

TITLE: 7B Particle Theory

Unit Overview (Linked to the KS3 Programme of Study)

Students will be taught:

- The **particle model** to describe solids, liquids and gases
- How the **arrangement, movement and spacing of particles** explains the properties of matter
- How **changes of state** occur through energy transfer (melting, freezing, boiling, evaporation and condensation)
- The process of **diffusion** and how particles move from high to low concentration
- How **gas pressure** is caused by particle collisions and affected by temperature and volume

Prior Learning (KS2)

Students have learnt previously about states of matter. This has involved:

- comparing and grouping materials according to whether they are solids, liquids or gases
- observing that materials change state when heated or cooled
- identifying evaporation and condensation as part of the water cycle
- recognising that dissolving, mixing and changes of state can be reversible processes

Future Learning (KS4)

At GCSE students will build on their knowledge of particle theory to develop a deeper understanding of the kinetic theory of matter. They will explain how particle motion relates to temperature, pressure and energy transfer, including quantitative relationships between variables. Students will also study how gas pressure changes with volume and temperature and apply these ideas to real-world systems. This forms part of a broader understanding of energy stores, transfers and thermodynamics.

Misconceptions

Key misconceptions focus on understanding particles as the basis of matter, how they move, and how they explain changes of state and pressure.

1. Nature of Particles

- Particles in gases do not exist (gases are “empty”)
- Particles are large enough to be seen or behave like visible objects

2. Particle Behaviour

- Particles in solids do not move

- Particles move in only one direction rather than randomly

3. Changes of State

- Particles expand in size when heated
- Temperature always increases during changes of state
- Boiling and evaporation are the same process

4. Diffusion

- Diffusion only happens when substances are stirred
- Diffusion only occurs in liquids
- Particles “want” to spread out rather than moving randomly

5. Gas Pressure

- Gas pressure is caused by the weight of gas rather than particle collisions
- Pressure only exists when gas is compressed
- Increasing temperature does not affect pressure

Practical Requisitions

[7A Requisitions.docx](#)

Mastery (HPA)

Students explain and justify ideas using the particle model, linking particle arrangement, movement and energy to the properties and behaviour of materials. They apply their knowledge to unfamiliar situations, analyse relationships between variables (e.g. temperature, pressure, concentration), and evaluate how well scientific models explain real-world phenomena.

7B.01 The Particle Model		HPA Challenge	Skills	EEF Recommendations
Learning Objectives	• Describe that all materials are made of particles • Describe the arrangement, movement and spacing of particles • Use the particle model to explain properties of materials	Analyse how the arrangement and movement of particles explains the properties of solids, liquids and gases.	Working Scientifically WS 1.2 (Models) Use and interpret particle diagrams as models	EEF 1 (Preconceptions): Diagnose KS2 ideas about matter (e.g. gases are empty) EEF 3 (Modelling): Model how particle diagrams represent real materials
Do Now (5 mins)	Purpose: Activate prior knowledge and identify misconceptions Suggested structure (teacher adapts): • Name the three states of matter • Give one property of a solid • Give one property of a gas	Apply the particle model to explain an unfamiliar material or situation. Evaluate how useful the particle model is for explaining matter.	WS 1.1 (Development of ideas) Understand that models represent unseen processes WS 4.1 (Scientific	EEF 6 (Language): Explicit teaching of vocabulary (particle, arrangement, spacing)

	Diamond (Challenge): Why can gases be compressed but solids cannot? Teacher uses responses to assess understanding of prior knowledge and reveal misconceptions (e.g. gases as empty space)		vocabulary) Use key terms (particle, arrangement, movement) Maths Skills 1d (Estimation) Compare particle spacing qualitatively 2h (Order of magnitude) Understand relative spacing of particles 3a (Use symbols) Compare spacing (e.g. more/less)	
Hook / Intro (5 mins)	Introduce key idea: “All materials are made of tiny particles that we cannot see.” Suggested strategy: - Demonstrate compression (balloon vs solid object) - Ask: <i>Why can one be squashed but not the other?</i> - Link to: need for a scientific model			
Direct Teaching: Cell Structure (10 – 15 mins)	Content: Particle model Introduce particle descriptions: - Solids → particles closely packed, regular arrangement, vibrate - Liquids → particles close together, random arrangement, move past each other - Gases → particles far apart, random arrangement, move freely Key idea: Properties are explained by particle behaviour Teacher modelling (EEF 3): Model explanation explicitly: “Solids keep their shape because particles are closely packed and fixed” “Gases can be compressed because particles are far apart” Check for understanding (hinge point): “Which state has particles that move freely?” “Why can gases be compressed?” Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task type: Supported matching and explanation Pupils: - Match particle diagrams to states - Match properties to particle explanations			

