

Year 9 Chemistry Assessment Objectives

Chemical foundations

	Substantive knowledge (subject content)	Disciplinary knowledge (skills)
Strong	- Suggest examples to explain the differences between physical changes and chemical reactions. - Suggest examples to explain the terms element, compound, molecule and giant lattice. - Predict what will happen to the overall mass in a reaction. - Write balanced chemical equations.	Evaluate scientific data, draw conclusions based on accuracy and validity.
Confident	- Explain the differences between physical changes and chemical reactions, drawing on specific examples provided. - Explain the differences between elements, compounds, molecules and giant lattices. - Explain, using a specific example what conservation of mass is. - Explain why mass may appear to change in a reaction. - Balance given symbol equations.	Make a conclusion and explain it using data and scientific reasoning to support the statements.
Developing	- Describe the differences between physical changes and chemical reactions, drawing on specific examples provided. - Describe the differences between elements, compounds, molecules and giant lattices. - Describe what would happen to the mass in a given reaction example. - Describe a balanced symbol question.	Describe data and scientific reasoning to support conclusions made.
Emerging	- State some features of a physical change and a chemical reaction. - Identify elements, compound, molecules and giant lattices from particle diagrams. - Write word equations and identify symbols of elements in compounds.	Describe data to make conclusions.

Atomic structure

	Substantive knowledge (subject content)	Disciplinary knowledge (skills)
Strong	- Suggest how new evidence led to the changing atomic model over time. - Calculate the numbers of protons, neutrons and electrons in an atom or ion. - Suggest how the properties of isotopes are similar and different, using an example. - Calculate relative atomic mass from isotopic data. - Draw the electronic structure for the first 20 elements. - Draw the electronic structure for ions of the first 20 elements. - Suggest the relationship between electronic structure of atoms and ions and patterns in the periodic table.	Evaluate scientific data, draw conclusions based on accuracy and validity.
Confident	- Explain how and why, referring to experimental evidence, the atomic model has changed over time. - Calculate the numbers of protons, neutrons and electrons in an atom or ion, given its atomic number and mass number for the first 20 elements. - Explain what an isotope is, using an example. - Calculate relative atomic mass from isotopic data. - Draw the electronic structure for the first 20 elements. - Explain the relationship between electronic structure of atoms and ions and patterns in the periodic table.	Make a conclusion and explain it using data and scientific reasoning to support the statements.
Developing	- Describe how and why, referring to experimental evidence, the atomic model has changed over time. - Calculate the numbers of protons, neutrons and electrons in an atom, given its atomic number and mass number for the first 20 elements. - Describe what an isotope is. - Calculate relative atomic mass, using a given formula, from isotopic data. - Draw the electronic structures of the first 18 elements. - Describe the relationship between electronic structure of atoms and ions and patterns in the periodic table.	Describe data and scientific reasoning to support conclusions made.
Emerging	- Calculate the numbers of protons, neutrons and electrons in an atom, given its atomic number and mass number for the first 20 elements, with support. - Identify how the numbers of protons and neutrons differ in isotopes. - Calculate relative atomic mass, using a partially completed formula. - Draw the electronic structures of the first 10 elements. - State that the number of outer shell electrons is the same as the group number. - State that the number of shells of electrons is the same as the period number.	Describe data to make conclusions.

Periodic Table

	Substantive knowledge (subject content)	Disciplinary knowledge (skills)
Strong	- Evaluate how testing a prediction can support or refute a new scientific idea, in the context of the development of the periodic table. - Explain the trends in physical and chemical properties and of group 0, 1 and 7 elements. - Predict and explain the reactions of group 1 and 7 elements, based on periodic trends. - Explain how displacement reactions of the halogens provides evidence of reactivity trends.	- Suggest how a question being investigated can be explored safely in school science laboratory. - Evaluate scientific data, draw conclusions based on accuracy and validity.
Confident	- Explain the steps in the development of the periodic table. - Explain the properties of group 0 elements. - Explain how the properties of group 0 elements relate to their uses. - Explain the reactions of group 1 and 7 elements. - Describe how displacement reactions of the halogens provides evidence of reactivity trends.	- Justify how the control measures lead to carrying out a safe experiment. - Make a conclusion and explain it using data and scientific reasoning to support the statements.
Developing	- Describe the steps in the development of the periodic table. - Describe the properties and uses of group 0 elements. - Describe the reactions of group 1 and 7 elements. - Describe what a displacement reaction is.	- Give reasons for the control measures. - Describe data and scientific reasoning to support conclusions made.
Emerging	- State how the periodic table was first organised - State how the periodic table was organised by Mendeleev. - State some physical, chemical properties and uses of group 0. - State some physical and chemical properties of group 1 elements. - State some physical and chemical properties of group 7 elements. - State what a displacement reaction is.	- State control measures for an investigation. - Describe data to make conclusions.

