing forces particles closer. More collisions per second → higher pressure in a smaller volume.

Why gases compress but liquids don't: gases have large empty spaces between particles; liquids don't.

6. KINETIC PARTICLE THEORY · the WHY

Heating transfers energy to particles → **KE increases** → eventually enough energy to **overcome the forces** between them → state changes.

Cooling removes energy → particles slow → **forces re-form** → particles pull closer → state changes.

Temperature = a measure of average kinetic energy. Particles don't have a temperature — substances do.

7. COMMON EXAM MISTAKES

✗ "The particles melt."
✓ The substance melts; particles overcome forces.
✗ "Bonds break during melting."
✓ Forces of attraction (not bonds) are overcome.
✗ "Temp rises during melting."
✓ Temp stays constant at the melting point.
✗ "Gas particles disappear when compressed."
✓ Particles are forced closer; number unchanged.

8. SELF-CHECK · cover & quiz yourself

Cover the rest of the sheet. Can you…

1. Sketch each state's particle arrangement?
2. Name all 6 changes of state and their direction?
3. Explain why a plateau is flat on a heating curve?
4. Explain (with KE & forces) why a balloon expands when warmed?
5. Explain why a gas can be compressed but a liquid cannot?
6. Distinguish boiling from evaporation in 2 sentences?
7. Define: kinetic energy, intermolecular force, plateau, sublimation?