	Teacher models first example and reinforces correct scientific language			
Main Task (20 mins)	Core task: Pupils: • Compare solids, liquids and gases using a table • Explain why they behave differently using the particle model Teacher flexibility: Teachers select format based on class need: • Table completion • Diagram annotation • Written explanation Success criteria: • Correct particle descriptions • Clear link between particle behaviour and properties • Use of scientific vocabulary Adaptation prompts: • If pupils struggle → provide sentence starters or scaffolded diagrams • If secure → apply to unfamiliar examples or real-world contexts			
Support / Diamond (challenge)	Support: • Word bank (particle, spacing, movement) • Sentence starters • Partially completed tables Diamond (Challenge): • Explain why solids keep their shape using particle theory • Apply the particle model to an unfamiliar material • Evaluate how useful the particle model is			
Common misconceptions	• Particles do not move in solids • Gases have no particles • Particles increase in size when heated			
Assessment (5 mins)	Formative and summary Quick check options: • MCQ: Which state has particles closest together? • Explain: Why can gases be compressed? • Diagram identification			

Exit ticket (5 mins)	Purpose: Inform next lesson (and Do Now) Example questions: - Describe particles in a gas - Why can gases be compressed? Teacher uses this to plan next lesson's Do Now (adaptive link)			
Adaptive teaching	- Retrieval informs starting point - Hinge questions guide pacing - Tasks scaffolded depending on need - Challenge extends conceptual thinking - Exit ticket informs next lesson			
British Values	Individual Liberty – Developing independent thinking when using scientific models to explain unseen processes Democracy – Sharing and discussing ideas about how particles behave Mutual Respect – Listening to and building on others' explanations during discussion			

Teacher Notes for MTP adaptations

7B.02 States of Matter		HPA Challenge	Skills	EEF Recommendations								
Leaning Objectives	- Describe the properties of solids, liquids, and gases - Describe the arrangement, movement, and spacing of particles in each state - Use the particle model to explain the properties of solids, liquids, and gases	Explain why solids, liquids and gases have different properties using particle behaviour. Compare the three states in unfamiliar contexts and justify differences. Evaluate how well the particle model explains the behaviour of real materials.	Working Scientifically WS 1.2 (Models) Use particle diagrams to explain properties WS 3.6 (Explain using evidence) Link particle behaviour to observable properties WS 4.1 (Scientific vocabulary) Use terms such as arrangement, spacing, movement Maths Skills 1d (Estimation) Compare spacing qualitatively 2h (Order of magnitude) Compare relative distances between particles 3a (Use symbols) Compare quantities (more/less spaced)	EEF 3 (Modelling): Explicit modelling of “because” explanations linking particles to properties EEF 4 (Memory): Retrieval of particle model from Lesson 1 EEF 6 (Language): Reinforce precise vocabulary (flow, compress, fixed, random)								
Do Now (5 mins)	Purpose: Retrieval from Lesson 1 and identification of conceptual gaps Suggested structure (teacher adapts): - Describe how particles are arranged in a solid - Which state has particles that move freely? - Which state can be compressed? Diamond (Challenge): - Why do liquids take the shape of their container? Teacher uses responses to assess understanding of particle model and identify misconceptions (e.g. liquids vs gases spacing confusion)											
Hook / Intro (5 mins)	Introduce key idea: “Different states of matter have different properties because their particles behave differently.” Suggested strategy: - Demonstrate liquid poured into different containers - Ask: <i>Why does it change shape?</i> - Link responses to particle movement rather than surface-level description											
Direct Teaching: Cell Structure (10 – 15 mins)	Content: Linking particle behaviour to properties <table><tr><th>Property</th><th>Particle explanation</th></tr><tr><td>Solid keeps shape</td><td>Particles fixed in position, only vibrate</td></tr><tr><td>Liquid flows</td><td>Particles close together but can move past each other</td></tr><tr><td>Gas fills container</td><td>Particles move freely and are far apart</td></tr></table>	Property	Particle explanation	Solid keeps shape	Particles fixed in position, only vibrate	Liquid flows	Particles close together but can move past each other	Gas fills container	Particles move freely and are far apart			
Property	Particle explanation											
Solid keeps shape	Particles fixed in position, only vibrate											
Liquid flows	Particles close together but can move past each other											
Gas fills container	Particles move freely and are far apart											