Metals and metal extraction

	Substantive knowledge (subject content)	Disciplinary knowledge (skills)
Strong	- Explain the differences between the physical properties of metals and non-metals. - Explain how the relative reactivities of metals and acids can be used to determine the reactivity series, taking into account the apparent underactivity of aluminium. - Explain why it is not possible to determine a full reactivity series of metals through reaction with acid and displacement reactions. - Explain how reactions of acid and metals and displacement reactions are examples of a redox reaction. - Suggest why some metals can be extracted from their ores, using carbon but others are extracted by alternative methods.	- Suggest how a question being investigated can be explored safely in school science laboratory. - Justify whether anomalous results can be explained or ignored. - Identify any further questions arising from an investigation.
Confident	- Explain the physical properties of metals. - Explain how the relative reactivities of metals and acids can be used to determine the reactivity series. - Predict and explain the outcomes of displacement reactions, using the reactivity series. - Explain that in reactions of acid and metals and displacement reactions metals are oxidised. - Explain the extraction of metals from their ores by reduction with carbon.	- Justify how the control measures lead to carrying out a safe experiment. - Make a conclusion and explain it using data and scientific reasoning to support the statements. - Give reasons for anomalous data.
Developing	- Describe the physical properties of metals. - Describe the reactions of acid and metals and displacement reactions and how relative reactivities can be determined by observation. - Describe the extraction of metals from their ores by reduction with carbon.	- Give reasons for control measures. - Use the pattern or trend into an answer to an enquiry question.
Emerging	- State some physical properties of metals. - State the reactivity of different metals based on observations of the reactions of acid and metals and displacement reactions. - Identify the products of reduction of metal ores, using carbon.	- State control measures for an investigation. - State a scientific reason for findings.

Pure and impure substances

	Substantive knowledge (subject content)	Disciplinary knowledge (skills)
Strong	- Explain how quantitative data can be used to assess purity and make judgements about purity based on data. - Suggest why a formulation is required for certain situations, rather than a mixture. - Suggest a real-life application to explain the concept of separation by filtration. - Explain how distillation can be used to separate a mixture of several different liquids. - Analyse chromatography experiments and explain the findings to draw conclusions. - Suggest an investigation to identify the following gases: hydrogen; carbon dioxide; oxygen and chlorine.	- Write methods for investigations, unaided. - Explain data should be recorded with consistency, to an appropriate number of significant figures. - Justify whether anomalous results can be explained or ignored. - Identify any further questions arising from an investigation.
Confident	- Explain how quantitative data can be used to assess purity. - Explain the difference between a formulation and a mixture. - Explain how filtration separates an insoluble solid from a liquid. - Explain how distillation separates two miscible liquids. - Explain how chromatography is used to separate a mixture of coloured dyes. - Explain how to identify following gases: hydrogen; carbon dioxide; oxygen and chlorine.	- Write methods for investigations, having discussed or observed an outline of the procedure. - Record data with consistency, to an appropriate number of significant figures. - Make a conclusion and explain it using data and scientific reasoning to support the statements. - Give reasons for anomalous data.
Developing	- Describe how quantitative data can be used to assess purity. - Describe what a formulation is. - Describe what filtration is. - Describe how distillation separates two miscible liquids. - Describe how to carry out chromatography. - Explain how to identify following gases: hydrogen; carbon dioxide; oxygen and chlorine.	- Write methods for simple experiments, using key words and diagrams for guidance. - Use data in an answer to an enquiry question.
Emerging	- State that melting points and boiling points are a measure of purity. - State what a formulation is. - State what filtration is. - Identify the changes of state that take place in distillation. - Write a method to carry out chromatography by completing a clozed activity. - State the test and result for the following gases: hydrogen; carbon dioxide; oxygen and chlorine.	- Write a method, using diagrams as a prompt. - State a scientific reason for findings.