

TITLE: C1 (Part 1) – Atomic Structure and the Periodic Table – A Simple Model of the Atom

Unit Overview

Prior Learning (KS3)

Future Learning (KS4 and KS5)

Misconceptions

Practical Requisitions

Mastery (HPA)

C1.01. Atoms		HPA Challenge	Skills	EEF Recommendations
Learning Objectives	- State the definition of the term atom - State the radius of an atom and compare it with the radius of the nucleus - State the relative charge and relative mass of protons, neutrons and electrons - Identify atomic number and mass number from the periodic table - Calculate the numbers of protons, neutrons and electrons in atoms and ions - Explain why atoms have no overall electrical charge - Identify elements from their chemical symbols - Relate the size and scale of atoms to objects in the physical world	Analyse how the structure of an atom explains its overall charge and properties. Apply knowledge of atomic structure to calculate sub-atomic particles in unfamiliar atoms and ions. Evaluate how scientific models help us understand structures that cannot be directly observed.	Working Scientifically WS 1.1 (Development of Scientific Thinking) Understand how scientific models of the atom have developed over time. WS 1.2 (Models) Use atomic models to explain invisible structures. WS 3.6 (Explain using Evidence) Explain atomic structure using scientific knowledge. WS 4.1 (Scientific Vocabulary) Use terms such as proton, neutron, electron, atom and nucleus accurately. Maths Skills 1a (Use of Numbers) Use powers of ten and numerical values. 2h (Order of Magnitude) Compare atomic and nuclear size. 3a (Standard Form) Express very small values appropriately.	EEF 4 (Memory): Retrieve prior learning about atoms, elements and particles. EEF 3 (Modelling): Model atomic structure using diagrams and particle representations. EEF 6 (Language): Explicit teaching of key atomic vocabulary. EEF 7 (Feedback): Feedback used to improve explanations and calculations.
Do Now (5 mins)	Purpose Retrieve prior learning about particles, atoms, elements and compounds. Suggested Structure (teacher adapts) - What is an atom? - What is an element? - What is a compound? Diamond (Challenge) - If atoms are so small, how do scientists know what is inside them? Teacher Uses Responses To - Assess prior understanding. - Identify misconceptions about atomic structure. - Prepare pupils for sub-atomic particles.			
Hook / Intro (5 mins)	Introduce Key Idea “Everything around you is made of atoms, yet they are far too small to see.” Suggested Strategy Display: - A football stadium - A marble - An atomic model Ask:			

	- How could something so small make up everything around us? - How much of an atom is actually empty space? Pedagogical Rationale Introduces scale and creates curiosity about atomic structure.															
Direct Teaching: Cell Structure (10 – 15 mins)	Content: Atomic Structure Introduce: Atom - The smallest particle of an element that can exist. Sub-Atomic Particles <table><tr><th>Particle</th><th>Charge</th><th>Relative Mass</th></tr><tr><td>Proton</td><td>+1</td><td>1</td></tr><tr><td>Neutron</td><td>0</td><td>1</td></tr><tr><td>Electron</td><td>-1</td><td>1/1836 (0)</td></tr></table> Location of Particles - Protons and neutrons are found in the nucleus. - Electrons move around the nucleus in shells. Atomic Number - Number of protons. Mass Number - Number of protons + neutrons. Atoms Have No Overall Charge Explain: - Number of protons = number of electrons. - Positive and negative charges balance. Size and Scale - Atom radius ≈ 0.1 nm - Nucleus radius ≈ 0.00001 nm Key Idea: The nucleus is tiny compared with the size of the atom. Teacher Modelling (EEF 3)	Particle	Charge	Relative Mass	Proton	+1	1	Neutron	0	1	Electron	-1	1/1836 (0)			
Particle	Charge	Relative Mass														
Proton	+1	1														
Neutron	0	1														
Electron	-1	1/1836 (0)														

	Model calculation: Mass Number = 23 Atomic Number = 11 Protons = 11 Electrons = 11 Neutrons = 23 - 11 = 12 Model one ion example if appropriate. Check for Understanding (Hinge Point) • Which particles are found in the nucleus? • Which particle has no charge? • What is the atomic number? • Why is an atom neutral? Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task Type Supported calculations and interpretation. Pupils • Label atomic diagrams. • Complete particle tables. • Calculate protons, neutrons and electrons. Teacher Role • Model first examples. • Support mathematical reasoning. • Correct misconceptions immediately.			
Main Task (20 mins)	Core Task Pupils: • Describe atomic structure. • Calculate sub-atomic particles. • Interpret atomic information from the periodic table. • Compare atomic and nuclear size. Suggested Activities • Particle calculation worksheet. • Atomic structure diagrams. • Periodic table interpretation. • Standard form practice.			

	Teacher Flexibility Teachers select format based on class need: • Structured worksheet. • Card sort activity. • Diagram annotation. • GCSE-style application questions. Success Criteria • Identify sub-atomic particles. • State charges and relative masses. • Calculate particle numbers accurately. • Explain why atoms are neutral. • Use scientific vocabulary accurately. Adaptation Prompts If pupils struggle • Use scaffolded particle tables. • Provide worked examples. • Highlight atomic number and mass number relationships. If secure • Interpret ions. • Use standard form confidently. • Analyse atomic scale comparisons.			
Support / Diamond (challenge)	Support • Particle fact sheet. • Calculation scaffold. • Vocabulary mat. Diamond (Challenge) • Explain why atoms are mostly empty space. • Analyse the limitations of atomic models. • Apply atomic structure to ions and unfamiliar examples.			
Common misconceptions	• Electrons are found in the nucleus. • Atomic number and mass number are the same thing. • Atoms contain equal numbers of neutrons and protons. • The nucleus occupies most of the atom.			

	Relative mass means actual mass.			
Assessment (5 mins)	Quick Check Options - Define atom. - State the charge of a proton. - Calculate neutrons. - Explain why atoms are neutral. Diagnostic Focus Can pupils: - Describe atomic structure? - Calculate particle numbers? - Use scientific vocabulary accurately? - Interpret periodic table information?			
Exit ticket (5 mins)	Purpose Inform planning for C1.02 Elements. Example Questions - What is the atomic number? - What is the mass number? - Which particles are found in the nucleus? Teacher uses responses to identify misconceptions before introducing elements and isotopes.			
Adaptive teaching	- Retrieval strengthens prior particle knowledge. - Hinge questions identify misconceptions early. - Worked examples reduce cognitive load. - Vocabulary explicitly taught and revisited. - Challenge develops abstract thinking and numerical reasoning. - Exit ticket informs progression to elements and isotopes.			
British Values	Democracy - Students discuss and justify scientific explanations using evidence from atomic models. Individual Liberty - Students independently apply scientific knowledge to interpret atomic structure and particle data.			

