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 theory, equations and the periodic table	Methods of separation	Maths skills and calculating relative formula mass	pH, acids and indicators	Green Chemistry	Energetics and atomic theory
10	Atoms, isotopes and periodicity	Bonding and molar calculations	Acid, base reactions and electrolysis	Energetics and electrochemical cells. Rates of reaction.	Mock examinations and intervention	Equilibrium
11	Equilibria and extracting metals	Corrosion, Alloys and Mock examinations	Organic Chemistry	Interpreting and interacting with Earth systems.	Examinations	Examinations
12	Foundations in Chemistry. Nomenclature and alkanes	Acids and base chemistry. Periodicity. Alkene reactions and mechanisms.	Energetics. Alcohols and Haloalkanes	Hess's Law and Rates. Synthetic pathways.	Equilibria and revision. Analysis – Mass spec and IR.	Examinations. Intervention. begin Module 5 – Rates and Module 6 – Benzene.
13	Equilibria – Kc and Kp. Acids and bases. Arenes and carbonyls.	Buffers. Energetics. Carboxylic acids and derevatives. Amines and amides. C-C bond formation.	Revision Mock examinations.	Redox titration. Electrochemistry. Transition metals. Synthesis. NMR and gas chromatography.	Examinations	Examinations

Chemistry: Medium Term Overview			
Year 10	**Autumn Term 1**	**Unit Title: Bonding and Properties of Materials**	**No of Lessons: 28**
Overview/Intent **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. 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):	**Essential Skills (what must students be able to demonstrate):**	**Lessons:**
• ATOMIC STRUCTURE • Bonding – ionic, covalent and metallic structure **Terminology:**	**Students will be able to:** • Know the sub atomic particles and which are nucleons and be able to	1. Atomic structure recap. 2. Isotopes and RAM. 3. Electron arrangement and the periodic table 4. Group 1 metals 5. Group 7 Halogens

Atomic Theory: Particle, Atom, element, compound, mixture, protons, neutrons, electrons **Bonding:** valency, energy levels, shells, Ions, mobile, delocalised. **Structures:** electrostatic attraction. **Changing state:** Inter- molecular forces (IMFs), sublimation, deposition. **Formulae**: element, compound, formulation, diatomic. **Calculations:** Mole, Avagadros number, limiting factor, stoichiometry. **Periodicity**: Reactivity, stable, displacement. **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.	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. • Explain the reactivity trends of group 1 metals and group 7. • Predict reactions based on these properties. • Predict products of halogen displacement reactions. • recall the general properties of transition metals and their compounds and exemplify these by reference to a small number of transition metals • 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. • 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. • explain how the concentration of a solution in mol/dm3 is related to the mass of the solute and the volume of the solution	6. Explaining trends 7. Group 7 reactions. 8. Transition metals 9. TEST 10. States of matter 11. Atoms to ions 12. Ionic bonding 13. Ionic compounds and formulae 14. Metallic structures 15. Assessment 16. Intervention 17. Covalent bonding 18. Giant covalent structures 19. Nanoparticles 20. The mole 21. Equations and calculations 22. From masses to balanced equations 23. Atom economy 24. % Yield 25. Expressing concentrations 26. Titration practical 27. Titration calculations 28. Gas Volumes

		• 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 specified product given appropriate data • Successfully be able to calculate reacting masses using stoichiometry	
electrolysisOverview	**Develop practical investigation skills and confidently complete PAG sheets designed by LTO to enable good understanding of the terminology used in practical investigations.**		

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

Essential Knowledge (what must students know):

- 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.

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.

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

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

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

Lessons:

1. TEST
2. Reactivity series
3. Extracting metals
4. Salts from metals
5. Salts from soluble bases
6. Making more salts
7. Neutralisation and the pH scale
8. Strong v's weak acids
9. TEST
10. Electrolysis of molten salts
11. Electrolysis of Aluminium oxide
12. Planning – Solutions
13. Electrolysis of solutions
14. Summary questions
15. Revision
16. Assessment
17. Intervention
18. Exothermic and endothermic
19. Energy profiles
20. Bond energy calculations
21. Chemical cells and batteries
22. Fuel cells
23. TEST

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 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.	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 • 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 • Investigate factors that affect the rate of a chemical reaction. • Explain the effect of temperature, concentration, surface area in terms of collision theory. • Explain the role of catalysts that lower the activation energy for a chemical reaction.	24. Temperature and rate 25. Concentration and rate 26. Surface area and rate 27. Catalysts and rate 28. Revision.
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: 22**
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.		
<u>Essential Knowledge (what must students know):</u> 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	**<u>Essential Skills (what must students be able to demonstrate):</u>** **Students will be able to:** • Students should be able to make qualitative predictions about the effect	**Lessons:** 1. Revision 2. Mock examinations 3. Intervention 4. Reversible reactions	

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 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.	of changes on systems at equilibrium when given appropriate information. • Students should be able to interpret appropriate given data to predict the effect of a change in concentration of a reactant or product on given reactions at equilibrium. • Students should be able to interpret appropriate given data to predict the effect of a change in temperature on given reactions at equilibrium • Students should be able to interpret appropriate given data to predict the effect of pressure changes on given reactions at equilibrium. • Students should be able to use melting point and boiling point data to distinguish pure from impure substances. • Students should be able to identify formulations given appropriate information. • explain how paper chromatography separates mixtures • suggest how chromatographic methods can be used for distinguishing pure substances from impure substances • interpret chromatograms and determine Rf values from chromatograms • Students should be able to identify species from the results of the tests in 4.8.3.1 to 4.8.3.5. Flame colours of	5. Equilibria 6. Le Chateliers principle 7. TEST 8. Pure substances and mixtures 9. Analysing Chromatograms 10. Gas tests 11. Cation tests 12. Anion tests 13. Instrumental analysis 14. Examination questions

Learners often misinterpret rate graphs and think that catalysts take part in reactions and run out/get used up.	other metal ions are not required knowledge. • Students should be able to write balanced equations for the reactions to produce the insoluble hydroxides. Students are not expected to write equations for the production of sodium aluminate. • Students should be able to state advantages of instrumental methods compared with the chemical tests in this specification. • Students should be able to interpret an instrumental result given appropriate data in chart or tabular form, when accompanied by a reference set in the same form, limited to flame emission spectroscopy.	