	Key idea: Observable properties are caused by particle behaviour Teacher modelling (EEF 3): Model explanations explicitly using “because”: • “Liquids flow because particles can move past each other” • “Solids keep their shape because particles are fixed” • “Gases spread because particles move freely” Check for understanding (hinge point): • “Why don’t solids flow?” • “Why do gases fill a container?” Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task type: Supported matching and explanation Pupils: • Match properties to particle explanations • Complete partially scaffolded explanations Teacher models first example and corrects imprecise language			
Main Task (20 mins)	Core task: Pupils: • Explain why solids, liquids and gases have different properties using the particle model Teacher flexibility: Teachers select format based on class need: • Structured writing task • Table completion • Diagram + explanation Success criteria: • Links particle behaviour to properties • Uses correct scientific vocabulary • Includes causal reasoning (“because”) Adaptation prompts: • If pupils struggle → provide sentence starters or structured answers • If secure → apply explanations to unfamiliar			

	contexts			
Support / Diamond (challenge)	Support: • Sentence starters (e.g. “Liquids flow because...”) • Word bank • Scaffolded explanations Diamond (Challenge): • Explain why liquids cannot be compressed easily • Apply particle model to real-world examples (e.g. tyres, liquids in pipes) • Compare properties of states in unfamiliar situations			
Common misconceptions	• Liquids have large gaps between particles • Gases contain no particles • Flowing means particles are far apart			
Assessment (5 mins)	Formative and summary Quick check options: • MCQ: Which state fills its container? • Explain: Why do liquids flow? • Match property → explanation			
Exit ticket (5 mins)	Purpose: Inform next lesson (and Do Now) Example questions: • Why do liquids take the shape of a container? • Explain one property of a gas using the particle model Teacher uses this to plan next lesson’s Do Now (adaptive link)			
Adaptive teaching	• Do Now identifies misconceptions from Lesson 1 • Hinge questions guide pace and depth • Tasks scaffolded depending on need • Challenge develops deeper conceptual understanding • Exit ticket informs next lesson			
British Values	• Mutual Respect – Engaging respectfully with others’ explanations of particle behaviour • Tolerance – Recognising and refining different ideas about why materials behave differently • Individual Liberty – Making independent links between particle behaviour and observable properties			

Teacher Notes for MTP adaptations

7B.03 Melting and Freezing		HPA CHALLENGE	Skills	EEF Recommendations
Learning Objectives	- Describe melting and freezing as changes of state - Explain changes of state in terms of particle movement and energy transfer (heating and cooling) - Investigate the melting point of a substance (e.g. stearic acid) - Interpret data from melting point experiments	Analyse temperature–time graphs to explain what happens during melting and freezing.	Working Scientifically WS 2.3 (Use of apparatus) Carry out a melting experiment safely WS 3.1 (Present data) Record results in tables/graphs WS 3.5 (Interpret data) Analyse temperature–time data WS 3.7 (Evaluate) Identify errors and improvements	EEF 5 (Practical): Practical used to support conceptual understanding of energy transfer EEF 3 (Modelling): Model how to interpret graphs and link to particle behaviour EEF 7 (Feedback): Use feedback to improve graph interpretation and explanations
Do Now (5 mins)	Purpose: Retrieval from Lesson 2 (states and particle behaviour) Suggested structure (teacher adapts): - Describe how particles are arranged in a liquid - Why can solids not flow? - Which state has particles that move freely? Diamond (Challenge): - What do you think happens to particles when a solid melts? Teacher uses responses to assess readiness for introducing changes of state and identify misconceptions about particle movement	Evaluate the reliability of melting point experiments and suggest improvements.		
Hook / Intro (5 mins)	Introduce key idea: “Materials can change state when energy is transferred.” Suggested strategy: - Demonstration: ice melting into water - Ask: <i>What is happening to the particles when this change occurs?</i> - Elicit ideas before formal teaching			
Direct Teaching: Cell Structure (10 – 15 mins)	Content: Changes of state and energy transfer Introduce: - Melting = solid → liquid (heating) - Freezing = liquid → solid (cooling)		Maths Skills 4a (Graphs) Plot temperature–time graphs 1a (Decimal form) Read thermometer accurately 2a (Significant figures) Record values appropriately	