Teacher Notes for MTP adaptations

C1.02 Elements		HPA Challenge	Skills	EEF Recommendations
Learning Objectives	- State the definition of the term element - Use the names and symbols of the first 20 elements, the elements in Groups 1 and 7, and other key elements - Describe how the number of protons in an element relates to its atomic number - Describe how the number of protons and neutrons in an element relates to its mass number - Define the term isotope - Explain how relative atomic mass is calculated from the abundance of isotopes - Calculate the relative atomic mass of an element using isotope abundance data	Analyse how isotopes of the same element can have different masses but similar chemical properties. Apply understanding of isotopes and abundance data to calculate relative atomic mass. Evaluate why relative atomic mass is often not a whole number.	Working Scientifically WS 1.1 (Development of Scientific Thinking) Understand how evidence from isotopes has developed scientific understanding of atoms. WS 1.2 (Models) Use atomic models to represent isotopes of elements. WS 3.5 (Interpret Data) Interpret isotope abundance data. WS 3.6 (Explain using Evidence) Explain atomic number, mass number and isotopes using evidence. WS 4.1 (Scientific Vocabulary) Use terms such as isotope, abundance, atomic number and relative atomic mass accurately. Maths Skills 1a (Number Skills) Use percentages and averages. 2h (Order of Magnitude) Consider isotopic mass differences. 3a (Standard Form) Apply scientific notation where appropriate.	EEF 4 (Memory): Retrieve prior learning about atomic structure and sub-atomic particles. EEF 3 (Modelling): Model isotope notation and relative atomic mass calculations step-by-step. EEF 6 (Language): Explicit teaching of specialist atomic vocabulary. EEF 7 (Feedback): Feedback used to improve calculations and scientific explanations.
Do Now (5 mins)	Purpose Retrieve prior learning from C1.01 about atomic structure. Suggested Structure (teacher adapts) - What is the atomic number? - What is the mass number? - Which particles are found in the nucleus? Diamond (Challenge) - Can two atoms of the same element have different masses? Teacher Uses Responses To - Assess understanding of atomic structure. - Identify misconceptions about protons, neutrons and electrons. - Prepare pupils for isotope concepts.			
Hook / Intro (5 mins)	Introduce Key Idea “Why is the relative atomic mass of chlorine 35.5 if atoms cannot contain half a proton or neutron?” Suggested Strategy Show: - Chlorine on the periodic table. - Atomic number = 17 - Relative atomic mass = 35.5 Ask:			

	• Why is the value not a whole number? • Could some chlorine atoms be different from others? Pedagogical Rationale Creates curiosity and provides a natural introduction to isotopes.			
Direct Teaching: Cell Structure (10 – 15 mins)	Content: Elements Introduce: Element • A substance made of only one type of atom. Examples: • Hydrogen • Oxygen • Carbon • Iron Atomic Number Explain: • Atomic number = number of protons. • Every atom of an element has the same number of protons. Example: Carbon = 6 protons Oxygen = 8 protons Sodium = 11 protons Mass Number Explain: Mass Number = Protons + Neutrons Example: Carbon-12 6 protons 6 neutrons Content: Isotopes Introduce: Isotope • Atoms of the same element with the same number of			

protons but different numbers of neutrons.

Example:

Carbon-12

6 protons

6 neutrons

Carbon-14

6 protons

8 neutrons

Key Idea

All isotopes of an element:



Have the same atomic number



Have similar chemical behaviour



Do not always have the same mass

Relative Atomic Mass

Introduce:

Most elements exist as mixtures of isotopes.

The relative atomic mass takes into account:

- Mass of each isotope
- Percentage abundance of each isotope

Worked Example

Isotope	Abundance (%)
X-20	75
X-22	25

Calculation:

$$(20 \times 75 + 22 \times 25) \div 100$$

$$= (1500 + 550) \div 100$$

$$= 20.5$$

Teacher Modelling (EEF 3)

	Model: 1. Identify isotope masses. 2. Identify abundances. 3. Multiply. 4. Add. 5. Divide by 100. Model interpretation: “Relative atomic mass is a weighted average based on isotope abundance.” Check for Understanding (Hinge Point) • What is an isotope? • What is the atomic number? • Why do isotopes have different masses? • Why is chlorine's relative atomic mass not a whole number? Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task Type Supported calculations and interpretation. Pupils • Identify isotopes. • Complete particle calculations. • Calculate relative atomic mass using scaffolded examples. Teacher Role • Model first calculation. • Support percentage interpretation. • Correct misconceptions immediately.			
Main Task (20 mins)	Core Task Pupils: • Define element and isotope. • Calculate protons, neutrons and electrons. • Interpret isotope notation. • Calculate relative atomic mass from abundance data. Suggested Activities			

	• Atomic structure calculations. • Isotope card sort. • Relative atomic mass worksheet. • GCSE-style application questions. Teacher Flexibility Teachers select format based on class need: • Structured worksheet. • Calculation practice. • Card sort activity. • Extended explanation task. Success Criteria • Define element and isotope accurately. • Explain the relationship between atomic number and protons. • Explain the relationship between mass number and neutrons. • Calculate relative atomic mass correctly. • Use scientific vocabulary accurately. Adaptation Prompts If pupils struggle • Provide isotope templates. • Use worked examples. • Scaffold calculations. If secure • Complete more complex abundance calculations. • Explain why isotopes behave similarly chemically. • Analyse unfamiliar isotope data. •			
Support / Diamond (challenge)	Support • Calculation scaffold. • Isotope diagram sheet. • Vocabulary mat. Example sentence starters: “An isotope is ____.” “The atomic number tells us ____.” “Relative atomic mass is calculated by ____.”			

	Diamond (Challenge) - Explain why isotopes have different masses but similar chemistry. - Evaluate why relative atomic mass is more useful than isotope mass alone. - Analyse isotope abundance data independently.			
Common misconceptions	- Isotopes are different elements. - Isotopes have different numbers of protons. - Atomic number and mass number are interchangeable. - Relative atomic mass is always a whole number. - All atoms of the same element have identical masses.			
Assessment (5 mins)	Formative and Summary Quick Check Options - Define element. - Define isotope. - Calculate neutrons. - Calculate relative atomic mass. Diagnostic Focus Can pupils: - Identify isotopes correctly? - Explain atomic number and mass number? - Calculate relative atomic mass accurately? - Use scientific vocabulary correctly?			
Exit ticket (5 mins)	Purpose Inform planning for C1.03 Compounds Example Questions - What is an isotope? - What is the atomic number? - Why is relative atomic mass often not a whole number? Teacher uses responses to identify misconceptions before introducing compounds and chemical bonding.			
Adaptive teaching	- Retrieval strengthens understanding of atomic structure. - Hinge questions identify misconceptions about			

	isotopes. • Worked examples reduce cognitive load. • Vocabulary is explicitly taught and revisited. • Challenge develops numerical reasoning and interpretation. • Exit ticket informs progression to compounds.			
British Values	Democracy - Students use evidence to explain why scientists classify atoms as isotopes and how relative atomic mass is determined. Individual Liberty - Students independently apply scientific and mathematical knowledge to analyse isotope data.			
Teacher Notes for MTP adaptations				

