	SCHEME OF WORK		***FORM FOUR CHEMISTRY***		***TERM ONE 20.....***		
WK NO	**L/ NO**	**TOPIC / SUBTOPIC**	**LESSON / SPECIFIC OBJECTIVES**	**TEACHING / LEARNING ACTIVITIES**	**MATERIALS / RESOURCES**	***REFERENCES***	**REMARKS**
1		**ACIDS, BASES AND SALTS.**	***By the end of the lesson, the learner should be able to:***				
	1, 2	Strength of acids. Acids in aqueous form.	Define an acid in terms of hydrogen ions. Explain strength of acids in aqueous form in terms of number of hydrogen ions present.	Class experiments: investigate reactions of magnesium and zinc carbonate with different acids. Make and record observations in tabular form. Make deductions from the observations. Write relevant chemical equations and ionic equations. Detailed discussion leading to the definition of an acid and explanation of strength of an acid.	Magnesium strip, zinc carbonate, 2M HCl, 2M H_2SO_4, 2M ethanoic acid.	*K.L.B. BK IV Pages 1-4*	
	3, 4	pH values of acids. Electrical conductivities of aqueous acids.	Determine strength of acids using pH values. Determine strengths of acids by comparing their electrical conductivities. Classify acids as either strong or weak in terms of partial dissociations in aqueous solutions.	Q/A: review determination of strength of acids using a litmus paper and pH scale. Class / group experiments: record colour of universal indicator in 2M HCl and 2M ethanoic acid. Set up voltameters of 2M HCl and 2M ethanoic acid in turns. Record amounts of current . Discuss the observations. Write corresponding ionic equations.	Universal indicator, 2M HCl, 2M ethanoic acid, dry cells, carbon electrodes, milli-ammeters, wires, switches etc.	*K.L.B. BK IV Pages 4-6*	
	5	Definition of a base in terms of hydroxide ions.	Define a base in terms of hydroxide ions.	Teacher demonstration: Dissolve calcium hydroxide in water. Carry out litmus test on the resulting solution. Discuss the results; hence define a base in terms of hydroxide ions.	Red litmus paper, calcium hydroxide solid.	*K.L.B. BK IV Pages 6-7*	

2	1	Neutralization reaction.	Determine the results of reaction of an acid and a base.	Add 1M HCl to an aqueous solution of Calcium hydroxide drop wise until colour, change of the universal indicator is noted. Write ionic equation for the reaction.	1M HCl, Calcium hydroxide, universal indicator.	*K.L.B. BK IV Page 7*	
	2,3	Strength of bases.	Compare strengths of bases using pH values and electrical conductivity. Classify bases/ alkali as either strong or weak in terms of complete / partial ionization.	Carry out pH tests of 2M NaOH and 2M ammonia solution using universal indicator solutions; and observe colour changes. Carry out electrical conductivity tests of voltameters of the above solutions. Discussion: relate number of hydroxide ions to pH values and electrical conductivity of bases.	2M NaOH, 2M ammonia solution, universal indicator solutions, dry cells, carbon electrodes, milliammeters, wires, switches etc	*K.L.B. BK IV Pages 7-9*	
	4	Dissolving hydrogen chloride gas in water / methylbenzene.	Define a polar and a non-polar solvent.	Teacher demonstration: Dissolving HCl gas in different solvents. Discuss the observations. Write down related balanced chemical equations.	Ammonia gas, Methylbenzene, hydrogen chloride gas.	*K.L.B. BK IV Pages 9-11*	
	5	Dissolving ammonia gas in water/ methylbenzene.	Investigate effect of a polar / non-polar solvent on ammonia gas.	Carry out litmus tests on the resulting solution. Make observations and deductions thereof. Write down related balanced chemical equations.	Ammonia gas, Methylbenzene.	*K.L.B. BK IV Pages 11-12*	