	Particle explanation: • Heating → particles gain energy → move more • Cooling → particles lose energy → move less Key idea: State changes are caused by changes in particle energy and movement, not changes in particle size Teacher modelling (EEF 3): Model explanation explicitly: • “When a substance melts, particles gain energy and can move past each other” • “When a substance freezes, particles lose energy and become fixed in position” Introduce melting point concept • Temperature at which a substance changes state • Temperature remains constant during melting Check for understanding (hinge point): • “What happens to particles when a solid melts?” • “Does temperature always increase when heating?” Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task type: Scaffolded explanation and data introduction Pupils: • Complete sequence of state change (solid → liquid → solid) • Begin interpreting simple temperature–time data Teacher models one explanation and one graph interpretation			
Main Task (20	Core task: Practical investigation of melting			

mins)	Pupils: • Heat a substance (e.g. stearic acid) • Record temperature over time • Observe melting process • Plot or interpret temperature–time graph Purpose of practical • Link abstract particle model to observable phenomena • Introduce concept of constant temperature during change of state • Develop experimental and analytical skills Teacher flexibility: Teachers select level of support: • Pre-prepared data for interpretation • Full practical investigation • Demonstration + data set Success criteria: • Accurate table or graph • Identification of melting point • Clear explanation of particle behaviour • Recognition of temperature plateau Adaptation prompts: • If pupils struggle → provide scaffolded graphs or pre-drawn axes • If secure → interpret graphs and explain energy changes			
Support / Diamond (challenge)	Support: • Step-by-step practical instructions • Scaffolded data tables • Sentence starters for explanations Diamond (Challenge): • Explain why temperature remains constant during melting • Analyse a temperature–time graph • Evaluate reliability of results and suggest improvements			
Common misconceptions	• Temperature increases continuously during melting			

	• Particles melt or expand • Melting point varies during experiment			
Assessment (5 mins)	Formative and summary Quick check options: • MCQ: What happens during melting? • Graph interpretation question • Explain particle changes in melting			
Exit ticket (5 mins)	Purpose: Inform next lesson (and Do Now) Example questions: • What happens to particles when a solid melts? • Why does temperature stay constant during melting? Teacher uses this to plan next lesson's Do Now (adaptive link)			
Adaptive teaching	• Retrieval informs starting point • Hinge questions guide depth of explanation • Practical support adjusted based on confidence • Tasks scaffolded for data interpretation • Exit ticket informs next lesson			
British Values	• Rule of Law – Following agreed scientific methods and procedures in practical work • Mutual Respect – Working collaboratively when collecting and analysing data • Democracy – Sharing and comparing interpretations of experimental results			

Teacher Notes for MTP adaptations

7B.04 Boiling		HPA Challenge	Skills	EEF Recommendations
Learning Objectives	- Describe boiling as a change of state - Explain boiling using the particle model and energy transfer - Explain the difference between boiling and evaporation - Interpret data about temperature changes during boiling	Explain the difference between boiling and evaporation using particle behaviour and energy transfer. Analyse temperature–time graphs during boiling and explain why temperature remains constant. Evaluate why boiling occurs at a fixed temperature whereas evaporation does not.	Working Scientifically WS 3.5 (Interpret data) Analyse temperature–time graphs WS 3.6 (Explain using evidence) Link energy transfer to particle movement WS 4.1 (Scientific vocabulary) Use terms (boiling, evaporation, energy) Maths Skills 4a (Graphs) Interpret temperature–time graphs 1a (Decimal form) Read temperature values 2c (Patterns) Identify constant temperature regions	EEF 3 (Modelling): Model explanation of boiling vs evaporation clearly EEF 4 (Memory): Build on prior lesson (melting and energy transfer) EEF 6 (Language): Explicit distinction between boiling and evaporation
Do Now (5 mins)	Purpose: Retrieval from Lesson 3 (melting, freezing, energy transfer) Suggested structure (teacher adapts): - What happens to particles during melting? - What is a melting point? - What happens to temperature during melting? Diamond (Challenge): - Why does temperature stay constant during melting? Teacher uses responses to assess understanding of energy transfer and identify misconceptions before introducing boiling			
Hook / Intro (5 mins)	Introduce key idea: “Liquids can change into gases in two different ways.” Suggested strategy: - Show boiling water (video/demo) - Ask: <i>Is all evaporation the same as boiling?</i> - Elicit initial ideas (likely misconceptions)			
Direct Teaching: Cell Structure (10 – 15 mins)	Content: Boiling vs evaporation Introduce: - Boiling = liquid → gas at fixed temperature - Evaporation = liquid → gas below boiling point Particle explanations Boiling: - Particles throughout the liquid gain enough energy to become gas Evaporation: - Only particles at the surface escape - Occurs at lower temperatures Teacher modelling (EEF 3)			