C1.03 Compounds		HPA CHALLENGE	Skills	EEF Recommendations
Learning Objectives	- State the definition of the term compound - Explain how compounds are formed - Name compounds from given formulae or symbol equations	Analyse how compounds differ from mixtures and elements. Apply knowledge of chemical formulae to identify the elements present in compounds. Evaluate why compounds have different properties from the elements they contain.	Working Scientifically WS 1.1 (Development of Scientific Thinking) Understand how atoms combine to form new substances. WS 1.2 (Models) Use particle and structural models to explain compounds. WS 3.6 (Explain using Evidence) Explain how compounds form and why their properties differ from those of their constituent elements. WS 4.1 (Scientific Vocabulary) Use terms such as compound, molecule, chemical formula and element accurately. Maths Skills 1c (Classification) Classify substances as elements, compounds or mixtures. 2c (Patterns and Relationships) Identify relationships between chemical symbols and formulae.	EEF 4 (Memory): Retrieve prior learning about atoms, elements and isotopes. EEF 3 (Modelling): Model how elements combine to form compounds using diagrams and chemical formulae. EEF 6 (Language): Explicit teaching of chemical vocabulary and naming conventions. EEF 7 (Feedback): Feedback used to improve scientific explanations and formula interpretation.
Do Now (5 mins)	Purpose Retrieve prior learning about atoms, elements and isotopes. Suggested Structure (teacher adapts) - What is an element? - What is an isotope? - How many protons are found in a carbon atom? Diamond (Challenge) - If atoms join together, do they always form the same substance? Teacher Uses Responses To - Assess understanding of elements. - Identify misconceptions about atomic structure. - Prepare pupils for compound formation.			
Hook / Intro (5 mins)	Introduce Key Idea “Why is sodium chloride safe to eat when sodium is a highly reactive metal and chlorine is a poisonous gas?” Suggested Strategy Display images of: - Sodium metal - Chlorine gas - Table salt Ask: - Are these the same substance? - Why might the properties be different? - What happens when atoms join together? Pedagogical Rationale Creates curiosity and introduces the concept that compounds have properties different from the elements from which they are formed.			
Direct Teaching:	Content: Compounds			

Cell Structure (10
– 15 mins)

Introduce:

Compound

- A substance formed when two or more different elements are chemically combined.

Key Idea

Compounds are not mixtures.

In a compound:

- Atoms are chemically bonded together.
- The elements cannot be separated by simple physical methods.
- A new substance is produced.

Examples of Compounds

Compound	Formula	Elements Present
Water	H ₂ O	Hydrogen and Oxygen
Carbon Dioxide	CO ₂	Carbon and Oxygen
Sodium Chloride	NaCl	Sodium and Chlorine
Magnesium Oxide	MgO	Magnesium and Oxygen

Chemical Formulae

Explain:

A chemical formula shows:

- Which elements are present.
- The ratio of atoms present.

Example:

CO₂

Contains:

- 1 carbon atom
- 2 oxygen atoms

Comparing Elements and Compounds

Elements

- One type of atom only.

Examples:

- Oxygen
- Iron
- Carbon

Compounds

	- Two or more elements chemically combined. Examples: - Water - Carbon dioxide Teacher Modelling (EEF 3) Model interpretation of formulae: H₂O Ask: - Which elements are present? - How many atoms of each element are there? Model explanation: “Water contains hydrogen and oxygen atoms chemically joined together. It is therefore a compound rather than an element.” Check for Understanding (Hinge Point) - What is a compound? - What is the difference between an element and a compound? - Which elements are present in CO₂? - Why is water not an element? Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task Type Supported identification and interpretation. Pupils - Sort substances into elements and compounds. - Identify elements from chemical formulae. - Count atoms in simple formulae. Teacher Role - Model first examples. - Reinforce vocabulary. - Correct misconceptions immediately.			
Main Task (20 mins)	Core Task Pupils: Define the term compound.			

	- Describe how compounds are formed. - Identify elements from formulae. - Explain the difference between elements and compounds. - Name compounds from formulae and equations. Suggested Activities - Formula interpretation worksheet. - Element/compound card sort. - Naming compounds activity. - Structured explanation task. Teacher Flexibility Teachers select format based on class need: - Sorting activity. - Formula matching exercise. - Table completion. - GCSE-style application questions. Success Criteria - Define compound accurately. - Describe how compounds form. - Identify elements from formulae. - Name simple compounds correctly. - Use scientific vocabulary accurately. Adaptation Prompts If pupils struggle - Provide chemical symbol sheet. - Use colour-coded formulae. - Scaffold atom counting. If secure - Explain why compounds have different properties from elements. - Interpret more complex chemical formulae. - Compare compounds with mixtures.			
Support / Diamond (challenge)	Support - Periodic table. - Symbol reference sheet. - Formula guide.			

	Example sentence starters: “A compound is _____.” “The formula H₂O shows _____.” “The elements in sodium chloride are _____.” Diamond (Challenge) • Explain why compounds often have different properties from the elements they contain. • Analyse unfamiliar formulae. • Compare compounds and mixtures using scientific evidence.			
Common misconceptions	• Compounds and mixtures are the same thing. • Compounds contain only one type of atom. • The numbers in a formula show mass rather than number of atoms. • Elements in a compound keep all of their original properties. • Water is an element because it contains hydrogen.			
Assessment (5 mins)	Formative and Summary Quick Check Options • Define a compound. • Identify the elements in a formula. • Explain how compounds are formed. • State the difference between an element and a compound. Diagnostic Focus Can pupils: • Define compounds accurately? • Interpret chemical formulae? • Distinguish between elements and compounds? • Use scientific vocabulary correctly?			
Exit ticket (5 mins)	Purpose Inform planning for C1.04 Chemical Equations Example Questions • What is a compound?			

