

**GCSE Additional Science**



**Module C6 – Chemical Synthesis:**

**What you should know**

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|  **Name:** **Science Group:** **Teacher:** |

**R.A.G. each of the statements to help focus your revision:**

*R = Red: I don’t know this A = Amber: I partly know this G = Green: I know this*

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| **C 6.1 Chemicals and why we need them** | **R.A.G.** |
| I understand the importance of chemical synthesis to provide food additives, fertilisers, dyestuffs, paints, pigments and pharmaceuticals |  |
| I can interpret information about the sectors, scale and importance of chemical synthesis in industry and in laboratories |  |
| I can recall the formulae of the following chemicals: chlorine gas, hydrogen gas, nitrogen gas, oxygen gas, hydrochloric acid, nitric acid, sulfuric acid, sodium hydroxide, sodium chloride, sodium carbonate, sodium nitrate, sodium sulfate, potassium chloride, magnesium oxide, magnesium hydroxide, magnesium carbonate, magnesium chloride, magnesium sulfate, calcium carbonate, calcium chloride and calcium sulfate |  |
| **I can work out the formulae of ionic compounds given the charges on the ions** |  |
| **I can work out the charge on one ion given the formula of a salt and the charge on the other ion** |  |
| I can recall the main hazard symbols and be able to give the safety precautions for handling hazardous chemicals (limited to explosive, toxic, corrosive, oxidizing, and highly flammable) |  |
| I can recall examples of pure acidic compounds which are solids (citric and tartaric acids), liquids (sulfuric, nitric and ethanoic acids) or gases (hydrogen chloride) |  |
| I can recall that common alkalis include the hydroxides of sodium, potassium and calcium |  |
| I can recall the pH scale |  |
| I can recall the use of litmus paper, universal indicator and pH meters to detect acidity and alkalinity, and the use of universal indicator and pH meters to measure pH |  |
| I can recall the characteristic reactions of acids that produce salts to include the reactions with metals, oxides, hydroxides and carbonates |  |
| I can write word equations when given appropriate information |  |
| I can interpret symbol equations, including the number of atoms of each element, the number of molecules of each element or covalent compound and the number of ‘formulas’ of ionic compounds, in reactants and products |  |
| **I can balance unbalanced symbol equations** |  |
| **I can write balanced equations, including the state symbols (s), (*l* ), (g) and (aq), to describe the characteristic reactions of acids and other reactions when given appropriate information** |  |
| I can recall the state symbols (s), (l), (g) and (aq) and understand their use in equations |  |
| **C 6.1 Chemicals and why we need them *Continued*** | **R.A.G.** |
| I can recall that the reaction of acid with an alkali to form a salt is a neutralisation reaction |  |
| I can explain that acidic compounds produce aqueous hydrogen ions, H+(aq) when they dissolve in water |  |
| I can explain that alkaline compounds produce aqueous hydroxide ions, OH-(aq), when they dissolve in water |  |
| I can write down the name of the salt produced given the names of the acid and alkali |  |
| **I can write down the formula of the salt produced given the formulae of the acid and the alkali** |  |
| I can explain that during a neutralisation reaction, the hydrogen ions from the acid react with hydroxide ions from the alkali to make water: H+(aq) + OH−(aq) → H2O(l) |  |
| I understand the terms endothermic and exothermic |  |
| I can use and interpret simple energy level diagrams for endothermic and exothermic reactions |  |
| I understand the importance of the energy change during a reaction to the management and |  |

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| **C6.2 Planning, carrying out and controlling chemical synthesis** | **R.A.G.** |
| I can identify the stages in a given chemical synthesis of an inorganic compound (limited to acid-alkali reactions), including:a. choosing the reaction or series of reactions to make the required productb. carrying out a risk assessment**c. working out the quantities of reactants to use**d. carrying out the reaction in suitable apparatus in the right conditions (such astemperature, concentration)e. separating the product from the reaction mixture (limited to filtration)f. purifying the product (limited to evaporation, crystallisation and drying in an oven ordesiccator)g. measuring the yield and checking the purity of the product (by titration) |  |
| I understand the purpose of these techniques: dissolving, crystallisation, filtration, evaporation, drying in an oven or dessicator |  |
| I understand the importance of purifying chemicals and checking their purity |  |
| I understand that a balanced equation for a chemical reaction shows the relative numbers of atoms and molecules of reactants and products taking part in the reaction |  |
| I understand that the relative atomic mass of an element shows the mass of its atom relative to the mass of other atoms |  |
| **C6.2 Planning, carrying out and controlling chemical synthesis *Continued*** | **R.A.G.** |
| I can use the Periodic Table to obtain the relative atomic masses of elements |  |
| I can calculate the relative formula mass of a compound using the formula and the relative masses of the atoms it contains |  |
| **I can** substitute relative formula masses and data into a given mathematical formula to calculate reacting masses and/or products from a chemical reaction |  |
| **I can calculate the masses of reactants and products from balanced equations** |  |
| I can calculate percentage yields given the actual and the theoretical yield |  |
| I can describe how to carry out an acid-alkali titration accurately, when starting with a solution or a solid to be dissolved to make up a solution |  |
| I can substitute results in a given mathematical formula to interpret titration results quantitatively. |  |
| I understand why it is important to control the rate of a chemical synthesis (to include safety and economic factors) |  |
| I can explain what is meant by the term: ‘rate of chemical reaction’ |  |
| I can describe methods for following the rate of a reaction (for example, by collecting a gas, weighing the reaction mixture or observing the formation of a colour or precipitate) |  |
| I can interpret results from experiments that investigate rates of reactions |  |
| I understand how reaction rates vary with the size of solid particles, the concentration of solutions of chemicals and the temperature of the reaction mixture |  |
| I understand that catalysts speed up chemical reactions while not being used up in thereaction |  |
| I can interpret information about the control of rates of reaction in chemical synthesis |  |
| I can use simple ideas about collisions to explain how chemical reactions take place |  |
| I can use simple collision theory and ideas about collision frequency to explain how rates of reaction depend on the size of solid particles and on the concentration of solutions of dissolved chemicals. |  |

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| **Grades A\* - C (Higher)** | All statements shown in **bold** as well as all statements shown in normal type. |
| **Grades C – G (Foundation)** | All statements shown in normal type. |