**Little Heath Sixth Form**

**(Chemistry)** Personal Learning Checklist

**Student Name: ……………………….…………………………………..………**

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| **Unit Name:**  **Chemistry of Natural Materials** | **Unit Code:**  **F332** |
| *Minimum Target Grade:* | *Aspirational Target Grade:* |

*KEY:* ***Red =*** *with difficulty* ***Amber*** *= not sure* ***Green*** *= yes*

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| **GCSE Re-Cap** |  | **Red** | **Amber** | **Green** |
| ***C1 – Air Quality*** | * Composition of atmosphere * Pollutants |  |  |  |
| ***C2 – Materials Properites*** | * Polymers (properties and synthesis) * Intermolecular forces |  |  |  |
| ***C3 – Chemicals in our Lives*** | * Oxidation and reduction |  |  |  |
| ***C4 – Chemical Patterns*** | * Electronic Configuration * Ions and ionic bonding * Balancing Equations * Halogen Chemistry |  |  |  |
| ***C5 – Chemistry of the Natural Environment*** | * Mr and reacting mass calculations * Covalent bonding (molecular and network) * Ionic Equations and half equations (with electrons) |  |  |  |
| ***C6 – Chemical Synthesis*** | * Energy in reactions (exothermic/endothermic) * Catalysts * Rates of Reaction and activation energy |  |  |  |
| ***C7 – Chemistry for a Sustainable Future*** | * Organic Chemistry (alkanes, alcohols, carboxylic acids, esters) * Dynamic Equilibrium |  |  |  |

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| **Elements from the Sea** | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| 1. Use the concept of amount of substance to perform calculations involving: molecular formulae, percentage yield, masses of reagents, volume of gases and concentrations of solutions. |  |  |  |  |
| 1. Write and interpret balanced chemical equations (including ionic equations). |  |  |  |  |
| 1. Explain the procedure for acid-alkali titrations. |  |  |  |  |
| 1. Work out electronic configurations of atoms (H to Kr) in terms of s, p & d subshells and represent the electrons in these orbitals. |  |  |  |  |
| 1. Draw and interpret ‘dot-cross’ diagrams for ionic, covalent and dative covalent bonds. |  |  |  |  |
| 1. Explain metallic bonding and how metals conduct electricity. |  |  |  |  |
| 1. Explain the shape and bond angles in molecules using electron pair repulsion theory. |  |  |  |  |
| 1. Recall physical properties (m.pt, solubility in H2O, ability to conduct electricity) of ionic lattices, metals, covalent network structure and simple molecules. |  |  |  |  |
| 1. Explain and use the term electronegativity. |  |  |  |  |
| 1. Explain, give examples of and recognise instantaneous dipole – induced dipole and permanent dipole permanent dipole intermolecular forces. |  |  |  |  |
| 1. Describe the structure of an ionic lattice and be able to draw the structure of compounds that have the NaCl lattice. |  |  |  |  |
| 1. Calculate the oxidation state of atoms (and ions) in formulae. |  |  |  |  |
| 1. Explain oxidation and reduction in terms of electrons lost or gained. |  |  |  |  |
| 1. Use systematic nomenclature to name inorganic compounds. |  |  |  |  |
| 1. Describe REDOX reactions of s and p block elements and their compounds. |  |  |  |  |
| 1. Use and write half equations to show oxidation and reduction. |  |  |  |  |
| 1. Recall that the Periodic Table lists the elements in order of atomic number and groups elements together according their common properties. |  |  |  |  |
| 1. Explain the classification of elements into s, p and d blocks. |  |  |  |  |
| 1. Know how an elements position in the Periodic Table relates to the charge on its ion. |  |  |  |  |
| 1. Recall the names and formulae of NO3-, SO42-, CO32-, OH-, NH4+ and HCO3- ions and be able to name and write formulae for compounds containing these ions. |  |  |  |  |
| 1. Be able to write equations to represent successive ionisation enthalpies and explain trends in ionisation enthalpy. |  |  |  |  |
| 1. Recall the appearance and physical state of the halogens at room temperature, volatility, solubility in water and organic solvents. |  |  |  |  |
| 1. Explain the physical state, volatility and solubility of halogens in terms of intermolecular forces. |  |  |  |  |
| 1. Use given information to compare different methods of manufacturing chemicals industrially. |  |  |  |  |
| 1. Explain and compare the relative reactivity of the halogens in terms of their oxidising ability. |  |  |  |  |
| 1. Recall reactions between halide ions (X-) and silver ions (Ag+) and write ionic equations. |  |  |  |  |
| 1. Explain the risks associated with storage and transport of halogens. |  |  |  |  |
| 1. Recall and describe some uses of halogen compounds which must be weighed against these risks (incl. F in PTFE, HCFCs & toothpaste, Cl in PVC & bleach, Br in medicines & flame retardants, I in medicines and as a human nutrient). |  |  |  |  |
| 1. Be able to write formulae and use systematic naming for alkanes, alkenes, alcohols, ethers and halogenoalkanes. |  |  |  |  |
| 1. Describe how a chloroalkane can be produced from an alcohol and HCl. |  |  |  |  |
| 1. Describe and explain the principle stages in the purification of an organic liquid; NaHCO3 to remove acidic impurities, use of separating funnel, drying with anhydrous Na2SO4 & distillation. |  |  |  |  |
| 1. Describe and explain characteristic properties of halogenoalkanes; b.pt.s and nucleophilic substitution. |  |  |  |  |