	Model explanation explicitly: • “Boiling happens when particles throughout the liquid have enough energy to become gas” • “Evaporation happens when some particles at the surface escape” Key idea Energy transfer increases particle movement until escape is possible Graph interpretation • Temperature remains constant during boiling • Energy goes into changing state (not increasing temperature) Check for understanding (hinge point) • “Why does temperature stay constant during boiling?” • “How is evaporation different from boiling?” Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task type: Scaffolded comparison and graph interpretation Pupils: • Compare boiling vs evaporation using structured table • Interpret simple temperature–time graph Teacher models: • One comparison • One graph explanation			
Main Task (20 mins)	Core task: Pupils: • Explain the difference between boiling and evaporation using the particle model • Interpret a temperature–time graph showing boiling Teacher flexibility: • Written explanation • Table comparison • Graph interpretation task Success criteria: • Correct distinction between boiling and			

	evaporation - Particle explanations included - Clear explanation of constant temperature Adaptation prompts: - If pupils struggle → provide comparison table or sentence starters - If secure → explain why boiling point is fixed			
Support / Diamond (challenge)	Support: - Sentence starters (e.g. “Boiling happens when...”) - Comparison tables - Scaffolded graph questions Diamond (Challenge): - Analyse a temperature–time graph in detail - Explain why evaporation can happen at any temperature - Apply to real-life contexts (e.g. drying clothes, puddles evaporating)			
Common misconceptions	- Boiling and evaporation are the same process - Temperature increases during boiling - All particles escape during evaporation			
Assessment (5 mins)	Formative and summary Quick check options: - MCQ: Which process happens at all temperatures? - Explain: Why does evaporation not need boiling point? - Graph interpretation question			
Exit ticket (5 mins)	Purpose: Inform next lesson (and Do Now) Example questions: - What is the difference between boiling and evaporation? - Why does temperature stay constant during boiling? Teacher uses this to plan next lesson’s Do Now (adaptive link)			
Adaptive teaching	- Retrieval ensures secure understanding of energy transfer - Hinge questions guide depth of explanation			

	• Tasks scaffolded depending on need • Challenge extends conceptual understanding • Exit ticket informs next lesson			
British Values	• Tolerance – Considering and refining different explanations (e.g. boiling vs evaporation) • Democracy – Discussing and justifying ideas using evidence • Individual Liberty – Forming independent scientific explanations			

