

IGCSE Co-ordinated Sciences 0654

Unit 9 : C1 The Elements of Chemistry & C2 Classifying the Elements

Recommended Prior Knowledge

Students should have some knowledge of atoms and molecules, elements and compounds from previous study.

Context

This Unit provides essential background knowledge, including use of symbol equations, for use in all succeeding units.

Outline

The unit used the Periodic Table as a basis for presentation of ideas about atoms, molecules, elements, compounds, mixtures and trends in properties of both elements and compounds.

| AO | Learning outcomes | Suggested Teaching activities | Learning resources |
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| A | Appreciate the distinction between the three states of matter and explain how they can be inter-converted in terms of the kinetic theory. | <p>A range of solids, liquids and gases may be used as examples. Students can carry out experiments involving heating and cooling of these substances to observe changes in state.</p> <p>The conversions observed can then be related to the motion and arrangement of particles.</p> | <p><i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 1.</p> <p>Particulate nature of matter:</p> <p>http://www.bbc.co.uk/schools/ks3bitesize/science/chemistry/materials1.shtml</p> |
| A | Understand the terms element, compound, mixture, atom and molecules. | <p>Use 'particles in boxes' diagrams to represent the three states of matter and stress the importance of the changes in arrangement and range of movement between states.</p> <p>Examples may be observed, and chemical reactions used to make compounds from their elements e.g. FeS and MgO.</p> | <p><i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 2.</p> |
| A | Know that each element has a particular chemical symbol. | <p>Chemical symbols and formulae may be introduced as examples of elements, and compounds are introduced. Further use of symbols is</p> | <p><i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 2.</p> |

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| A | Be able to use symbols of elements to write formulae of simple compounds when given a list of symbols and combining powers. | made throughout the syllabus. Use cards of symbols and element names to play a pairs style matching game. Word and symbol equations, including state symbols, may be written for the chemical reactions studied in this and further units. Use cards again, this time including compounds so that whole equations can be created. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 2. |
| A | Know that 'amount of substance' is measured in moles. | Once the mole concept has been introduced it should be used in the context of the experiments given above. Emphasize the idea of a mole being a number of particles of matter. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 5. http://www.liv.ac.uk/chemistry/links/constants.html (Not very useful website but can't find anything else relevant) |
| ABC | Know quantitatively that 'amount of substance' has a precise meaning in chemistry. | Calculations may be made using the example experiments given above, and other examples, to include decomposition as well as synthesis of simple compounds. The website gives a simple introduction to the ideas involved in mole calculations. Examples can be used from chemical reactions in further units. This can be linked back to the preparation of salts by titration e.g. preparation of sodium chloride. The website can be used to illustrate the steps involved in making a mole calculation. Students should also be competent at handling reactant mass data given in tonnes for industrial scale reactions e.g. preparation of salts for use as fertilisers. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 5. http://www.science.widener.edu/ http://misterguch.brinkster.net/molecalculations.html (good method for teaching calculations) |
| A | Know the relative charge and the approximate relative mass of a proton, a neutron and an electron. | This may be presented using diagrams drawn on the board or projected from a computer. The neutrality of atoms that results from equal numbers of protons and electrons should be emphasised. Do students have prior knowledge of the arrangement of particles within the atom. Good opportunity to recap this. | <i>Teaching and Assessing Practical Skills in Science</i> by Dave Hayward <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 3. |

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| A | Understand the meaning of nucleon number and proton number. | This may be related to the position of each element in the Periodic Table. The lack of a distinct pattern in the number of neutrons in succeeding elements should be contrasted with the regular increase in proton number in the Periodic Table. Cards of each element can be used for students to put into order of proton and or nucleon number so that they form the pattern of the Periodic Table themselves. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 3. |
| AB | Know the distinction between metals and non-metals on the basis of their physical properties, in particular, density, malleability, electrical and thermal conductivity. | Elements to be classified as metals and non-metals. Properties limited to quantitative ideas of the properties listed. Students may make observations from a photographic version of the periodic table or from samples of elements. A database of properties for element could be set up. Students could be asked to design queries to find the metals and non metals and enter the results on a blank copy of the periodic table. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapters 3 & 4. |
| AB | Know that elements can be arranged in groups with similar chemical properties and may form compounds with similar chemical properties. | General ideas about the properties of elements in Groups I, VII and VIII, and relevant compounds, can be presented and discussed. Reaction of group 1 metals with water could be demonstrated. Students may interrogate a database to gather and then present data to support these ideas. Most of the websites listed will provide students with a range of information about individual elements that they select. They can use this information to put together tables or descriptions about the properties of element in Groups I, VII and VIII. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 3. Periodic table teaching site: http://www.genesismission.org/ Interactive periodic tables: http://www.cs.ubc.ca/cgi-bin/nph-pertab/tab/periodic-table http://www.webelements.com/ http://chemlab.pc.maricopa.edu/periodic/periodic.html http://www.dayah.com/periodic/ http://www.chemicool.com/ |

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| AB | Be able to describe the trends in physical properties of the alkali metals, in particular, density, hardness and melting point. | These properties can be shown in samples of these metals by demonstration only. | http://www.chemsoc.org/viselements/ <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 3. |
| AB | Be able to predict the properties of elements from their position in the Periodic Table, given relevant information, and to identify trends in other groups of elements. | The position in the Periodic Table and properties of the elements in Groups I, VII and VIII can be discussed. Trends are best left until Groups I and VIII are looked at in more detail below. Then the position and properties of rubidium and caesium, and fluorine and astatine, can be discussed. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 3. |
| AB | Know that the reactivity of the alkali metals increases down Group I. | Reaction of lithium, sodium and potassium with water can be demonstrated, and the trend in reactivity inferred from observations. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 3. |
| AB | Be able to describe the trends in physical properties of the halogens, in particular, colour, physical state, density and melting point. | Samples of the halogens (chlorine and bromine in sealed containers) can be observed. A database can be interrogated to provide further information. For example, students can use the websites to gather information about chlorine and the other halogens, and then make either a written or oral presentation. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 3. http://c3.org/ http://www.chemsoc.org/visElements/pages/data/intro_groupvii_data.html |
| AB | Know that the reactivity of the halogens decreases down Group VII. | Students may use aqueous solutions of halogens and halides to safely carry out test tube scale displacement reactions. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 3. |
| AB | Know that, in the Periodic Table, the elements are arranged in order of proton number and understand the terms group and period. | Students can be given example elements to work out the number of protons and hence the group and period. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 3. |
| AB | Understand what is meant by a periodic pattern, exemplified by electronic structure of atoms and melting point of elements (qualitative treatment only required). | Emphasise number of valency electrons = group number and metals have a low number and non-metals have a high number. A database of melting points can be used to follow trends in the elements related to position in the Periodic Table. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 3. |

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| A | Know that some metals form oxides by reaction with oxygen. | The reaction of magnesium with oxygen can be used to both illustrate this concept and as an example for a stoichiometric mole calculation. | <i>IGCSE Chemistry</i> by B Earl and LCR Wilford, Chapter 9. |
| A | Know that some metals form basic oxides and some metals form acidic oxides. | Soluble oxides can be dissolved in water and the solution tested using Universal indicator. | |