Biddulph High School Curriculum Intent

To deliver a broad and enriching curriculum through engaging and challenging lessons that provide a wide range of opportunities for all students to achieve their potential.
Students will all be prepared to take their next steps in a diverse and ever changing future ready to make a positive contribution to society.
Through a broad programme of extracurricular activities students will have the opportunities to showcase their talents and experience new challenges.
We value individuals and all that they can offer as well as supporting each other with kindness and empathy.

Curriculum Intent for Chemistry:

Our overarching aim is to develop well rounded chemists who can not only explain complex theoretical concepts, but can investigate them practically for themselves. Investigative skills and techniques are at the heart of chemistry at BHS and we have embedded frequent opportunities for our learners to develop these at all stages of the curriculum. Our curriculum reflects the vast number of our students for whom chemistry will form part or all of their further studies and to this end, from year 9 to year 13, we deliver our lessons with the expectation that our students will take the skills and knowledge they have gained here on into their future careers

All teachers will follow the schemes of work provided by the department. This will ensure that all students receive the same high-quality provision. All units of work will provide a clear outline of the knowledge and skills required and assessments will ensure that this knowledge has been retained and that skills can be evidenced.

Teachers will ensure that gaps are closed through regular monitoring within the classroom. DINT activities will allow for interleaving and recap of previous learning. Misconceptions will be identified through effective questioning and the regular inspection of student work.

Chemistry **Long Term Overview**						
Year Group	**Autumn 1**	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
9	Particle and atomic theory. Introduction to methods of separation	Introduction to methods of separation	Investigations into methods of separation.	Formulae and equations	Acid – Base reactions	Pollution and climate change
10	Atomic structure and bonding	Properties of materials	Equations and molar calculations	Energetics. Acid base theory and pH	Electrolysis	Periodicity – Group 1, 7, 0 and transition metal chemistry
11	Equilibria and extracting metals	Corrosion, Alloys and Mock examinations	Organic Chemistry	Interpreting and interacting with Earth systems.	Examinations	Examinations
12						
13						

Chemistry: Medium Term Overview

Year 10	Autumn Term 1	Unit Title: Bonding and Properties of Materials	No of Lessons: 28

Overview/Intent

- Develop scientific knowledge and conceptual understanding through the specific disciplines of Chemistry.
- Develop understanding of the nature, processes and methods of science, through different types of scientific enquiries that help them to answer scientific questions about the world around them.
- Develop and learn to apply observational, practical, modelling, enquiry and problem solving skills in the laboratory, in the field and in other learning environments.
- Develop their ability to evaluate claims based on science through critical analysis of the methodology, evidence and conclusions, both qualitatively and quantitatively.

Assessment

Learners should be familiar with the simple (Dalton) atomic model. They should be familiar with the principles underlying the Mendeleev Periodic Table and the modern Periodic Table including periods and groups, and metals and non-metals. Learners should have some knowledge of the properties of metals and non-metals including the chemical properties of metal and non-metal oxides with respect to acidity.

Essential Knowledge (what must students know):

- ATOMIC STRUCTURE
- Bonding – ionic, covalent and metallic structure

Terminology:

Atomic Theory: Particle, Atom, element, compound, mixture, protons, neutrons, electrons

Bonding: valency, energy levels, shells, Ions, mobile, delocalised.

Structures: electrostatic attraction.

Essential Skills (what must students be able to demonstrate):

Students will be able to:

- Know the sub atomic particles and which are nucleons and be able to explain the charge on the nucleus and also the overall charge on the atom.
- Know that electron arrangement is linked to how an atom may bond to another atom.

Lessons:

1. Atomic structure. Students will be able to correctly draw and label the atom. Use the periodic table to determine the sub-atomic particles in the atom.
2. Metals and non-metals. Students will investigate the chemical properties of metal and non-metal oxides. Be able to state the properties of a typical metal.
3. Electron arrangement. Students will learn about Bohrs theory of organising he distribution of electrons in their energy levels around the nucleus.