Teacher Notes for MTP adaptations

7B.05 More Changes of State		HPA Challenge	Skills	EEF Recommendations
Learning Objectives	- Describe changes of state involving gases (evaporation and condensation) - Explain evaporation and condensation using particle movement and energy transfer - Describe how evaporation differs from boiling - Describe how evaporation differs from boiling	Explain evaporation and condensation using particle energy and movement. Analyse how factors (e.g. temperature, surface area) affect evaporation rate. Evaluate the process of crystallisation and explain how particle theory accounts for it.	Working Scientifically WS 2.3 (Use of apparatus) Carry out evaporation/crystallisation safely WS 3.1 (Present data) Record observations clearly WS 3.6 (Explain using evidence) Link particle behaviour to change of state WS 3.7 (Evaluate) Consider improvements to practical methods Maths Skills 1c (Comparisons) Compare rates of evaporation qualitatively 2c (Patterns) Identify trends (faster/slower evaporation) 4a (Data interpretation) Interpret simple observations	EEF 3 (Modelling): Model explanations of evaporation and condensation using particle theory EEF 5 (Practical): Use crystallisation practical to support conceptual understanding EEF 6 (Language): Reinforce key terms (evaporation, condensation, surface, energy)
Do Now (5 mins)	Purpose: Retrieval from Lesson 4 (boiling vs evaporation) Suggested structure (teacher adapts): - What is evaporation? - What is the difference between boiling and evaporation? - Why does temperature stay constant during boiling? Diamond (Challenge): - Why can evaporation happen at any temperature? Teacher uses responses to assess understanding of evaporation and energy transfer before extending to condensation and crystallisation			
Hook / Intro (5 mins)	Introduce key idea: “Liquids can change into gases and back again depending on energy transfer.” Suggested strategy: - Show condensation forming on a cold surface (e.g. outside of a cold beaker) - Ask: <i>Where has this liquid come from?</i> - Elicit ideas about gas → liquid change			
Direct Teaching: Cell Structure (10 – 15 mins)	Content: Evaporation and condensation ◆ Evaporation - Liquid → gas - Occurs at the surface - Happens when particles gain enough energy to escape ◆ Condensation - Gas → liquid - Occurs when particles lose energy - Particles come closer together			

	◆ Teacher modelling (EEF 3) Model explanations explicitly: • “Evaporation happens when particles at the surface gain enough energy to escape” • “Condensation happens when gas particles lose energy and come closer together to form a liquid” ◆ Key idea Changes of state depend on energy transfer affecting particle movement ◆ Crystallisation (link to practical) • Solution → solid crystals • Occurs when solvent evaporates • Particles come together to form solid Check for understanding (hinge point) • “What happens to particles during condensation?” • “Why does evaporation only happen at the surface?” Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task type: Structured explanation and process sequencing Pupils: • Sequence evaporation → condensation • Complete scaffolded explanation sentences Teacher models one full explanation and corrects misconceptions			
Main Task (20 mins)	Core task: Pupils: • Observe or carry out crystallisation (or use demonstration/data) • Explain evaporation and condensation using particle model • Link observations to theory Teacher flexibility: • Practical (crystal formation) • Demonstration + discussion			

	- Diagram + explanation task Success criteria: - Correct explanation of evaporation and condensation - Clear link to particle movement and energy - Ability to describe crystallisation process Adaptation prompts: - If pupils struggle → provide scaffolded explanations or diagrams - If secure → explain factors affecting evaporation rate			
Support / Diamond (challenge)	Support: - Sentence starters (e.g. “Evaporation happens when...”) - Word bank - Sequencing diagrams Diamond (Challenge) - Explain why increasing temperature speeds up evaporation - Analyse how surface area affects evaporation rate - Evaluate crystallisation process (accuracy, improvements)			
Common misconceptions	- Evaporation and boiling are the same - Condensation is simply “cooling” without particle explanation - Particles disappear during evaporation			
Assessment (5 mins)	Formative and summary Quick check options: - MCQ: What happens during condensation? - Explain: Why does evaporation only occur at the surface? - Sequence diagram activity			
Exit ticket (5 mins)	Purpose: Inform next lesson (and Do Now) Example questions: - What happens to particles during condensation? - Why does evaporation happen more quickly at higher temperatures?			

	Teacher uses this to plan next lesson's Do Now (adaptive link)			
Adaptive teaching	• Retrieval identifies gaps in evaporation vs boiling • Hinge questions guide conceptual clarity • Practical support adjusted depending on confidence • Tasks scaffolded to support explanation • Exit ticket informs next lesson			
British Values	• Rule of Law – Following safe and systematic procedures during practical work • Mutual Respect – Collaborating effectively and sharing observations • Individual Liberty – Drawing independent conclusions from investigations			
Teacher Notes for MTP adaptations				