	- Which elements are present in CO₂? - Why is water a compound? Teacher uses responses to identify misconceptions before introducing chemical equations.			
Adaptive teaching	- Retrieval strengthens understanding of atoms and elements. - Hinge questions identify misconceptions early. - Formula interpretation is modelled explicitly. - Vocabulary is revisited frequently. - Challenge develops explanation and application skills. - Exit ticket informs progression to chemical equations.			
British Values	Democracy - students discuss and justify explanations about how atoms combine to form compounds.			
	Individual Liberty - Students independently apply scientific knowledge to interpret chemical formulae and identify compounds.			
Teacher Notes for MTP adaptations				

C1.04 Chemical Equations		HPA CHALLENGE	Skills	EEF Recommendations
Learning Objectives	- Write word equations for given chemical reactions - Write formulae and balanced symbol equations	Analyse chemical equations to explain why atoms must be conserved during reactions.	Working Scientifically WS 1.1 (Development of Scientific Thinking) Understand	EEF 4 (Memory): Retrieve prior learning about elements, compounds and chemical

	for given chemical reactions Write balanced ionic equations and half equations where appropriate (HT only)	Apply knowledge of formulae to construct balanced symbol equations from word equations.	how scientific models represent chemical change. WS 3.5 (Interpret Data) Interpret chemical formulae and equations. WS 3.6 (Explain using Evidence) Explain balancing using conservation of atoms. WS 4.1 (Scientific Vocabulary) Use terms such as reactant, product, coefficient, ionic equation and symbol equation accurately.	formulae.
Do Now (5 mins)	Purpose Retrieve prior learning about elements, compounds and formulae. Suggested Structure (teacher adapts) - What is an element? - What is a compound? - Which elements are present in H₂O? - Which elements are present in CO₂? Diamond (Challenge) - Why might chemists need a special way of recording chemical reactions? Teacher Uses Responses To - Assess understanding of chemical formulae. - Identify misconceptions about compounds. - Prepare pupils for chemical equations.	Evaluate the importance of balanced equations as scientific models of chemical reactions.	WS 3.5 (Interpret Data) Interpret chemical formulae and equations. WS 3.6 (Explain using Evidence) Explain balancing using conservation of atoms. WS 4.1 (Scientific Vocabulary) Use terms such as reactant, product, coefficient, ionic equation and symbol equation accurately. Maths Skills 1a (Number Skills) Count and compare numbers of atoms. 2c (Patterns and Relationships) Identify balancing patterns in equations. 3c (Formulae) Apply chemical formulae correctly.	EEF 3 (Modelling): Model the step-by-step construction and balancing of equations. EEF 6 (Language): Explicit teaching of chemical equation vocabulary. EEF 7 (Feedback): Feedback used to improve balancing accuracy and scientific explanations.
Hook / Intro (5 mins)	Introduce Key Idea “Chemists across the world need a universal language to describe chemical reactions.” Suggested Strategy Display: Magnesium + Oxygen → Magnesium Oxide Ask: - What information does this statement provide? - Could a scientist in another country understand it? - Is there a more precise way to record the reaction? Pedagogical Rationale Introduces equations as scientific models that communicate chemical changes clearly and consistently.			
Direct Teaching:	Content: Word Equations			

Cell Structure (10 – 15 mins)	Introduce: Word Equation A simple description of a chemical reaction. General format: Reactants → Products Example: Magnesium + Oxygen → Magnesium Oxide Key Terms Reactants Substances present at the start of a reaction. Products Substances formed during a reaction. Symbol Equations Introduce: Symbols can replace names. Example: $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$ Balanced Symbol Equations Explain: Chemical equations must be balanced because: • Atoms are not created. • Atoms are not destroyed. • The same number of atoms must appear on both sides. Example: Unbalanced: $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$ Balanced: $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ Conservation of Atoms Key Idea: The number of each type of atom remains the same before and after a reaction. Higher Tier Extension			
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	Introduce: Ionic Equations Show only the particles involved in a reaction. Half Equations Represent processes occurring at electrodes. Keep conceptual and age-appropriate. Teacher Modelling (EEF 3) Model balancing: Step 1 Count atoms: $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$ Magnesium = balanced Oxygen = not balanced Step 2 Add coefficients: Step 3 Recount atoms and check. Model common mistakes: • Changing subscripts • Balancing only one element • Ignoring diatomic molecules Check for Understanding (Hinge Point) • What is a reactant? • What is a product? • Why must equations be balanced? • What does the coefficient tell us? • Is this equation balanced? Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task Type Supported equation writing and balancing. Pupils • Convert word equations into symbol equations. • Identify reactants and products. • Balance simple equations. Teacher Role • Model first examples. • Support atom counting. • Address misconceptions immediately.			

Main Task (20 mins)	Core Task Pupils: • Write word equations. • Convert word equations into symbol equations. • Balance equations. • Explain why balancing is necessary. Suggested Activities • Equation conversion worksheet. • Atom counting exercise. • Balancing challenge. • GCSE-style application questions. Teacher Flexibility Teachers select format based on class need: • Structured worksheet. • Whiteboard balancing activity. • Card sort. • Extended written explanation. Success Criteria • Identify reactants and products. • Write word equations accurately. • Convert to symbol equations correctly. • Balance equations successfully. • Explain conservation of atoms. Adaptation Prompts If pupils struggle • Provide chemical formula sheets. • Use colour-coded atoms. • Scaffold balancing process. If secure • Balance more complex equations. • Write ionic equations (HT). • Explain why chemists use balanced equations. •			
Support / Diamond (challenge)	Support • Formula reference sheet. • Atom counting scaffold. • Balancing checklist.			

	Example sentence starters: “The reactants are _____.” “The products are _____.” “The equation is balanced because _____.” Diamond (Challenge) • Explain why changing a subscript changes the substance. • Balance complex equations independently. • Evaluate how useful chemical equations are as scientific models.			
Common misconceptions	• Coefficients and subscripts mean the same thing. • Balancing changes the substances involved. • Atoms can be created during reactions. • Reactants disappear completely. • The arrow means “equals”.			
Assessment (5 mins)	Formative and Summary Quick Check Options • Define reactant. • Define product. • Convert a word equation to a symbol equation. • Balance an equation. Diagnostic Focus Can pupils: • Write equations correctly? • Balance equations accurately? • Explain conservation of atoms? • Use scientific vocabulary appropriately?			
Exit ticket (5 mins)	Purpose Inform planning for C1.05 Mixtures and Chromatography Example Questions • What is a reactant? • Why must equations be balanced? • Balance a simple equation.			

