Lacon Childe School Science Department – Chemistry Scheme of Work – Year 10: **Acids and Alkalis**

Opportunities for Breadth and Challenge: Pupils are challenged to use their scientific knowledge to practically demonstrate the ability to test and neutralise substances, prepare a soluble salt and apply the rules of solubility to given substances. Breadth of this unit is extended looking at reactions of acids with a number of other substances, including metals and carbonates.			
Links to Sequencing for Learning: This unit links to previous work on acids and alkalis done in Y8, ionic bonding done in Y9. This unit prepares pupils for work later in Y10 (calculations, concentration and electrolysis, plus titration methods in triple science) and in Y11 where it links to energy changes in reactions and carboxylic acids in triple science.			
Section	What we are learning (Key knowledge)	Key words	Assessment
1	Acids, alkalis and indicators Why are hazard symbols useful? What does the pH tell us about the ions in a solution?	Acids, alkalis, indicators, methyl orange, phenolphthalein, universal indicator	Prior knowledge of the pH scale
2a	Investigating indicators What are the effects of acids and alkalis on some common indicators?	Methyl orange, phenolphthalein, universal indicator	Retrieval Qs of keywords
2b (H)	Looking at acids What is the difference between dilute and concentrated solutions? (H) How do changes in the concentration of hydrogen ions affect the pH of a solution? (H) What is the difference between strong and weak acids? (H)	Concentrated, dilute, strong, weak, ions	Recall keywords
3	Bases and salts Why are metal oxides bases? What happens during neutralisation? How can a soluble salt be prepared from an acid and an insoluble base?	Neutralisation, soluble, salt	Recall keywords
4	Preparing copper sulphate (core practical) *Investigate the preparation of pure, dry, hydrated copper sulfate crystals starting from copper oxide including the use of a water bath.*	Pure, dry, hydrated copper sulfate crystals, water bath	Practical skills – making copper sulfate
5	Alkalis and balancing equations What are alkalis? What happens when alkalis react with acids? How do we balance chemical equations?	Balanced equation	Recall keywords
6	Investigating neutralisation (core practical) *Investigate the change in pH on adding powdered calcium hydroxide or calcium oxide to a fixed volume of dilute hydrochloric acid.*	Neutralisation, pH, fixed volume	Practical skills – investigating neutralisation
7	Alkalis and neutralisation What happens to the ions from acids and alkalis during neutralisation? What is titration? How do we make a soluble salt using titration?	Titration, soluble	MUM – acids and neutralisation worksheet
8a	Reactions of acids (with metals) What happens when an acid reacts with a metal? What is the chemical test for hydrogen?	Chemical test	Chemical test for hydrogen
8b	Reactions of acids (with carbonates) What happens when an acid reacts with a metal carbonate? What is the chemical test for carbon dioxide?	Limewater	Chemical test for carbon dioxide
9	Solubility What are the rules for solubility of common substances in water? How do you prepare a sample of pure dry, soluble salt? How do you predict whether a precipitate will be formed in a reaction?	Solubility, soluble, solvent, solute, precipitate	Predicting precipitates
10	Revision / Ionic equations (H) How do you write an ionic equation? (H)	Ionic equation, spectator ions	Class assessment sheet
11	End of Unit Test		EUT
12	Test Feedback		Test feedback sheet

Calculations Involving Masses

Opportunities for Breadth and Challenge: Pupils are challenged to use their scientific and mathematical knowledge to calculate in moles. Breadth of topic includes how pupils can relate the information to ratios in maths.			
Links to Sequencing for Learning: This unit links to previous work on atomic number and mass number done in Y9. This unit prepares pupils for work later in Y10 triple science on quantitative analysis.			
Section	What we are learning (Key knowledge)	Key words	Assessment
1	Relative Formula Mass and Empirical Formula How do you calculate the relative formula mass of a compound? How do you determine the empirical formula of a compound?	Relative formula mass, empirical formula	Prior knowledge of RAM
2	Empirical formula practical How do you determine the empirical formula of a compound?	Empirical formula	Retrieval of EF calculation and putting it in to practice
3	Molecular formula What is the difference between an empirical formula and a molecular formula?	Molecular formula	Difference between EF and MF
4	Concentration How do you calculate the concentration of a solution?	Concentration, dm, cm	MUM – past exam questions to date
5	Conservation of mass How do you calculate the masses of reactant and products in a reaction?	Conservation of mass, reactant, product	Recall – ratio calculations from maths
6	Conservation of mass practical How does the law of conservation of mass explain why magnesium increases in mass when it is burned?	Conservation of mass, reactant, product	Recall calculating masses
7 (H)	Moles How do you calculate the number of moles and number of particles of a substance?	Avogadro's constant, moles, ion, atoms, molecules	Past exam Qs
8 (H)	Limiting reactant How do you work out a balanced equation from masses of reactants and/ or products?	Limiting reactant	Past exam Qs
9 (H)	Stoichiometry What controls the mass of product formed in a reaction?	Stoichiometry, balanced equation	Past exam Qs
10	Revision		Class assessment sheet
11	End of Unit Test		EUT
12	Test Feedback		Test feedback sheet

Lacon Childe School Science Department – Chemistry Scheme of Work – Year 10 – COMBINED ONLY - **Electrolysis, Metals, Equilibria**

Opportunities for Breadth and Challenge:
Pupils are challenged to use their scientific knowledge to explain how electrolysis is used to extract metals from their ores and know when this is the most appropriate method of extraction
Breadth – links to materials sciences and reactivity.