7B.06 Diffusion		HPA Challenge	Skills	EEF Recommendations
Learning Objectives	- Describe diffusion as the movement of particles from high to low concentration - Explain diffusion using the random motion of particles - Describe factors that affect the rate of diffusion (e.g. temperature, concentration gradient) - Plan or carry out an investigation into diffusion	Explain diffusion using particle movement and energy. Analyse how different factors affect the rate of diffusion.	Working Scientifically WS 2.3 (Use of apparatus) Carry out a diffusion investigation safely WS 3.1 (Present data) Record observations clearly WS 3.5 (Interpret data) Identify patterns in diffusion rate WS 3.7 (Evaluate) Suggest improvements to method Maths Skills 1c (Comparisons) Compare faster/slower rates 2c (Patterns) Identify trends in rate of diffusion 4a (Data interpretation) Interpret simple quantitative observations	EEF 3 (Modelling): Model particle explanation of diffusion carefully (movement → spreading) EEF 5 (Practical): Use demonstration/practical (e.g. dye in water) to support understanding EEF 6 (Language): Explicit teaching of 'concentration', 'diffusion', 'gradient'
Do Now (5 mins)	Purpose: Retrieval from Lesson 5 (evaporation, condensation, particle movement) Suggested structure (teacher adapts): - What happens to particles during evaporation? - What happens to particles during condensation? - Why does temperature affect evaporation? Diamond (Challenge): - How do particles move in gases? Teacher uses responses to assess understanding of particle movement before introducing diffusion	Evaluate a diffusion experiment and suggest improvements to increase accuracy.		
Hook / Intro (5 mins)	Introduce key idea: "Particles are in constant motion and spread out over time." Suggested strategy: - Demonstration: food colouring in still water - Ask: <i>Why does the colour spread without stirring?</i> - Encourage pupils to suggest explanations before introducing the term diffusion			
Direct Teaching: Cell Structure (10 – 15 mins)	Content: Diffusion Introduce: - Diffusion = movement of particles from high concentration → low concentration ◆ Particle explanation - Particles move randomly - Over time, spreading leads to even distribution ◆ Teacher modelling (EEF 3) Model explanation explicitly: "Diffusion happens because particles are moving randomly and spread out from areas where there are more particles to areas where			

	there are fewer" ◆ Factors affecting diffusion • Temperature → higher temperature = faster movement → faster diffusion • Concentration gradient → bigger difference = faster diffusion ◆ Key idea Diffusion is caused by random motion of particles, not "wanting to spread out" Check for understanding (hinge point) • "What is diffusion?" • "Why does temperature affect diffusion rate?" Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task type: Structured explanation and interpretation Pupils: • Describe diffusion using diagrams • Identify direction of movement (high → low concentration) Teacher models one full explanation and reinforces correct terminology			
Main Task (20 mins)	Core task: Pupils: • Observe or carry out a diffusion experiment (e.g. dye in water) • Describe what happens • Explain observations using particle theory • Identify factors affecting rate Teacher flexibility: • Practical investigation • Demonstration + written explanation • Worksheet with data/diagrams Success criteria: • Correct definition of diffusion • Clear explanation using particle movement • Identification of factors affecting rate			

	Adaptation prompts: - If pupils struggle → provide sentence starters or diagram support - If secure → analyse rate differences or compare scenarios			
Support / Diamond (challenge)	Support: - Word bank (diffusion, concentration, particles) - Sentence starters - Labelled diagrams Diamond (Challenge) - Explain why diffusion happens faster at higher temperatures - Compare diffusion in solids, liquids and gases - Evaluate the diffusion experiment and suggest improvements			
Common misconceptions	- Diffusion requires stirring - Particles move in one direction - Diffusion only occurs in liquids			
Assessment (5 mins)	Formative and summary Quick check options: - MCQ: What is diffusion? - Explain: Why does diffusion happen? - Identify direction of diffusion on diagram			
Exit ticket (5 mins)	Purpose: Inform next lesson (and Do Now) Example questions: - What is diffusion? - Why does diffusion happen faster at higher temperatures? Teacher uses this to plan next lesson's Do Now (adaptive link)			
Adaptive teaching	- Retrieval checks understanding of particle movement - Hinge questions guide explanation depth - Practical support adjusted depending on need - Tasks scaffolded to support reasoning - Exit ticket informs next lesson			
British Values	Democracy – Sharing and justifying explanations for particle movement Tolerance – Accepting and refining different ideas about diffusion			

- | | |
|--|---|
| | <ul style="list-style-type: none">• Individual Liberty – Applying the particle model independently to new situations |
| Teacher Notes for MTP adaptations | |

