**Unit 1**

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| **Controlling the Rate: Learning Outcomes** | Got it? | | |
| I understand why it is important for chemists to control the rate of reaction |  |  |  |
| I can predict how the rate of a chemical reaction will be affected by changing the concentration, particle size, temperature or by using a catalyst |  |  |  |
| Collision theory can be used to explain how these factors affect the rate of a reaction |  |  |  |
| I understand energy distribution diagrams and can explain the effect of increasing the temperature, or adding a catalyst, on the rate of a reaction  [http://scienceaid.co.uk/chemistry/physical/images/maxboltz.jpg](http://www.google.co.uk/url?sa=i&rct=j&q=maxwell+boltzmann+distribution&source=images&cd=&cad=rja&uact=8&ved=0CAcQjRw&url=http://scienceaid.co.uk/chemistry/physical/reactionrate.html&ei=DkAVVYzGFMLcaP2OgqgB&bvm=bv.89381419,d.d2s&psig=AFQjCNHNRdWR5VtAE6S2rs0M5T7IttzmMQ&ust=1427542406004057) |  |  |  |
| I understand the concepts of collision geometry and activation energy |  |  |  |
| I understand the effect of pressure on gases |  |  |  |
| I know different methods to monitor reaction rates |  |  |  |
| I can use the reciprocal of the equation below to calculate time in seconds (s): |  |  |  |
| I can calculate activation energy and enthalpy change from energy profile diagrams  [http://gcserevision101.files.wordpress.com/2009/02/energy-level-diagram-activation-energy.jpg](http://www.google.co.uk/url?sa=i&rct=j&q=energy+profile+diagram&source=images&cd=&cad=rja&uact=8&ved=0CAcQjRw&url=http://www.akitarescueoftulsa.com/activation-energy-diagram/&ei=hkAVVbsFxLBRrNKCqAE&bvm=bv.89381419,d.d2s&psig=AFQjCNHWtfEwML2qupm_B1GpKi2ED2lqlA&ust=1427542518853046) |  |  |  |
| I know what is meant by an ‘activated complex’ |  |  |  |
| I can show the position of an activated complex on an energy profile diagram |  |  |  |
| I can show the effect of adding a catalyst on an energy profile diagram |  |  |  |

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| **Learning Outcomes: The Periodic Table – Bonding and Structure** | Got it? | | |
| I can identify groups and periods in the periodic table |  |  |  |
| I know where to find the metals, non-metals, halogens, noble gases and transition metals on the periodic table |  |  |  |
| I can explain the reactivity of elements by considering electron arrangement |  |  |  |
| I can discuss the bonding and structure of the first 20 elements:   * The metallic elements (Li, Be, Mg, Al, K, Ca) * The covalent molecular elements (H2, N2, O2, F2, Cl2, P4, S8 and C60) * The covalent network elements (B, C (diamond and graphite) and Si |  |  |  |

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| **Learning Outcomes: Trends in the Periodic Table** | Got it? | | |
| I know how to use the covalent radius to state the size of an atom |  |  |  |
| I can explain the meaning of electronegativity |  |  |  |
| I know how to use the data booklet to find out the covalent radius and electronegativity values for elements |  |  |  |
| I can explain the trend in electronegativity and covalent radius across a period or down a group |  |  |  |
| I know the meaning of and can write the equation for the first and subsequent ionisation energies of elements |  |  |  |
| I know where to find ionisation energy values in the data book |  |  |  |
| I can describe and explain trends in first ionisation energies across a period or down a group |  |  |  |
| I can explain patterns in successive ionisation energies and identify the group of an element from these |  |  |  |

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| **Learning Outcomes: Bonding in Compounds** | Got it? | | |
| I can describe how ionic and covalent bonding arises |  |  |  |
| I can identify a molecule as being polar or non-polar and know how to represent this on a diagram |  |  |  |
| I understand how London dispersion forces, permanent dipole-permanent dipole interactions and hydrogen bonding arise; and understand these are all types of van der Waal’s forces |  |  |  |
| I can use the shapes of molecules to predict whether they are polar or non-polar |  |  |  |
| I can draw diagrams to show hydrogen bonding between molecules |  |  |  |
| I can use electronegativity data to predict bonding type and understand the concept of the ‘bonding continuum’ |  |  |  |
| I can relate physical properties such as melting and boiling points; viscosity, solubility (miscibility) to the type of intermolecular forces present in substances |  |  |  |
| I can relate hydrogen bonding in water to its density when solid and liquid |  |  |  |