Links to Sequencing for Learning:
This unit links to previous work on ionic bonding done in Y9 and the reactivity series of metals in Y8.
This unit prepares pupils for work in Y11 (groups in the periodic table and reactivity).

Section	What we are learning (Key knowledge)	Key words	Assessment
1	Electrolysis (water) What is an electrolyte? What happens to the ions during electrolysis? How do you explain and represent the reactions taking place at the electrodes in electrolysis?	Electrolysis, electrolyte, ions, solution, current, decompose, anode, cathode, anions, cations	Prior knowledge of ions
2	Electrolysis products (sodium chloride) How do you predict the products formed in the electrolysis of molten zinc chloride? How do explain the properties formed in the electrolysis of sodium chloride solution?	Products, ions, anode, cathode, anions, cations	Retrieval Qs of keywords
2b	Electrolysis products (copper sulfate) (core practical) *Investigate the electrolysis of copper sulfate solution with inert electrodes and copper electrodes.* How is copper purified during electrolysis?	Copper electrode, graphite electrode, products, anode, cathode, anions, cations	Differences in electrode products formed
3	Reactivity What are the similarities and differences in the way different metals react with water, acids and salt solutions? What happens to metal atoms when they react with water and acids? How do you explain displacement reactions as redox reactions?	Reactivity, displacement	Recall – reactivity series
4	Ores Which metals are found uncombined in the Earth's crust? How is the method of extraction of a metal related to its position in the reactivity series? How are biological methods used to extract some metals?	Ores, uncombined, native state, extraction,	MUM: Past exam Qs
5a	Oxidation and reduction How do you explain oxidation and reduction in terms of oxygen? What types of reaction happen to ores when metals are extracted? How is the position of a metal in the reactivity series related to its resistance to corrosion?	Corrosion, oxidations, reduction, OILRIG, electrons, REDOX	Practical skills – extracting metal
5b	Oxidation and reduction recap How do you explain oxidation and reduction in terms of oxygen? What types of reaction happen to ores when metals are extracted? How is the position of a metal in the reactivity series related to its resistance to corrosion?	Corrosion, oxidations, reduction, OILRIG, electrons, REDOX	Practical skills – extracting metal
6	Lifecycle assessment What are the advantages of recycling a metal? When might recycling a metal not be worthwhile? What are the factors to consider in a life cycle assessment of a product?	Recycling, lifecycle assessment, raw materials	Advantages and disadvantages of recycling
7	Dynamic equilibrium What is meant by dynamic equilibrium? How is ammonia manufactured? How do changes in temperature, pressure and concentration affect the equilibrium position?	Dynamic, equilibrium, position ammonia, Haber process	Past exam Qs
8	Revision		Class assessment sheet
9	End of Unit Test		EUT
10	Test Feedback		Test feedback sheet

Electrolysis, Metals, Equilibria

Opportunities for Breadth and Challenge: Pupils are challenged to use their scientific knowledge to explain how electrolysis is used to extract metals from their ores and know when this is the most appropriate method of extraction Breadth – links to materials sciences and reactivity.			
Links to Sequencing for Learning: This unit links to previous work on ionic bonding done in Y9 and the reactivity series of metals in Y8. This unit prepares pupils for work in Y11 (groups in the periodic table and reactivity).			
Section	What we are learning (Key knowledge)	Key words	Assessment
1	Electrolysis (water) What is an electrolyte? What happens to the ions during electrolysis? How do you explain and represent the reactions taking place at the electrodes in electrolysis?	Electrolysis, electrolyte, ions, solution, current, decompose, anode, cathode, anions, cations	Prior knowledge of ions
2	Electrolysis products (sodium chloride) How do you predict the products formed in the electrolysis of molten zinc chloride? How do explain the properties formed in the electrolysis of sodium chloride solution?	Products, ions, anode, cathode, anions, cations	Retrieval Qs of keywords
2b	Electrolysis products (copper sulfate) *Investigate the electrolysis of copper sulfate solution with inert electrodes and copper electrodes.* How is copper purified during electrolysis?	Copper electrode, graphite electrode, products, anode, cathode, anions, cations	Differences in electrode products formed
3	Reactivity What are the similarities and differences in the way different metals react with water, acids and salt solutions? What happens to metal atoms when they react with water and acids? How do you explain displacement reactions as redox reactions?	Reactivity, displacement	Recall – reactivity series
4	Ores Which metals are found uncombined in the Earth's crust? How is the method of extraction of a metal related to its position in the reactivity series? How are biological methods used to extract some metals?	Ores, uncombined, native state, extraction,	MUM: Past exam Qs
5	Oxidation and reduction How do you explain oxidation and reduction in terms of oxygen? What types of reaction happen to ores when metals are extracted? How is the position of a metal in the reactivity series related to its resistance to corrosion?	Corrosion, oxidations, reduction, OILRIG, electrons, REDOX	Practical skills – extracting metal