	Teacher uses responses to identify misconceptions before introducing mixtures and separation techniques.			
Adaptive teaching	• Retrieval strengthens understanding of formulae and compounds. • Hinge questions identify misconceptions about balancing. • Worked examples reduce cognitive load. • Vocabulary is explicitly taught and revisited. • Challenge develops deeper conceptual understanding. • Exit ticket informs progression to separation techniques.			
British Values	Rule of Law - Students recognise that chemical equations follow agreed scientific rules and conventions.			
	Individual Liberty - Students independently apply scientific rules to construct and balance equations.			
Teacher Notes for MTP adaptations				

C1.05 Mixtures and Chromatography		HPA CHALLENGE	Skills	EEF Recommendations
Learning Objectives	- State the definition of the term mixture - Describe the physical processes used to separate a mixture of pigments - Explain how chromatography works to separate a mixture	Analyse chromatography results to identify substances within a mixture. Apply knowledge of particle properties to explain why substances separate during chromatography. Evaluate the effectiveness of chromatography compared with other separation techniques.	Working Scientifically WS 1.1 (Development of Scientific Thinking) Understand that different substances have different physical properties that allow separation. WS 2.2 (Experimental Skills and Strategies) Follow a chromatography method accurately and safely. WS 3.5 (Interpret Data) Interpret chromatograms and identify patterns in results. WS 3.6 (Explain using Evidence) Explain separation using observations and evidence. WS 4.1 (Scientific Vocabulary) Use terms such as mixture, chromatography, solvent, pigment and chromatogram accurately. Maths Skills 1c (Classification) Classify substances as pure substances or mixtures. 2c (Patterns and Relationships) Identify patterns in chromatograms. 4a (Interpretation) Interpret chromatography results and compare separated substances.	EEF 4 (Memory): Retrieve prior learning about elements, compounds and chemical formulae. EEF 3 (Modelling): Model the chromatography process and interpretation of chromatograms. EEF 5 (Practical Work): Practical work used to support understanding of particle behaviour and separation techniques. EEF 6 (Language): Explicit teaching of specialist separation-technique vocabulary. EEF 7 (Feedback): Feedback used to improve practical observations and conclusions.
Do Now (5 mins)	Purpose Retrieve prior learning about elements, compounds and chemical reactions. Suggested Structure (teacher adapts) - What is an element? - What is a compound? - Can two substances be physically mixed together without reacting? Diamond (Challenge) - If substances are mixed together, how could they be separated again? Teacher Uses Responses To - Assess understanding of pure substances and compounds. - Identify misconceptions about mixtures. - Prepare pupils for separation techniques.			
Hook / Intro (5 mins)	Introduce Key Idea “Can you separate all the colours hidden inside a black pen?” Suggested Strategy Show: - A black felt-tip pen. - A completed chromatogram revealing several colours. Ask: - How can one black ink contain different colours? - How did scientists separate the pigments? - Why might this be useful? Pedagogical Rationale			

	Creates curiosity and introduces chromatography through an observable phenomenon.			
Direct Teaching: Cell Structure (10 – 15 mins)	Content: Mixtures Introduce: Mixture • Two or more substances physically combined. • No chemical reaction has occurred. • Components can often be separated by physical methods. Examples: • Air • Salt water • Ink Key Idea Unlike compounds, substances in a mixture are not chemically bonded together. Content: Chromatography Introduce: Chromatography • A technique used to separate mixtures of dissolved substances. Common uses: • Identifying pigments in inks. • Testing food colourings. • Forensic investigations. Key Terms Solvent • A liquid that dissolves substances and carries them through the paper. Chromatogram • The final pattern produced after chromatography. Pigment • A coloured substance within a mixture. Mobile Phase			

- The solvent moving through the paper.

How Chromatography Works

1. A sample is placed on chromatography paper.
2. The bottom of the paper is placed in a solvent.
3. The solvent travels up the paper.
4. Different substances move at different speeds.
5. The mixture separates into individual components.

Why Separation Occurs

Different substances:

- Dissolve differently in the solvent.
- Interact differently with the paper.

As a result:

- Some travel further.
- Some remain lower on the paper.

Teacher Modelling (EEF 3)

Model a chromatogram:

Pigment A



Pigment B



Start Line

Model interpretation:

“Two spots show that the original ink contained at least two different pigments.”

Check for Understanding (Hinge Point)

- What is a mixture?
- What is chromatography?
- What is a solvent?
- Why do substances separate?
- What is a chromatogram?

Mini whiteboards / cold calling

Guided Practice (10 mins)	Task Type Supported interpretation and practical preparation. Pupils • Identify mixtures from examples. • Label chromatography equipment. • Interpret simple chromatograms. Teacher Role • Model first examples. • Reinforce vocabulary. • Correct misconceptions immediately.			
Main Task (20 mins)	Core Task Pupils: • Carry out a chromatography investigation (where appropriate). • Observe separation of pigments. • Record observations. • Interpret chromatograms. • Explain why substances separate. Suggested Activities • Chromatography practical. • Chromatogram analysis. • Mixture classification. • Structured explanation questions. Teacher Flexibility Teachers select format based on resources available: • Practical chromatography. • Demonstration with class analysis. • Data and chromatogram interpretation. • Forensic science case-study activity. Success Criteria • Define mixture correctly. • Describe the chromatography process. • Explain why separation occurs. • Interpret chromatograms accurately. • Use scientific vocabulary correctly. Adaptation Prompts			

	If pupils struggle • Provide labelled chromatography diagrams. • Use scaffolded interpretation questions. • Highlight key terms and definitions. If secure • Compare different chromatograms. • Explain separation using particle ideas. • Evaluate the reliability of chromatography results.			
Support / Diamond (challenge)	Support • Chromatography worksheet. • Vocabulary mat. • Labelled equipment diagram. Example sentence starters: “A mixture is _____.” “Chromatography separates substances because _____.” “This chromatogram shows _____.” Diamond (Challenge) • Explain how chromatography could be used in forensic investigations. • Analyse chromatograms to identify unknown substances. • Evaluate the effectiveness of chromatography compared with other separation techniques.			
Common misconceptions	• Mixtures and compounds are the same thing. • Chromatography causes a chemical reaction. • A single spot always means a pure substance was used. • The solvent and the mixture are the same thing. • All substances travel at the same speed during chromatography.			
Assessment (5 mins)	Formative and Summary Quick Check Options • Define a mixture.			

	• Define chromatography. • Identify the solvent. • Interpret a simple chromatogram. Diagnostic Focus Can pupils: • Explain what a mixture is? • Describe the chromatography process? • Interpret chromatograms correctly? • Use scientific vocabulary accurately?			
Exit ticket (5 mins)	Purpose Inform planning for C1.06 Other Separation Techniques Example Questions • What is a mixture? • What is chromatography used for? • Why do different substances travel different distances? Teacher uses responses to identify misconceptions before moving on to additional separation methods.			
Adaptive teaching	• Retrieval strengthens understanding of elements, compounds and mixtures. • Hinge questions identify misconceptions about separation. • Practical work provides a concrete context for abstract ideas. • Vocabulary is explicitly taught and revisited. • Challenge develops interpretation and evaluation skills. • Exit ticket informs progression to other separation techniques.			
British Values	Democracy - Students use evidence from chromatograms to justify conclusions about mixtures. Rule of Law - Students follow practical procedures and laboratory safety rules when carrying out chromatography.			