3	1,2	Amphoteric oxides.	Define an amphoteric oxide. Identify some amphoteric oxides.	Class experiment: Carry out acid / base reactions with metal oxides. Q/A: make deductions from the results. Writing and balancing relevant equations.	2M Nitric acid 2M NaOH, HNO_3. Amphoteric oxides.	*K.L.B. BK IV Pages 12-14*	
	3,4	Precipitation Reactions.	Define a precipitate. Write ionic equations showing formation of precipitates.	Q/A: review definition of a salt. Class experiment; Add sodium carbonate or a suitable carbonate to various salt solutions containing Mg^{2+}, Al^{3+}, Ca^{2+}, etc. Make observations and discuss the results.	Soluble carbonates e.g. Na_2CO_3, K_2CO_3, $(NH4)_2CO_3$ Salt solutions containing Mg^{2+}, Al^{3+}, Ca^{2+}, etc.	*K.L.B. BK IV Pages 14-16*	
	5	Solubility of chlorides sulphites and sulphates.	Find out cations that form (in)soluble chlorides, sulphates and sulphites.	Class experiments: measure 2cc of 0.1M solution containing Pb^{2+} into a test tube. Add drops of 2M NaCl solution. (Later 2M Sodium Sulphate and 2M Sodium Sulphate). Warm the mixture and make observations. Repeat the procedure using other salt solutions containing other ions. Tabulate the results.	0.1M solution containing Pb^{2+}, 2M NaCl solution, 2M sodium sulphate, source of heating.	*K.L.B. BK IV Pages 16-17*	
4	1	Equations for formation of insoluble chlorides, sulphites and sulphates.	Write down equations for formation of insoluble chlorides, sulphites and sulphates.	Q/A: review observations made in the above experiments. Discuss the solubility of the cations. Write relevant ionic equations.		*K.L.B. BK IV Pages 17-18*	

	2,3	Complex ions.	Explain formation of complex ions.	Add drops of 2M sodium hydroxide / 2M ammonia solution to a solution containing Mg^{2+}, Zn^{2+}, etc. Make observations and discuss the results.	2M Sodium hydroxide (2M ammonia solution), solution containing Mg^{2+}, Zn^{2+}, etc.	*K.L.B. BK IV Pages 18-20*	
	4,5	Solubility of a salt at a given temperature.	Define the term solubility. Determine solubility of a given salt at room temperature.	Q/A: review the terms saturated, unsaturated solutions & crystallization. Class experiment: determine mass of a solute that dissolves in 100cc of water at room temperature.	Suitable solutes.	*K.L.B. BK IV Pages 20-21*	
5	1	Problems solving on solubility.	Solve problems involving solubility of a solute in a solvent at a given temperature.	Worked examples. Supervised practice. Written assignment.	Evaporating dish, watch glass, heating source, thermometer.	*K.L.B. BK IV Pages 21-22*	
	2,3	Effect of temperature on solubility of a solute in a solvent.	Investigate the effect of temperature on solubility of a solute in a solvent.	Experiments involving solubility of $KClO_3$ at different temperatures. Note temperatures at which crystallization occurs. Oral questions and discussion.	$KClO_3$ thermometers, source of heat.	*K.L.B. BK IV Pages 22-25*	
	4	Effects of various salts on soap.	Determine the effects of various salts on soap.	Group experiments: form soap lather in distilled water, tap water, rainwater, dilute solution of sodium chloride and solutions containing Ca^{2+} and Zn^{2+}. Note volume of soap that forms lather readily.	distilled water, tap water, rainwater, dilute solution of sodium chloride and solutions containing Ca^{2+} and Zn^{2+}.	*K.L.B. BK IV Pages 25-27*	

	5	Removal of hardness of water.	Identify ions for hardness of water. Identify methods of removing hardness of water. State merits & demerits of hard water.	Review results of above experiments. Probing questions & brief discussion. Assignment.		*K.L.B. BK IV Pages 27-29*	
6	1	**ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES.** Endothermic and Exothermic Reactions.	To differentiate between endothermic & exothermic reactions.	Investigate temperature changes in solution formation. Obtain changes in temperature when ammonium nitrate and sodium hydroxide are dissolved in water, one at a time.	Ammonium nitrate, Sodium hydroxide, thermometers.	*K.L.B. BK IV Pages 32-33*	
	2	Energy level diagrams.	Represent endothermic reactions with exothermic reactions with energy level diagrams.	Probing questions on relative energies of reactants and products in endothermic and exothermic and endothermic reactions.		*K.L.B. BK IV Pages 33-35*	