Changing state: Inter- molecular forces (IMFs), sublimation, deposition. **Formulae**: element, compound, formulation, diatomic. **Calculations:** Mole, Avagadros number, limiting factor, stoichiometry. **Common misconceptions** Learners do not always appreciate that the nucleus of an atom does not change when an electron is lost, gained or shared. They also find it difficult to predict the numbers of atoms that must bond in order to achieve a stable outer level of electrons. Learners think that chemical bonds are physical things made of matter. They also think that pairs of ions such as Na+ and Cl - are molecules. They do not have an awareness of the 3D nature of bonding and therefore the shape of molecules. Learners commonly have a limited understanding of what can happen during chemical reactions, for example substances may explode, burn, contract, expand or change state.	• Make links to the type of bonding and the physical properties of a structure. • Calculate RFM for a range of molecules. • Use molymods to build structures. • Work safely in a laboratory. • State how the modern periodic table is organised. • Link melting and boiling points of chemicals to the numbers of IMFs. • Understand the difference between a chemical bond and an IMF. • State uses and dangers of nanoparticles • Calculate area and volumes of a cube. • Write a balanced symbol and ion equation confidently. • Successfully be able to calculate reacting masses using stoichiometry • distinguish between endothermic and exothermic reactions on the basis of the temperature change of the surroundings • draw and label a reaction profile for an exothermic and an endothermic reaction • calculate energy changes in a chemical reaction by considering bond making and bond breaking energies	4. Forming Ions. Understand why atoms react and how ions are formed from atoms. Links made to the periodic table and stability to gain noble gas configuration. 5. Ionic compounds. Building on the formation of ions from the previous lesson, students will be taught how the ions come together to from ionic structures. They will investigate the physical properties of ionic compounds. 6. Simple covalent bonding. Using molymods to build a range of covalent structures not limited to the specification. Be taught why how non-metal atoms join to form compounds. 7. Metallic bonding. Investigate the physical and chemical properties of metals based on their structure. 8. Giant covalent structures. – Looking at carbon and its allotropes. – From the structures, deduce the properties of each structure. 9. Revision 10. TEST 11. Bulk properties and polymers. Review the properties of ionic and covalent structures. Link the melting and boiling points to IMFs. Look at thermosetting and thermosoftening polymers and how their structure determines properties. 12. Development of the periodic table. Learn about key scientists such as Dobereiner, Newlands and Mendeleev and how their work led to the development of the periodic table. 13. The periodic table and atomic structure. Link electron arrangement to the periodic table.

		14. Changing state. Building on from the properties of materials topic, students will be able to predict states of matter based on melting and boiling points. Also apply understanding of IMFs to explain sublimation and deposition. 15. Nanoparticles. Be able to calculate surface area to volume ratio and how it is important in the use of nanoparticles. Assess the advantages of nanoparticles to humans.) 16. Formulae of elements and compounds. Students will learn how to write formulae such as elements and diatomic molecules. Read a formula to determine the name and amount of each element it is made up of. 17. Conservation of mass. Investigate the conservation of mass by burning in magnesium in air. 18. Equations. Learn how to use state symbols and write correct equations from information in a text 19. Half and ionic equations. Learn how compounds are built from separate half equations. Removal of spectator ions to form ionic equations. 20. The mol. Students will learn what is meant by the mole as an amount of substance. Us Avagadros constant to calculate numbers of atoms, ion or molecules in a specific mass. 21. Reacting mass calculations. Use the formula n=mass/Mr to calculate masses of reactants and products from a known quantity. 22. Revision 23. TEST 24. Intervention. 25. Exothermic and endothermic reactions. 26. Reaction profiles

		27. Bond enthalpy calculations 28. TEST
Careers Links: Research. Laboratory work. Polymer scientists. Material scientists. Industrial chemist. Chemical engineer	**Enrichment:** Practical investigations to reinforce the scientific concepts presented.	**MY PB** **Social Me- active listening, speaking effectively, working with others** Practical work will require aspects of the social me strand **Thinking Me – evaluating & creativity** Evaluation will be utilised when assessing data from investigations **This is Me – Resilience, responsibility, self-motivation, integrity, self-management** Students will need to demonstrate resilience and self-management when looking at the assessed points across the lessons

Chemistry **Medium Term Overview**			
Year 10	***Spring Term 2***	**Unit Title: Types of chemical reactions and Predicting and Identifying the products of chemical reactions.**	**No of Lessons: 21**
Overview **Assessment**	**Develop practical investigation skills and confidently complete PAG sheets designed by LTO to enable good understanding of the terminology used in practical investigations.** Develop scientific knowledge and conceptual understanding through the specific disciplines of Chemistry. • Develop understanding of the nature, processes and methods of science, through different types of scientific enquiries that help them to answer scientific questions about the world around them. • Develop and learn to apply observational, practical, modelling, enquiry and problem solving skills in the laboratory, in the field and in other learning environments. • Develop their ability to evaluate claims based on science through critical analysis of the methodology, evidence and conclusions, both qualitatively and quantitatively PAG sheets and end of unit tests		