**Grade tracking:**

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*Note: You should discuss this checklist regularly with your subject teacher/mentor*

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| **Atmosphere** | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| 1. Describe examples of giant covalent structures (diamond & SiO2); explain differences in physical properties of CO2 and SiO2 in terms of their structures. |  |  |  |  |
| 1. Recall and explain (using collision theory) how concentration, pressure and surface area affect the rate of a reaction. |  |  |  |  |
| 1. Explain and use the terms: enthalpy profile and activation enthalpy. |  |  |  |  |
| 1. Use the concept of activation enthalpy to explain how changing the temperature affects the rate of a reaction. |  |  |  |  |
| 1. Explain the role of catalysts in providing alternate routes of lower activation enthalpy. |  |  |  |  |
| 1. Explain homogeneous catalysis in terms of the formation of intermediates. |  |  |  |  |
| 1. Explain and use the term dynamic equilibrium. |  |  |  |  |
| 1. Use Le Chatelier’s principle to describe and predict, in a homogeneous reaction, the effect on the position of equilibrium when concentration, temperature or pressure, are changed. |  |  |  |  |
| 1. Recall the gases present in the atmosphere (N2, O2, Ar, CO2, H2O), their percentages and some polluting gases and their sources (from DF). |  |  |  |  |
| 1. Calculate composition by volume measured in percentage concentration or parts per million (ppm) from given data. |  |  |  |  |
| 1. Explain the chemical basis of the depletion of ozone in the stratosphere due to halogenoalkanes, (radical reactions and catalytic role of halogen atoms). |  |  |  |  |
| 1. Explain the ease of photodissociation of halogenoalkanes in terms of bond enthalpy. |  |  |  |  |
| 1. Discuss and evaluate the evidence that was gathered to support understanding of how ozone depletion occurred and how the scientific community validated the results (from given information). |  |  |  |  |
| 1. Describe the difference between homolytic and heterolytic bond fission, give examples. |  |  |  |  |
| 1. Recall the formation, nature and reactivity of radicals and explain the mechanism of radical chain reactions (initiation, propagation & termination). |  |  |  |  |
| 1. Use a radical mechanism to explain the reaction of alkanes with halogens in the presence of uv radiation. |  |  |  |  |
| 1. Explain why some properties of CFCs made them such useful compounds and discuss the relative advantages and disadvantages of replacement compounds. |  |  |  |  |
| 1. Recall the way ozone is formed and destroyed in the atmosphere. |  |  |  |  |
| 1. Recall the effects of ozone including; its action as a sunscreen by absorbing uv radiation & polluting the troposphere (photochemical smog). |  |  |  |  |
| 1. Recall and discuss aspects of research leading to the discovery of the ozone hole and how the evidence was first overlooked. |  |  |  |  |
| 1. Recall the electromagnetic spectrum (IR/Vis/uv) in order of increasing frequency. |  |  |  |  |
| 1. Recall that molecules change vibrational energy states when they absorb IR. |  |  |  |  |
| 1. Recall that uv and visible radiation promote electrons to higher energy levels, sometimes causing bond breaking. |  |  |  |  |
| 1. Recall that vibrational and electronic energies of molecules are quantised. |  |  |  |  |
| 1. Calculate values of frequencies and energy of electromagnetic radiation using E = hν. |  |  |  |  |
| 1. Explain the ‘greenhouse effect’. |  |  |  |  |
| 1. Discuss the evidence for the relationship between the increased concentration of gases and global warming. |  |  |  |  |
| 1. Recall and discuss different approaches to the control of CO2 emissions including burning fewer fossil fuels, increasing photosynthesis, burying or reacting CO2. |  |  |  |  |