**Unit 2**

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| **Learning Outcomes: Alcohols, Carboxylic Acids and Esters** | Got it? | | |
| I can name, draw full structural formulae and write shortened structural formulae for alkanes, alkenes, alkynes, cycloalkanes and cycloalkenes |  |  |  |
| I can name, draw full structural formulae and write shortened structural formulae for alcohols, carboxylic acids and esters |  |  |  |
| I can name the functional groups in alcohols, carboxylic acids and esters |  |  |  |
| I can describe, in detail, the procedure to make an ester |  |  |  |
| I can name esters and predict the reactants from the ester and vice versa |  |  |  |
| I know some uses of esters |  |  |  |
| I can explain the process of hydrolysis of esters and predict the products of this |  |  |  |

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| **Learning Outcomes: Fats, Oils, Soaps and Detergents** | Got it? | | |
| I can name some sources of fats and oils |  |  |  |
| I can state the benefits of fats and oils in our diet |  |  |  |
| I can describe the structure of fats and oils and use these to explain their melting and boiling points |  |  |  |
| I know how fats and oils are formed from fatty acids and glycerol |  |  |  |
| I can predict the structure of the fatty acid from the structure of the fat or oil formed |  |  |  |
| I can recognise glycerol (propan-1, 2, 3-triol) |  |  |  |
| I can describe the test for unsaturated fats or oils |  |  |  |
| I can explain the process of hardening oils |  |  |  |
| I can explain the solubility vitamin C and vitamin A in relation to their polarity |  |  |  |
| I can explain how soap is made from fats and oil |  |  |  |
| I can explain the cleaning action of soap and detergent in terms of their structure |  |  |  |
| I can describe where detergents are particularly useful |  |  |  |
| I can describe an emulsion and name some examples |  |  |  |
| I can explain why a molecule can act as an emulsifier in terms of its structure |  |  |  |

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| **Learning Outcomes: Protein** | Got it? | | |
| I know some examples of proteins |  |  |  |
| I can explain how proteins can be hydrolysed into their constituent amino acids |  |  |  |
| I can explain how proteins are made from amino acids; recognise amino acids from proteins and vice versa |  |  |  |
| I can draw and recognise an amide (peptide) link |  |  |  |
| I can draw a section of protein from amino acids |  |  |  |
| I can describe ‘essential amino acids’ as being obtained only from our diet |  |  |  |
| I know that enzymes are proteins and that they are biological catalysts |  |  |  |
| **Learning Outcomes: The Chemistry of Cooking & Oxidation of Food** | Got it? | | |
| I can predict whether a molecule is likely to be fat/oil soluble or water soluble by examining the functional group/s present |  |  |  |
| I can predict how volatile a molecule is likely to be by examining the size and structure of the molecule |  |  |  |
| I can describe the structure of a protein |  |  |  |
| I can describe how heating a protein can change its structure |  |  |  |
| I can state whether an alcohol is primary, secondary or tertiary and whether it is likely to be oxidised |  |  |  |
| I can name some common agents capable of oxidising alcohols and aldehydes and describe the results of these tests |  |  |  |
| I can draw full structural formulae, shortened structural formulae and name alcohols, aldehydes and ketones |  |  |  |
| I can name and recognise the functional group in aldehydes and ketones |  |  |  |
| I can name and draw products formed when an alcohol or aldehyde is oxidised |  |  |  |
| I can explain why carboxylic acids are weak acids |  |  |  |
| I can write equations for and predict the products when carboxylic acids react with bases to form salts |  |  |  |
| I can describe oxidation of a carbon compound in terms of the oxygen hydrogen ratio |  |  |  |
| I can state the function of an antioxidant and describe some uses of these |  |  |  |
| I can write ion-electron equations for antioxidants |  |  |  |
| I can describe the reaction of edible oils and oxygen |  |  |  |

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| **Learning Outcomes: Fragrances** | Got it? | | |
| I can describe essential oils and name some of their uses |  |  |  |
| I can explain that terpenes are major components of essential oils |  |  |  |
| I can draw and recognise isoprene, give its systematic name and state how many isoprene units are in a terpene from its structure |  |  |  |
| I can describe the oxidation of terpenes and predict the products that may be formed |  |  |  |