Essential Knowledge (what must students know):	**Essential Skills (what must students be able to demonstrate):**	**Lessons:**
• Reactivity is linked to electron arrangement and some atoms will not react as they have a stable electron arrangement. • Electrolysis is the separation of chemicals and will only work if the ions are mobile. • Acids are proton donors and will dissociate to become proton donors. • Ions can be detected by the use of a range of chemicals. **Terminology:** **Electrolysis:** Cation, anion, cathode, anode, molten, inert, discharge. **REDOX:** reduction, oxidation, reducing agent, Oxidising agent. **Acids:** Base, alkali, dissociation, ionisation, pH. **Periodicity**: Reactivity, stable, displacement. **Analysis**: Cation, anion. **Summary** Chemical reactions can be classified according to changes at the atomic and molecular level. Examples of these include reduction, oxidation and neutralisation reactions. Underlying knowledge and understanding Learners should be familiar with combustion, thermal decomposition, oxidation and displacement reactions. They will be familiar with defining acids and alkalis in terms of neutralisation reactions. Learners will have met reactions of acids with alkalis to produce a salt and water and reactions of acids with metals to produce a salt and	**Students will be able to:** • explain reduction and oxidation in terms of loss or gain of oxygen, identifying which species are oxidised and which are reduced • recall that acids form hydrogen ions when they dissolve in water and solutions of alkalis contain hydroxide ions • recall that acids form hydrogen ions when they dissolve in water and solutions of alkalis contain hydroxide ions • use and explain the terms dilute and concentrated (amount of substance) and weak and strong (degree of ionisation) in relation to acids • describe neutrality and relative acidity and alkalinity in terms of the effect of the concentration of hydrogen ions on the numerical value of pH (whole numbers only) • recall that metals (or hydrogen) are formed at the cathode and non-metals are formed at the anode in electrolysis using inert electrodes • predict the products of electrolysis of binary ionic compounds in the molten state	1. Electrolysis of molten salts. Learn specific key terms and identify the products at the anode and cathode. 2. Electrolysis of solutions. – Electrolysis of copper sulphate with inert electrodes. 3. Electroplating. 4. PAG in Booklets NaCl solution. 5. PAG in booklets 6. TEST 7. REDOX Reactions. Linked to OILRIG and the transfer of oxygen. 8. Prediction of salts made in acid base reactions. Know the salts made from specific acids. 9. Acid reactions. Metals, metal oxides, carbonates and neutralisation. 10. Strong and weak acids (HA dissociation). HA fully and partial dissociation. 11. Group 1. Reactions to include with oxygen and water. 12. Group 7. Physical properties and uses. 13. Halogen displacement Reactions. Linked to reactivity. 14. Group 0. Linked to electron arrangement. 15. Transition metals. melting point, density, reactivity, formation of coloured ions with different charges and uses as catalysts 16. Reactivity of metals. Displacement reactions involving metals and metal salts. (PAG C1, PAG C7, PAG C8) 17. TEST 18. Detecting cations. PAG BOOKLET 19. Detecting Anions. PAG BOOKLET

hydrogen. They should have met the pH scale for measuring acidity and alkalinity, and some indicators. **Common misconceptions** Learners commonly intuitively adhere to the idea that hydrogen ions in an acid are still part of the molecule, not free in the solution. They tend to have little understanding of pH, for example, they tend to think that alkalis are less corrosive than acids. Learners also may think that the strength of acids and bases and concentration mean the same thing. A common misconception is that ionic solutions conduct because of the movement of electrons. Another common misconception is that ionic solids do not conduct electricity because electrons cannot move.	• describe competing reactions in the electrolysis of aqueous solutions of ionic compounds in terms of the different species present • describe electrolysis in terms of the ions present and reactions at the electrodes. the equations and half equations of the reactions at the electrodes • recall the simple properties of Groups 1, 7 and 0. explain how observed simple properties of Groups 1, 7 and 0 depend on the outer shell of electrons of the atoms and predict properties from given trends down the groups. • recall the general properties of transition metals and their compounds and exemplify these by reference to a small number of transition metals • C4.2a (Combined Science C3.1g) describe tests to identify selected gases • describe tests to identify aqueous cations and aqueous anions • describe how to perform a flame test • interpret an instrumental result given appropriate data in chart or tabular form, when accompanied by a reference set of data in the same form • describe the advantages of instrumental methods of analysis •	20. Gas tests. Limited to oxygen, carbon dioxide, Hydrogen and Chlorine. 21. Analytical techniques. Students will learn about mass and IR Spectroscopy.
Careers Link: Industrial chemist. Chemical engineer.		**MY PB**