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| **Polymer Revolution** | **Red** | **Amber** | **Green** | **To address this before the exam I will:-** |
| 1. Explain how hydrogen bonds form and describe and give examples of hydrogen bonding (including water and ice). |  |  |  |  |
| 1. Explain the relative boiling points of substances in terms of intermolecular forces. |  |  |  |  |
| 1. Describe and explain the solubility of a dissolving polymer (e.g. polyethanol) in terms of its molecular structure. |  |  |  |  |
| 1. Recognise, name and write formulae for alkanes, alcohols, aldehydes, ketones and carboxylic acids. |  |  |  |  |
| 1. Differentiate between primary, secondary and tertiary alcohols and their reactions. |  |  |  |  |
| 1. Describe and explain the technique of heating under reflux (including labelled diagram) for reactions involving volatile liquids. |  |  |  |  |
| 1. Explain and use the term elimination reaction. |  |  |  |  |
| 1. Explain and use the term addition polymerisation and predict structural formula of the addition polymer from a given monomer (and vice versa). |  |  |  |  |
| 1. Recall the conditions and mechanism for electrophilic addition reactions of alkenes with Br2, HBr, H2 and H2O. |  |  |  |  |
| 1. Describe and explain the following properties of alcohols: 2. oxidation of alcohols to carbonyl compounds (aldehydes and ketones) and carboxylic acids (including conditions), 3. dehydration of alcohols to form alkenes (including conditions). |  |  |  |  |
| 1. Explain and use the terms addition, electrophile, carbocation. |  |  |  |  |
| 1. Use the mechanism of electrophilic addition to explain the reaction between alkenes and electrophiles using curly arrows and explain how the products obtained when other anions are present confirm the model of the mechanism. |  |  |  |  |
| 1. Recognise where E/Z isomerism (geometric) occurs and explain it in terms of lack of free rotation about C=C double bonds when there are two different groups on each carbon . |  |  |  |  |
| 1. Draw and interpret diagrams to represent E/Z isomers for alkenes which have the same groups of both sides of the double bond (E – opposite sides of the bonds, Z – same side of bond) for these molecules. |  |  |  |  |
| 1. Describe E as trans and Z as cis and extend this ‘cis-trans’ nomenclature to other more complicated alkenes. |  |  |  |  |
| 1. Understand how the uses of a polymer are related to its properties, explaining given examples and suggest uses for polymers based on their given properties. |  |  |  |  |
| 1. Explain and use the terms: thermoplastic, thermoset and co-polymer. |  |  |  |  |
| 1. Use relevant given data to interpret (and make predictions of) infrared spectra for organic compounds containing a limited range of functional groups (hydroxyl –OH, carbonyl –C=O and carboxylic acid groups –COOH). |  |  |  |  |
| 1. Understand that every compound has a distinctive ‘fingerprint’ in its infrared spectrum. |  |  |  |  |

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