7B.07 Gas Pressure		HPA Challenge	Skills	EEF Recommendations
Learning Objectives	- Describe gas pressure as caused by collisions of particles with container walls - Explain gas pressure using the particle model - Describe how factors (e.g. temperature, volume) affect gas pressure	Explain how gas pressure is caused by particle collisions.	Working Scientifically	EEF 3 (Modelling): Explicit modelling of particle collisions causing pressure
Do Now (5 mins)	Purpose: Retrieval from Lesson 6 (diffusion and particle movement) Suggested structure (teacher adapts): - What is diffusion? - Why do particles move? - What happens to particle movement when temperature increases? Diamond (Challenge): - How might fast-moving particles affect their surroundings? Teacher uses responses to assess understanding of particle movement as preparation for introducing collisions and pressure	Predict how changes in temperature and volume affect gas pressure using the particle model. Evaluate real-world situations involving gas pressure (e.g. tyres, balloons, aerosols).	WS 1.2 (Models) Use particle models to explain pressure WS 3.6 (Explain using evidence) Link particle collisions to pressure WS 3.5 (Interpret data) Interpret simple pressure changes Maths Skills 1c (Comparisons) Compare pressure changes qualitatively 2c (Patterns) Identify trends (increase/decrease) 4a (Data interpretation) Interpret simple pressure scenarios	EEF 4 (Memory): Build on prior learning about particle movement and energy EEF 6 (Language): Reinforce key terms (pressure, collision, force)
Hook / Intro (5 mins)	Introduce key idea: “Gases can exert pressure on their surroundings.” Suggested strategy: - Demonstration: inflate a balloon or use a syringe with finger over the end - Ask: <i>Why does the balloon expand? Why is it difficult to compress the syringe?</i> - Link to invisible particle behaviour			
Direct Teaching: Cell Structure (10 – 15 mins)	Content: Gas pressure ◆ Particle explanation - Gas particles move randomly and rapidly - They collide with the walls of the container - These collisions exert a force → pressure ◆ Teacher modelling (EEF 3) Model explanation explicitly: “Gas pressure is caused by particles colliding with the walls of the container” “More collisions per second means greater pressure” ◆ Factors affecting gas pressure			

	Temperature: - Higher temperature → particles move faster → more frequent collisions → higher pressure Volume: - Smaller volume → particles collide more often → higher pressure ◆ Key idea Pressure is caused by particle collisions, not by the “weight” of gas Check for understanding (hinge point) “What causes gas pressure?” “Why does pressure increase when temperature increases?” Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task type: Structured explanation and prediction Pupils: - Explain gas pressure using sentence starters - Predict what happens when volume or temperature changes Teacher models one full explanation and one prediction			
Main Task (20 mins)	Core task: Pupils: - Explain how gas pressure is produced using the particle model - Describe how temperature and volume affect gas pressure - Apply ideas to real-world examples Teacher flexibility: - Written explanation - Scenario-based questions - Diagram interpretation Success criteria: - Clear explanation of pressure as particle collisions - Links temperature and volume to particle behaviour - Uses correct scientific vocabulary Adaptation prompts:			

	- If pupils struggle → provide scaffolded explanations or diagrams - If secure → apply to unfamiliar contexts or predict changes			
Support / Diamond (challenge)	Support: - Sentence starters (e.g. “Gas pressure is caused by...”) - Word bank (collision, force, pressure) - Diagrams of particles in containers Diamond (Challenge) - Explain why a balloon expands when heated - Predict what happens when gas is compressed - Evaluate real-life examples (e.g. why tyres can burst in heat)			
Common misconceptions	- Gas pressure is caused by weight of gas - Gas particles move in one direction - Pressure only exists when something is compressed			
Assessment (5 mins)	Formative and summary Quick check options: - MCQ: What causes gas pressure? - Explain: Why does pressure increase with temperature? - Scenario: Predict pressure change			
Exit ticket (5 mins)	Purpose: Inform next lesson (and Do Now) Example questions: - What causes gas pressure? - Why does pressure increase when temperature increases? Teacher uses this to plan next lesson’s Do Now (adaptive link)			
Adaptive teaching	- Retrieval confirms understanding of particle movement - Hinge questions guide conceptual understanding of pressure - Tasks scaffolded to support explanation and application - Challenge extends reasoning to real-world contexts - Exit ticket informs future retrieval and consolidation			

British Values	• Individual Liberty – Making independent predictions about pressure changes • Democracy – Discussing and justifying ideas about particle collisions • Mutual Respect – Listening to and evaluating others' reasoning
Teacher Notes for MTP adaptations	