		Social Me- active listening, speaking effectively, working with others Practical work will require aspects of the social me strand **Thinking Me – evaluating & creativity** Evaluation will be utilised when assessing data from investigations **This is Me – Resilience, responsibility, self-motivation, integrity, self-management** Students will need to demonstrate resilience and self-management when looking at the assessed points across the lessons

Chemistry **Medium Term Overview**			
Year 10	***Summer Term 3***	**Unit Title: Monitoring and controlling chemical reactions.**	**No of Lessons: 17**
Overview **Assessment**	**.** Develop scientific knowledge and conceptual understanding through the specific disciplines of Chemistry. • Develop understanding of the nature, processes and methods of science, through different types of scientific enquiries that help them to answer scientific questions about the world around them. • Develop and learn to apply observational, practical, modelling, enquiry and problem solving skills in the laboratory, in the field and in other learning environments. • Develop their ability to evaluate claims based on science through critical analysis of the methodology, evidence and conclusions, both qualitatively and quantitatively PAG sheets and end of unit tests. Mock examinations.		

Essential Knowledge (what must students know):	**Essential Skills (what must students be able to demonstrate):**	**Lessons:**
This topic tackles the relationship of moles to the concentration of a solution and the volume of a gas. It also tackles the calculation of the mass of a substance in terms of its molarity. The topic then moves on to look at using equations to make predictions about yield by calculations and to calculate atom economy. Underlying knowledge and understanding Learners should be familiar with the mole from Topic C3 and know that it measures the amount of substance. They should be familiar with representing chemical reactions using formulae and using equations. The rate and yield of a chemical reaction can be altered by changing the physical conditions. Underlying knowledge and understanding Learners should be familiar with the action of catalysts in terms of rate of reaction. They should know the term surface area and what it means. **Common misconceptions** The most common problem learners' encounter with these calculations is their lack of understanding of ratios. Also most learners think that the mole and mass are the same thing. This is reinforced by use of phrases such as '1 mole is 12 g of carbon, '1 mole is the relative atomic mass in grammes' or '1 mol = 12 g C' in teaching and	**Students will be able to:** • explain how the concentration of a solution in mol/dm3 is related to the mass of the solute and the volume of the solution • explain the relationship between the volume of a solution of known concentration of a substance and the volume or concentration of another substance that react completely together • describe the relationship between molar amounts of gases and their volumes and vice versa • calculate the volumes of gases involved in reactions using the molar gas volume at room temperature and pressure (assumed to be 24dm3 • explain how the mass of a solute and the volume of the solution is related to the concentration of the solution • calculate the theoretical amount of a product from a given amount of reactant • calculate the atom economy of a reaction to form a desired product from the balanced equation • explain why a particular reaction pathway is chosen to produce a	1. Concentration. – Know how to calculate concentrations of solutions liked to g/dm3 and mol/dm3 2. Theoretical Yield. Use reacting mass calculations to confirm concentrations. 3. Atom economy and percentage yield. Calculations to determine AE and % Yield 4. Choosing a reaction pathway. Link the AE and % yield to determine the best pathway in producing chemicals. 5. Titration method – PAG BOOKLET 6. Titration theory – Students will learn how to perform titration calculations. 7. Gas molar calculations. Students will learn how to perform molar calculations of gases. 8. TEST 9. Rates theory. Understand collision theory and the factors that affect rate. 10. Rate and temperature PAG BOOKLETS 11. Rate and concentration PAG BOOKLETS 12. Rate and particle size 13. Rates and catalysts. 14. TEST 15. Mock revision – WAGOLL 16. Mock examinations. 17. Intervention.

in textbooks equating amount of substance to mass, portion of substance, number of particles (Avogadro's number) or number of moles. All these phrases reinforce the idea that amount of substance is a measure of mass or a number. Learners often misinterpret rate graphs and think that catalysts take part in reactions and run out/get used up.	specified product given appropriate data • suggest practical methods for determining the rate of a given reaction • interpret rate of reaction graphs • describe the effect of changes in temperature, concentration, pressure, and surface area on rate of reaction • explain the effects on rates of reaction of changes in temperature, concentration and pressure in terms of frequency and energy of collision between particles • explain the effects on rates of reaction of changes in the size of the pieces of a reacting solid in terms of surface area to volume ratio • explain catalytic action in terms of activation energy	