Teacher Notes for MTP adaptations

C1.06 Other Separation Techniques		HPA CHALLENGE	Skills	EEF Recommendations
Learning Objectives	- Describe techniques that can be used to separate different mixtures - Explain how each technique works to separate a mixture - Suggest suitable separation and purification techniques for mixtures when given appropriate information - Safely use a range of equipment to separate chemical mixtures	Analyse mixtures and justify which separation technique would be most effective. Apply knowledge of particle properties to explain why different techniques work. Evaluate the advantages and limitations of different separation methods.	Working Scientifically WS 2.2 (Experimental Skills and Strategies) Select and use appropriate techniques and apparatus safely. WS 3.5 (Interpret Data) Analyse observations from separation processes. WS 3.6 (Explain using Evidence) Explain separation methods using particle theory. WS 3.7 (Evaluation) Evaluate the effectiveness of different techniques. WS 4.1 (Scientific Vocabulary) Use terms such as filtration, distillation, purification, residue and fractionation accurately. Maths Skills 1c (Comparisons) Compare different separation techniques. 2c (Patterns and Relationships) Identify relationships between physical properties and separation methods.	EEF 4 (Memory): Retrieve prior learning about mixtures and chromatography. EEF 3 (Modelling): Model each separation technique using diagrams and practical demonstrations. EEF 5 (Practical Work): Practical activities used to reinforce understanding of separation techniques. EEF 6 (Language): Explicit teaching of scientific vocabulary. EEF 7 (Feedback): Feedback used to improve practical explanations and technique selection.
Do Now (5 mins)	Purpose Retrieve prior learning about mixtures and chromatography. Suggested Structure (teacher adapts) - What is a mixture? - What is chromatography used for? - Why can mixtures be separated physically? Diamond (Challenge) - Would the same separation method work for every mixture? Explain. Teacher Uses Responses To - Assess understanding of mixtures. - Identify misconceptions about separation. - Prepare pupils for a range of separation techniques.			
Hook / Intro (5 mins)	Introduce Key Idea “How could you separate a mixture of sand, salt and water?” Suggested Strategy Show a beaker containing: - Sand - Salt - Water Ask: - Could all three materials be separated? - Would one method be enough? - What properties could help us separate them? Pedagogical Rationale			

	Creates a practical problem-solving context and highlights the need for multiple separation methods.			
Direct Teaching: Cell Structure (10 – 15 mins)	Content: Separation Techniques <u>Filtration</u> Used to separate: • Insoluble solids from liquids Equipment: • Filter paper • Funnel Key Terms: Residue • Solid left on filter paper Filtrate • Liquid that passes through Example: Sand + Water <u>Evaporation</u> Used to: • Recover a dissolved solid from a solution Example: Salt solution → Salt crystals <u>Distillation</u> Used to: • Separate a liquid from a solution Process: 1. Heat solution. 2. Liquid evaporates. 3. Vapour condenses. 4. Pure liquid collected. Example: Water from salt water <u>Fractional Distillation</u> Used to: • Separate mixtures of liquids with different boiling points. Example: Crude oil fractions Key Idea Different techniques work because substances have different			

	physical properties such as: • Solubility • Particle size • Boiling point Teacher Modelling (EEF 3) Model decision-making: <table><tr><th>Mixture</th><th>Technique</th></tr><tr><td>Sand + Water</td><td>Filtration</td></tr><tr><td>Salt + Water</td><td>Evaporation</td></tr><tr><td>Water from Salt Solution</td><td>Distillation</td></tr><tr><td>Ethanol + Water</td><td>Fractional Distillation</td></tr></table> Model explanation: “Filtration works because sand is insoluble in water. The particles are too large to pass through the filter paper.” Check for Understanding (Hinge Point) • What is filtration used for? • What is a residue? • What is distillation used for? • Why does fractional distillation work? Mini whiteboards / cold calling	Mixture	Technique	Sand + Water	Filtration	Salt + Water	Evaporation	Water from Salt Solution	Distillation	Ethanol + Water	Fractional Distillation			
Mixture	Technique													
Sand + Water	Filtration													
Salt + Water	Evaporation													
Water from Salt Solution	Distillation													
Ethanol + Water	Fractional Distillation													
Guided Practice (10 mins)	Task Type Supported classification and explanation. Pupils • Match mixtures to separation methods. • Label separation equipment. • Explain why each method works. Teacher Role • Model first examples. • Reinforce scientific vocabulary. • Correct misconceptions immediately.													
Main Task (20 mins)	Core Task Pupils: • Identify appropriate separation techniques. • Explain how each technique works.													

	- Justify choices using physical properties. - Interpret practical separation scenarios. Suggested Activities - Separation technique card sort. - Equipment labelling. - Mixture challenge worksheet. - Practical demonstration observations. Teacher Flexibility Teachers select format based on class need: - Practical carousel. - Demonstration lesson. - Structured worksheet. - GCSE-style application questions. Success Criteria - Identify suitable separation methods. - Explain how techniques work. - Link methods to physical properties. - Use scientific vocabulary accurately. - Justify choices using evidence. Adaptation Prompts If pupils struggle - Provide mixture-method matching cards. - Use labelled diagrams. - Supply key-word definitions. If secure - Evaluate multiple methods for the same mixture. - Explain why one technique may be more effective than another. - Apply learning to unfamiliar mixtures.			
Support / Diamond (challenge)	Support - Equipment diagrams. - Separation methods summary sheet. - Vocabulary mat. Example sentence starters: "Filtration is used because ____."			

	“Distillation works by _____.” “The most suitable technique is _____ because _____.” Diamond (Challenge) • Evaluate which separation technique is most efficient in different situations. • Compare evaporation and distillation. • Explain how separation methods are used in industry.			
Common misconceptions	• Filtration removes dissolved substances. • Evaporation and boiling are the same process. • Distillation changes the substance chemically. • All mixtures can be separated using one method. • A residue and filtrate are the same thing.			
Assessment (5 mins)	Formative and Summary Quick Check Options • Define residue. • Define filtrate. • Identify the correct separation technique. • Explain why a method works. Diagnostic Focus Can pupils: • Select the correct technique? • Explain why the technique works? • Use scientific vocabulary correctly? • Link methods to physical properties?			
Exit ticket (5 mins)	Purpose Inform planning for C1.07 The History of the Atom Example Questions • Which technique separates sand and water? • What is a residue? • Why is distillation used? Teacher uses responses to identify misconceptions before moving on to atomic models.			