	3,4	Enthalpy Notation. Change of state.	Define the term enthalpy. Distinguish positive enthalpy change from negative enthalpy change. Determine the M.P/ B.P of a pure substance.	Q/A and brief discussion. Class experiments: determine B.P of pure water/ M.P of naphthalene / ice. Use experimental results to plot temperature-time graphs. Explain the shape of the graphs. Q/A: review kinetic theory of matter. Apply the theory to explain the shape of the graph, and nature of bonding in substances.	Ice, naphthalene, thermometers, graph papers.	*K.L.B. BK IV Pages 35-39*	
	5	C.A.T.					
7	1,2	Molar heat of solution.	Determine molar heat of solution of given substances.	Dissolve known masses of ammonia nitrate / sodium hydroxide in known volumes of water. Determine temperature changes. Calculate molar heat of solution. Supervised practice.	Ammonia nitrate / sodium hydroxide, thermometers.	*K.L.B. BK IV Pages 40-41*	
	3,4	Molar heat of solution of H_2SO_4.	Determine molar heat of solution of H_2SO_4.	Dissolve some known volume of conc. H_2SO_4 in a given volume of water. Note the change in temperature. Work out the molar heat of solution of H_2SO_4.	Conc. H_2SO_4, thermometers.	*K.L.B. BK IV Pages 42-45*	

8	5, 1	Enthalpy of combustion. Enthalpy of combustion.	Define the term enthalpy of combustion. Determine the enthalpy of combustion of ethanol. Explain why actual heats of combustion are usually lower than the theoretical values.	Group experiments / teacher demonstration. Obtain and record results. Work out calculations.	Ethanol, distilled water, thermometer, clear wick, tripod stand and wire gauze.	*K.L.B. BK IV Pages 45-48*	
	2,3	Molar heat of displacement of ions.	Define the term molar heat of solution of displacement of ions. Determine the molar heat of solution of displacement of ions.	Group experiments/ teacher demonstration. Note steady temperature of solutions formed when zinc/ iron / magnesium reacts with copper sulphate solution. Work out the molar heat of displacement of a substance from a solution of its ions.	Zinc, iron, magnesium, copper sulphate solution.	*K.L.B. BK IV Pages 48-50*	
	4,5	Molar heat of solution of neutralization.	Define the term neutralization. Determine the molar heat of neutralization of HCl with NaOH.	Class experiments: Neutralize 2M HCl of known volume with a determined volume of 1M / 2M sodium hydroxide. Note highest temperature of the solution. Work out the molar heat of neutralization. Solve other related problems. Assignment.	2M HCl of known volume, 1M / 2M sodium hydroxide.	*K.L.B. BK IV Pages 50-53*	
9	1	Standard enthalpy changes.	Define the term standard enthalpy change. Denote standard enthalpy change with the correct notation.	Exposition & brief discussion.		*K.L.B. BK IV Pages 54-56*	

	2,3	Hess's Law.	State Hess's law. Solve problems related to Hess's law.	Detailed discussion & guided discovery of the law. Illustrations of energy cycles and energy levels leading to Hess's law. Worked examples. Supervised practice Written assignment.		*K.L.B. BK IV Pages 56-57*	
	4,5	Heat of solution hydration energy and lattice energy.	Define the terms lattice energy and hydration energy. Explain the relationship between heat of solution, hydration energy. Solve related problems.	Exposition of new concepts. Guided discovery of the relationship between heat solution hydration energy and lattice energy. Worked examples. Assignment.		*K.L.B. BK IV Pages 60-64*	
10	1	Heat values of fuels.	Define the term fuel. Describe energy changes when a fuel undergoes combustion. Outline factors considered when choosing a suitable fuel.	Probing questions and brief discussion.		*K.L.B. BK IV Pages 64-66*	
	2	Environmental effects of fuels.	Outline some environmental effects of fuels. Identify measures taken to reduce environmental pollution.	Q/A & open discussion.		*K.L.B. BK IV Pages 67-68*	

	3, 4	**RATES OF REACTION & REVERSIBLE REACTIONS.** Effect of concentration on rate of a reaction	Explain the effects of change of concentration of reactants on a reaction.	Group experiments to investigate effect of concentration on rate of reaction using dil. HCl and magnesium ribbons. Determine the time taken for reactions to be complete. Calculation of concentration of HCl in moles per litre. Discuss the observations and sketch illustrative graphs.	Portions of 2M HCl diluted with different volumes of water, Stopwatches.	*K.L.B. BK IV Pages 73-74*	
	5	Effect of time of reaction on the rate of reaction.	Explain how the rate or reaction changes as the reaction proceed	Group experiments: investigate volume of gas evolved when magnesium reacts with dilute HCl. Collect evolved gas and sketch and illustrative graphs. Discuss the results.	Magnesium ribbons, stopwatches, conical flask. $100cm^3$ 0.5M HCl, syringes, stoppers, tubes and connectors.	*K.L.B. BK IV Pages 75-79*	
11	1	Effect of temperature of reactants on rate of reaction.	Explain the effect of temperature on rate of reaction.	Group experiments: investigate the effects of temperature on the rate of reaction of sodium thiosulphate with dilute HCl. Sketch and interpret relevant graphs. Discuss the collision theory and effects of activation energy.	Sodium thiosulphate heated at different temperatures, dilute HCl, stopwatches. Graph papers.	*K.L.B. BK IV Pages 80-83*	