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| **Learning Outcomes: Skin Care** | Got it? | | |
| I can explain why UV light can be damaging to skin |  |  |  |
| I can explain how sunblock can prevent damage from UV light |  |  |  |
| I can describe what a free radical is |  |  |  |
| I can write equations for the three steps in a free radical reaction and name these steps |  |  |  |
| I can describe a ‘free radical scavenger’ |  |  |  |
| I can describe and explain the use of free radical scavengers |  |  |  |

**Unit 3:**

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| **Learning Outcomes: Getting the most from Reactants** | Got it? | | |
| I can explain how industrial processes are designed to maximise profit and minimise the impact on the environment |  |  |  |
| I can describe some of the factors influencing industrial process design |  |  |  |
| I can describe some environmental consideration in industrial process design |  |  |  |
| I can balance equations and use these to calculate the mass of a reactant or product |  |  |  |
| I can express quantities in terms of moles |  |  |  |
| I can perform calculations involving solutions, volumes and concentrations |  |  |  |
| I can perform calculations to identify the excess reactant and the limiting reactant |  |  |  |
| I can perform calculations involving molar gas volumes |  |  |  |
| I can calculate the volumes of reactant and product gases from the number of moles of each reactant and product |  |  |  |

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| **Learning Outcome: Percentage Yield and Atom Economy** | Got it? | | |
| I can explain that the efficiency with which reactants are converted into the desired product is measured in terms of the percentage yield and atom economy |  |  |  |
| I can perform percentage yield calculations: |  |  |  |
| I can perform atom economy calculations: |  |  |  |
| I can use the percentage yield and atom economy to comment on the choice of route for making a chemical |  |  |  |

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| **Learning Outcomes: Equilibria** | Got it? | | |
| I know what is meant by the term 'dynamic equilibrium' |  |  |  |
| I know what is meant by a 'closed system' |  |  |  |
| I understand why chemists want to alter the position of equilibrium |  |  |  |
| I understand and can predict the effect of changing the temperature and concentration on a system at equilibrium |  |  |  |
| I understand that a catalyst has no effect on the position of equilibrium |  |  |  |

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| **Learning Outcomes: Chemical Energy** | Got it? | | |
| I can calculate the enthalpy change of a reaction using: Eh = c m T |  |  |  |
| I know the definition of enthalpy of combustion and enthalpy of formation |  |  |  |
| I can describe how enthalpy of combustion data can be obtained by experiment |  |  |  |
| I can evaluate different experimental methods used to obtain enthalpy of combustion data |  |  |  |
| I know the definition of Hess's Law |  |  |  |
| I can use Hess's Law to calculate the enthalpy change for a chemical reaction |  |  |  |
| I can use bond enthalpies to calculate the enthalpy change for a reaction |  |  |  |
| I understand that bond breaking is endothermic and bond making is exothermic |  |  |  |
| I understand where mean bond enthalpy data comes from |  |  |  |

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| **Learning Outcomes: Oxidising and Reducing Agents** | Got it? | | |
| I know the definition of oxidising and reducing agents |  |  |  |
| I can identify a substance as an oxidising or reducing agent |  |  |  |
| I can write balanced redox equations |  |  |  |
| I can combine ion-electron equations to make an overall redox equation |  |  |  |
| I understand the relationship between electronegativity and the ability of a substance to act as a reducing or oxidising agent |  |  |  |
| I know the strongest reducing agents are found in Group 1 |  |  |  |
| I know the strongest oxidising agents are found in Group 7 |  |  |  |
| I can use the electrochemical series to identify highly effective reducing and oxidising agents |  |  |  |
| I can write ion-electron equations for more complex oxidations and reductions involving compounds |  |  |  |
| I know examples of everyday oxidising agents and why these are used |  |  |  |

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| **Learning Outcomes:** **Chemical Analysis** | Got it? | | |
| I can describe the basic principles of chromatography in terms of mobile and stationary phases |  |  |  |
| I can interpret simple chromatograms |  |  |  |
| I can explain the difference in separation of two compounds based on their size or polarity |  |  |  |

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| **Learning Outcomes: Volumetric Analysis** | Got it? | | |
| I can used a balanced equation to calculate the quantity of an unknown reactant using information from a titration experiment |  |  |  |
| I can use balanced redox equations to calculate the quantity of an unknown reactant using information from a redox titration experiment |  |  |  |
| I know what is meant by the terms 'indicator' and 'standard solution' |  |  |  |
| I know that redox titrations involving potassium permanganate are self-indicating |  |  |  |