Adaptive teaching	• Retrieval strengthens understanding of mixtures and chromatography. • Hinge questions identify misconceptions about separation. • Practical demonstrations reduce cognitive load. • Vocabulary is explicitly taught and revisited. • Challenge develops evaluation and application skills. • Exit ticket informs progression to the history of the atom.			
British Values	Rule of Law - Students follow laboratory safety procedures and scientific methods when carrying out separation techniques.			
	Individual Liberty - Students independently select and justify appropriate separation methods using scientific evidence.			
Teacher Notes for MTP adaptations				

	atom - Explain how the results of the alpha particle scattering experiment led to the nuclear model - Describe how Niels Bohr adapted the nuclear model - Describe how developments in scientific methods led to the discovery of protons and neutrons	Apply evidence from experiments to explain why atomic models changed. Evaluate the importance of experimental evidence in the development of scientific theories.	models develop and change as evidence improves. WS 1.2 (Models) Compare different atomic models and evaluate their strengths and limitations. WS 3.6 (Explain using Evidence) Explain how experimental evidence changed scientific understanding. WS 3.7 (Evaluation) Evaluate how scientific ideas develop over time. WS 4.1 (Scientific Vocabulary) Use terms such as atom, electron, nucleus, model and scattering accurately. Maths Skills 1c (Comparisons) Compare different atomic models. 2c (Patterns and Relationships) Identify patterns between evidence and scientific developments.	EEF 3 (Modelling): Model the development of atomic theories using timelines and diagrams. EEF 6 (Language): Explicit teaching of scientific vocabulary linked to atomic theory. EEF 7 (Feedback): Feedback used to improve explanations of scientific developments.
Do Now (5 mins)	Purpose Retrieve prior learning about atoms, sub-atomic particles and atomic structure. Suggested Structure (teacher adapts) - What is an atom? - Name the three sub-atomic particles. - Which particles are found in the nucleus? Diamond (Challenge) - How do scientists know what atoms look like if they cannot see them directly? Teacher Uses Responses To - Assess understanding of atomic structure. - Identify misconceptions about the atom. - Introduce the concept of scientific models.			
Hook / Intro (5 mins)	Introduce Key Idea “Everything we know about atoms today comes from scientists testing and improving their ideas over hundreds of years.” Suggested Strategy Display: - Dalton's solid sphere model. - Thomson's plum pudding model. - Rutherford's nuclear model. - Bohr model. Ask: - Which model looks most accurate? - Were scientists always correct about atoms?			

	Why did their ideas change? Pedagogical Rationale Introduces science as an evolving process based on evidence rather than fixed facts.			
Direct Teaching: Cell Structure (10 – 15 mins)	Content: Early Atomic Models Dalton's Model - Atoms were tiny solid spheres. - Different elements contained different atoms. - No internal structure was known. Discovery of the Electron Introduce: J.J. Thomson - Discovered electrons. - Led to the plum pudding model. Plum Pudding Model Features: - Positive sphere. - Negative electrons embedded throughout. Scientists accepted this model because it explained the evidence available at the time. Rutherford's Alpha Scattering Experiment Introduce: Scientists fired alpha particles at thin gold foil. Expected Result Based on the plum pudding model: - Alpha particles should pass straight through. Observed Results - Most passed straight through. - Some were deflected. - A very small number bounced back. Key Conclusion Most of the atom is empty space. The positive charge and most of the mass are concentrated in a tiny nucleus.			

Nuclear Model

Features:

- Small dense nucleus.
- Electrons around the outside.
- Atom mostly empty space.

Bohr Model

Introduce:

Niels Bohr

- Proposed electrons exist in fixed shells or energy levels.
- Improved the nuclear model.

Discovery of Neutrons

Introduce:

James Chadwick

- Discovered the neutron.
- Helped explain atomic mass.

Key Idea

Scientific models change when new evidence becomes available.

Teacher Modelling (EEF 3)

Construct timeline:

Dalton

↓

Thomson

↓

Rutherford

↓

Bohr

↓

Chadwick

Model explanation:

“The plum pudding model was replaced because Rutherford's evidence could not be explained by Thomson's model.”

Check for Understanding (Hinge Point)

- What did Dalton believe atoms were like?

	• What was the plum pudding model? • What did Rutherford discover? • Why was the plum pudding model replaced? • What did Bohr add to the atomic model? Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task Type Supported sequencing and comparison. Pupils • Sequence atomic models in chronological order. • Match scientists to discoveries. • Compare models using a table. Teacher Role • Model first examples. • Reinforce vocabulary. • Address misconceptions immediately.			
Main Task (20 mins)	Core Task Pupils: • Describe how atomic models changed over time. • Explain Rutherford's experiment. • Explain how evidence led to improvements in models. • Compare different atomic models. Suggested Activities • Atomic model timeline. • Scientist matching activity. • Alpha scattering interpretation task. • Structured extended explanation question. Teacher Flexibility Teachers select format based on class need: • Timeline construction. • Card sort. • Comparison table. • GCSE-style explanation task. Success Criteria • Describe key atomic models. • Explain Rutherford's experiment.			

	• Explain how evidence changed scientific understanding. • Use scientific vocabulary accurately. • Describe the contributions of key scientists. Adaptation Prompts If pupils struggle • Provide completed timeline. • Use labelled model diagrams. • Supply key-word definitions. If secure • Explain why scientific models are useful. • Evaluate strengths and weaknesses of early models. • Analyse how technology improved scientific understanding.			
Support / Diamond (challenge)	Support • Timeline scaffold. • Atomic model diagrams. • Scientist fact sheet. Example sentence starters: “The plum pudding model suggested that ____.” “Rutherford concluded that ____.” “Bohr improved the model by ____.” Diamond (Challenge) • Evaluate why Rutherford's experiment was important. • Explain why scientific theories change over time. • Analyse the relationship between evidence and scientific progress.			
Common misconceptions	• Scientists knew the correct atomic model from the beginning. • The plum pudding model was completely incorrect. • Rutherford was able to see atoms directly. • Scientific ideas change because scientists guess. • Bohr and Rutherford proposed identical models.			

Assessment (5 mins)	Formative and Summary Quick Check Options - Define the plum pudding model. - State one conclusion from Rutherford's experiment. - Explain why the atomic model changed. - Identify the scientist associated with a discovery. Diagnostic Focus Can pupils: - Describe key atomic models? - Explain how evidence changed scientific ideas? - Explain Rutherford's conclusions? - Use scientific vocabulary correctly?			
Exit ticket (5 mins)	Purpose Inform planning for C1.08 Electronic Structure Example Questions - What did Rutherford discover about the atom? - What was the plum pudding model? - Why do scientific models change? Teacher uses responses to identify misconceptions before studying electronic structure.			
Adaptive teaching	- Retrieval strengthens understanding of atomic structure. - Hinge questions identify misconceptions about scientific models. - Timelines support chronological understanding. - Vocabulary is explicitly taught and revisited. - Challenge develops evaluation of scientific evidence. - Exit ticket informs progression to electronic structure.			
British Values	Democracy - Students evaluate how scientific evidence challenged previous ideas and led to better explanations. Tolerance - Students recognise that scientific understanding develops over time as new evidence becomes available.			