6	Lifecycle assessment What are the advantages of recycling a metal? When might recycling a metal not be worthwhile? What are the factors to consider in a life cycle assessment of a product?	Recycling, lifecycle assessment, raw materials	Advantages and disadvantages of recycling
7 T	Transition metals (Triple only) Where are the transition metals found in the periodic table? What are the typical properties of transition metals? What properties of iron make it a typical transition metal?	Coloured compounds, catalyst, transition metals	Past exam Qs
8 T	Corrosion (Triple only) Why do metals corrode? How can the surface of iron be protected from rusting? How does sacrificial protection prevent rusting?	Corrosion, oxidations, rusting	Past exam Qs
9 T	Electroplating (Triple only) What is electroplating? Why are metals electroplated? How is electroplating done?	Electroplating, valuable, appearance, sacrificial protection	Past exam Qs
10 T	Alloys (Triple only) What is an alloy? Why is iron mixed with other metals to make alloy steels? Why are alloys often stronger than pure metals?	Alloy, improvement, properties	Past exam Qs
11 T	Uses of metals and their alloys (Triple only) What are some common uses for aluminium, copper and gold? What are some common alloys containing aluminium and copper? Why are different metals or their alloys chosen for different uses?	Density, strength, alloy	Past exam Qs
12 T	Dynamic equilibrium What is meant by dynamic equilibrium? How is ammonia manufactured? How do changes in temperature, pressure and concentration affect the equilibrium position?	Dynamic equilibrium position, ammonia, Haber process	Past exam Qs
13	Revision		Class assessment sheet
14	End of Unit Test		EUT
15	Test Feedback		Test feedback sheet

Quantitative Analysis, Dynamic Equilibria, Calculations Involving Volumes of Gases, Chemical Cells and Fuel Cells

Opportunities for Breadth and Challenge:
Pupils are challenged to use their mathematical knowledge to calculate atom economy and percentage yield
Breadth – links to calculations involving masses.

Links to Sequencing for Learning:
This unit links to previous work on calculations involving masses done in Y10 and equilibria, plus the work covered on acids and alkalis and titration.
This unit prepares pupils for work in Y11 (fuels).

Section	What we are learning (Key knowledge)	Key words	Assessment
1	Yields What is meant by the terms theoretical yield and actual yield of a reaction? How do you calculate the percentage yield of a reaction? What are some reasons for the actual yield being less than the theoretical yield?	Yield, calculation, theoretical, percentage	Prior knowledge of percentage calculations
2	Atom Economy What is meant by the atom economy of a reaction? How do you calculate the atom economy of a reaction? How is data used to decide on the best way to manufacture a product?	Atom economy, manufacture	Retrieval Qs of percentage by mass
3	Concentration How do you calculate the concentration of a solution in gdm^{-3}? How do you calculate the concentration of a solution in $moldm^{-3}$? How do you convert a concentration in gdm^{-3} into $moldm^{-3}$ and vice versa?	Concentration, moles	Past paper Qs on calculations
4	Titration How do you carry out an acid-alkali titration? How do you calculate the number of moles of solute in a given volume of solution? How do you calculate the concentration of solution using the results of an acid-alkali titration? *Carry out an acid-alkali titration, using a burette, a pipette and a suitable indicator.*	Titration, concentration, moles, calculation, indicator	MUM: Past exam Qs
5	Molar volume of gas What is Avogadro's law? What is the molar volume of a gas? How do you calculate the volume of a gas, and the mass of a solid, involved in a chemical reaction?	Avagadros Law, molar volume, moles, volume, gas	Past paper Qs on calculations
6	Fertilizers and the Haber Process What are fertilisers? What are the similarities and differences between making a fertiliser in a laboratory and in a factory? How is the Haber process used in the manufacture of ammonium nitrate?	Reaction pathway, fertiliser, Labatory, batch method	Applying knowledge to choose a reaction pathway
7	Equilibrium How is the time taken to reach equilibrium affected by changes in conditions? How are conditions chosen for industrial chemical reactions? How are reaction pathways chosen for industrial processes?	Equilibrium, temperature, rate or attainment, yield, concentration, surface area, catalyst,	Recall on rates of reaction
8	Chemical and fuel cells Why do batteries go 'flat'? What happens in a hydrogen-oxygen fuel cell? What are the strengths and weaknesses of fuel cells?	Hydrogen oxygen fuel cell,	Recall on fuels
9	Revision		Class assessment sheet
10	End of Unit Test		EUT
11	Test Feedback		Test feedback sheet