

## IGCSE Chemistry: Periodic Table 2

## Whole Unit Overview

(Please note: (S) denotes material in the Supplement (Extended syllabus) only)

| Learning Outcomes |  | Suggested Teaching Activities  | Resources  |
|-------------------|--|--|--|
| 9.2               | Describe chlorine, bromine and iodine in Group VII as a collection of diatomic non-metals showing a trend in colour, state and their reaction with other halide ions.  | Demonstration of preparation of chlorine (from concentrated hydrochloric acid and potassium manganate(VII)).<br><br>Students, using aqueous solutions of halogens and halides can safely carry out test tube scale displacement reactions.<br><br>Opportunity for practice of 'half equation' writing. | <a href="http://edis.ifas.ufl.edu/scripts/htmlgen.exe?DOCUMENT_AE080">http://edis.ifas.ufl.edu/scripts/htmlgen.exe?DOCUMENT_AE080</a><br><br><a href="http://c3.org/">http://c3.org/</a> |
| 9.2               | Predict the properties of other elements in the Group given data, where appropriate.   | This extends the list of halogens to include fluorine and astatine in theory only.   |  |
| 9.2 (S)           | Identify trends in other Groups given information about elements concerned.  | Information could include melting and boiling points, density and chemical reactivity. Include examples from <u>any</u> group in the Periodic Table.   |  |
| 7.2               | Describe the idea that some chemical reactions can be reversed by changing the reaction conditions, limited to the effects of heat on hydrated salts. (Concept of equilibrium is <u>not required for core</u> students.) | Hydrated copper(II) sulphate can be used experimentally and the amount of water removed on heating could be calculated (link to Unit 6 - Amount of Substance).<br><br>For more advanced students, hydrated magnesium sulphate is also a suitable example.  |  |

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| 7.2 (S) | Concept of equilibrium  | <p>This could be introduced by demonstrating the effect of acid and alkali on the :</p> <p>sodium chromate/ dichromate equilibrium</p> <p>iodide/ iodine equilibrium</p>   |   |
| 7.2 (S) | Predict the effect of changing the conditions (temperature and pressure) on other reversible reactions. | <p>For example changing the temperature, pressure and catalyst of the Haber and Contact processes (below).</p> <p>Important issues to consider include-</p> <ul style="list-style-type: none"> <li>• raising the temperature for industrial processes increases energy demand and hence economic cost.</li> <li>• considerations of increased yield against increased cost are balanced to give 'optimum conditions'.</li> </ul> | <p><a href="http://www.cem.msu.edu/~parrill/equilibria">http://www.cem.msu.edu/~parrill/equilibria</a></p>  |
| 11      | Describe the displacement of ammonia from its salts.  | <p>Experiments involving heating ammonium salts with or without added hydroxide (test for ammonia link to Experimental Analysis Techniques).</p> <p>Illustrate by reference to how liming of soils can lead to ammonia loss from ammonium salts added as fertilisers.</p>  | <p>Notes on compounds of nitrogen:<br/> <a href="http://www.rjclarkson.demon.co.uk/middle/middle3.htm">http://www.rjclarkson.demon.co.uk/middle/middle3.htm</a></p> |

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| 11 (S)   | Describe the essential conditions for the manufacture of ammonia by the Haber process including the sources of the hydrogen and nitrogen, i.e. hydrocarbons or steam and air. | <p>Nitrogen from the air (link with Unit 1 - Periodic Table 1). Hydrogen from natural gas (link with Unit 4 – Organic Chemistry 1).</p> <p>The effect of the variation of values of temperature and pressure can be studied by advanced students.</p> <p>Awareness of the economic and environmental advantages of using a catalyst to lower energy demand and hence save fossil fuel.</p> <p>Opportunities for reacting masses and volume calculations, link with Unit 6 - Amount of Substance.</p> | <p><a href="http://www.efma.org/publications/index.asp">www.efma.org/publications/index.asp</a></p> |
| 10.2 (S) | Describe the action of heat on the hydroxides of calcium, copper(II), iron(II), iron(III), magnesium, potassium, sodium and zinc.   | Experiment to determine reactivity possible for calcium, zinc and iron hydroxides  |   |

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| 10.2 (S) | Describe the action of heat on the nitrates of calcium, copper(II), iron(II), iron(III), magnesium, potassium, sodium and zinc.      | Test tube experiments possible with caution (fume cupboard use).<br><br>This could be presented as a data analysis activity, linked to the trends already identified in the heating of the hydroxides. |  |
| 11       | Describe the need for nitrogen-, phosphorus- and potassium-containing fertilisers.   | Links to biology and practical involving plant growth under controlled conditions.   |  |
| 12 (S)   | Name some sources of sulphur.  | Allotropes of sulphur could also be mentioned here (link to Unit 10 - Bonding and Structure). Note, however that the concept of allotropes is not on the syllabus.                                     | Notes on sulphur:<br><a href="http://www.rjclarkson.demon.co.uk/middle/middle2.htm">http://www.rjclarkson.demon.co.uk/middle/middle2.htm</a> |
| 12 (S)   | Name the use of sulphur in the manufacture of sulphuric acid.  |  |  |
| 12 (S)   | Name the use of sulphur dioxide as a bleach in the manufacture of wood pulp for paper; as a food preservative (by killing bacteria). | Look at food labels to see if sulphites (which release sulphur dioxide in acidic conditions) are present.  |  |

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| 12 (S) | Describe the manufacture of sulphuric acid by the Contact process, including essential conditions. | <p>Mention specific temperature, pressure and catalyst information.</p> <p>Students can practise using flow diagrams to represent the process.</p> <p>Economic issues relating to temperature and catalyst use could be discussed here, as with the Haber Process.</p> <p>As with the Haber process, more advanced students could study the effect of variation of temperature and pressure on the yield of sulphuric acid. Mention that the industrial process does not use high pressure even though it would be theoretically beneficial.</p> <p>Opportunities for reacting masses and volume calculations, link with Unit 6 - Amount of Substance.</p> |  |
| 12 (S) | Describe the properties of dilute sulphuric acid as a typical acid.                                | Link to the reactions in Unit 1 - Periodic table 1 and Acids, Bases and Salts (Unit 3 – Acids)   |  |