Teacher Notes for MTP adaptations

C1.08 Electronic Structure		HPA CHALLENGE	Skills	EEF Recommendations
Learning Objectives	- Represent the electronic structures of the first 20 elements of the periodic table in numerical form - Represent the electronic structures of the first 20 elements of the periodic table as diagrams	Analyse how electronic structure explains the position of elements in the periodic table. Apply knowledge of electronic structure to predict how elements behave chemically. Evaluate how electronic structure supports the modern model of the atom.	Working Scientifically WS 1.1 (Development of Scientific Thinking) Understand how atomic models explain the arrangement of electrons. WS 1.2 (Models) Use shell diagrams to represent electronic structure. WS 3.6 (Explain using Evidence) Explain patterns in the periodic table using electronic structure. WS 4.1 (Scientific Vocabulary) Use terms such as electron arrangement, energy level, shell and valence electron accurately. Maths Skills 1a (Number Skills) Count and represent electron arrangements correctly. 2c (Patterns and Relationships) Identify patterns between atomic number and electron structure. 3a (Data Representation) Present electronic structures numerically and diagrammatically.	EEF 4 (Memory): Retrieve prior learning about atomic structure and sub-atomic particles. EEF 3 (Modelling): Model electron arrangement using diagrams and worked examples. EEF 6 (Language): Explicit teaching of specialist vocabulary linked to atomic structure. EEF 7 (Feedback): Feedback used to improve diagram accuracy and interpretation of patterns.
Do Now (5 mins)	Purpose Retrieve prior learning about atomic structure and the development of atomic models. Suggested Structure (teacher adapts) - What is the atomic number? - Which particle has a negative charge? - What did Bohr add to the atomic model? Diamond (Challenge) - If electrons are arranged in shells, what might determine how many shells an atom has? Teacher Uses Responses To - Assess understanding of atomic structure. - Identify misconceptions about electrons. - Prepare pupils for electronic arrangement.			
Hook / Intro (5 mins)	Introduce Key Idea “Why do elements in the same group often behave in similar ways?” Suggested Strategy Display: - Lithium - Sodium - Potassium Ask: - Why are these elements grouped together? - Could something inside the atom explain their similarities? Pedagogical Rationale Creates curiosity and links electronic structure to the periodic table.			
Direct Teaching:	Content: Electron Arrangement			

Cell Structure (10 – 15 mins)	Recap: - Electrons are negatively charged particles. - Electrons exist in energy levels (shells) around the nucleus. Electronic Structure Rules (First 20 Elements) For GCSE students should know: - First shell holds 2 electrons - Second shell holds 8 electrons Third shell holds 8 electrons (for first 20 elements) Examples Hydrogen (Atomic Number = 1) 1 electron in the first shell Oxygen (Atomic Number = 8) Configuration = 2,6 Diagram 2 electrons in the first shell 6 electrons in the second shell Sodium (Atomic Number = 11) Configuration = 2,8,1 Diagram 2 electrons in the first shell 8 electrons in the second shell 1 electron in the third shell Calcium (Atomic Number = 20) Configuration = 2,8,8,2 Diagram 2 electrons in the first shell 8 electrons in the second shell 8 electrons in the third shell 2 electrons in the fourth shell Key Idea Electronic structure is determined by: Number of electrons = Atomic number (for neutral atoms) Link to the Periodic Table Explain:			
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	Group Number The number of electrons in the outer shell. Example: Group 1: 2,8,1 2,8,8,1 Period Number The number of occupied electron shells. Example: 2,8,1 has three electron shells therefore, period 3 Teacher Modelling (EEF 3) Model: Magnesium Atomic number = 12 Step 1 – how many electrons? 12 electrons Step 2 – fill shells – 2,8,2 Step 3: Draw shell diagram. Model common errors: • forgetting electrons = atomic number • placing too many electrons in the first shell Check for Understanding (Hinge Point) • How many electrons can fit in the first shell? • What is the electron arrangement of oxygen? • What is the electron arrangement of sodium? • How can electronic structure help place an element in the periodic table? Mini whiteboards / cold calling			
Guided Practice (10 mins)	Task Type Supported construction of electronic structures. Pupils • Determine electron arrangements from atomic numbers. • Draw shell diagrams. • Identify group and period from electronic structures.			

	Teacher Role • Model first examples. • Check shell filling accuracy. • Reinforce vocabulary.			
Main Task (20 mins)	Core Task Pupils: • Write electronic structures for the first 20 elements. • Draw shell diagrams. • Link electronic structure to position in the periodic table. • Explain patterns between different elements. Suggested Activities • Electronic structure worksheet. • Shell diagram construction. • Card matching activity. • GCSE-style periodic table questions. Teacher Flexibility Teachers select format based on class need: • Structured worksheet • Shell template diagrams • Card sort activity • Independent problem-solving task Success Criteria • Correctly determine electron arrangements. • Draw accurate shell diagrams. • Explain links between electronic structure and the periodic table. • Use scientific vocabulary accurately. Adaptation Prompts If pupils struggle • Provide shell templates. • Use guided examples. • Colour-code electron shells. If secure • Predict group and period from electronic structures. • Explain periodic trends using electron arrangements.			

	• Apply knowledge to unfamiliar examples.			
Support / Diamond (challenge)	Support • Shell diagram templates. • Electron arrangement guide. • Vocabulary mat. Example sentence starters: “The atomic number is _____ so there are _____ electrons.” “The electron arrangement is _____.” Diamond (Challenge) • Explain why Group 1 elements have similar properties. • Predict the electronic structure of unfamiliar elements. • Evaluate how electronic structure supports the modern atomic model.			
Common misconceptions	• Electrons are found in the nucleus. • Atomic number gives the number of neutrons. • Shells can contain unlimited electrons. • Electrons are placed randomly around the atom. • Group number and period number represent the same thing.			
Assessment (5 mins)	Formative and Summary Quick Check Options • Write an electron arrangement. • Draw a shell diagram. • Identify the group and period of an element. • Explain what determines electronic structure. Diagnostic Focus Can pupils: • Write electronic structures correctly? • Draw shell diagrams accurately? • Link electronic arrangement to periodic table position? • Use scientific vocabulary accurately?			

Exit ticket (5 mins)	Purpose Review and consolidate learning from the entire C1 Atomic Structure and the Periodic Table topic. Example Questions • What is the electron arrangement of magnesium? • How many electrons fit into the first shell? • What does the group number tell us? Teacher uses responses to identify misconceptions and areas for revision.			
Adaptive teaching	• Retrieval strengthens understanding of atomic structure. • Hinge questions identify misconceptions about electron arrangement. • Diagram modelling reduces cognitive load. • Vocabulary is explicitly taught and revisited. • Challenge develops links between atomic structure and the periodic table. • Exit ticket informs revision and assessment planning.			
British Values	Democracy - Students use scientific evidence and patterns to justify explanations about atomic structure and periodic table placement. Individual Liberty - Students independently apply scientific knowledge to construct and interpret electronic structures.			
Teacher Notes for MTP adaptations				