	2	Effect of change in surface area of reactants on the rate of a reaction.	Explain the effect of change in surface area on the rate of a reaction.	Group experiment/ teacher demonstration. Compare reactions of marble chips with dilute HCl and that of marble chips powder with equally diluted HCl. Collect evolved gas in each case. Teacher asks probing questions related to the observations made.	Marble chips, marble chips powder, syringes, conical flasks with stoppers, 1M HCl.	*K.L.B. BK IV Pages 83-85*	
	3	Effect of a suitable catalyst on the rate of a reaction	Explain effects of a suitable catalyst on the rate of a reaction.	Teacher demonstration: preparation and collection of oxygen gas without using a catalyst, then using manganese (IV) oxide as a catalyst. Explain the results in terms of activation energy.	Hydrogen peroxide, manganese (IV) oxide.	*K.L.B. BK IV Pages 85-88*	
	4	Effect of light on rate of specific reactions.	Identify reactions that are affected by light.	Teacher demonstration: decomposition of silver bromide in the presence of light. Mention other examples of reactions affected by light.	Silver bromide.	*K.L.B. BK IV Pages 89-91*	
	5	Reversible reactions.	Write down equations for reversible reactions.	Q/A: review temporary and permanent changes. Teacher demonstration: heating crystals of hydrated copper (II) sulphate, then “hydrating” them. Write the corresponding chemical equations. Give further examples of reversible reactions.	Crystals of hydrated copper (II) sulphate.	*K.L.B. BK IV Pages 91-93*	

12	1	State of equilibrium in chemical reactions.	Define the term equilibrium as used in reversible reactions. Write down equations of reversible reactions in a state of equilibrium.	Brief discussion, giving examples of chemical equations for reversible reactions.		*K.L.B. BK IV Pages 94-95*	
	2	Le Chatelier's Principle.	State Le Chatelier's Principle.	Investigate the effect of change of concentration of reactants on equilibrium. Add 2M sodium hydroxide in steps to bromine water. Make and record observations. Discuss the results leading to Le Chatelier's Principle.	Add 2M sodium hydroxide,	*K.L.B. BK IV Pages 95-97*	
	3	Effect of change of pressure and temperature on equilibrium shift.	Explain the effect of change of pressure & te,perature on equilibrium shift.	Q/A: review kinetic theory of matter. Q/A & discussion on effect of change of pressure / temperature on shifting of equilibrium; giving specific examples of chemical equations. Written assignment.		*K.L.B. BK IV Pages 97-101*	
	4	The Haber Process.	Explain the concept *optimum conditions* of a chemical equilibrium. Explain factors that change the position of equilibrium of the Harber process.	Q/A and detailed discussion on change of pressure, temperature, concentration of ammonia and effect of presence of a suitable catalyst on the Haber process.		*K.L.B. BK IV Pages 102-103*	
	5	The Contact Process.	Explain how change of temperature and pressure affect rate of manufacture of sulphur (VI) acid.	Probing questions and brief discussion. Assignment.		*K.L.B. BK IV Pages 103-104*	

13		*END OF TERM ONE EXAMINATIONS*	

		SCHEME OF WORK	***FORM FOUR CHEMISTRY***	***TERM TWO***			
			20……				
WK NO	**L/ NO**	**TOPIC / SUBTOPIC**	**LESSON / SPECIFIC OBJECTIVES**	**TEACHING / LEARNING ACTIVITIES**	**MATERIALS / RESOURCES**	***REF.***	**REM.**
1	1	**ELECTRO-CHEMISTRY.** Redox reactions.	Describe redox reactions in terms of gain / loss of electrons. Identify oxidizing / reducing agents involved in redox reactions.	Q/A: review cations, anions and charges. Write down ionic half equations and identify reducing / oxidizing agents.		*K.L.B. BK IV Pages 108-9*	
	2	Oxidizing Numbers.	Outline rules of assigning oxidation numbers. Determine the oxidation numbers of an element in a given compound. Explain the use of oxidation numbers in naming compounds.	Exposition and giving specific examples. Work out oxidizing number of elements in given compounds. Copy and complete a table of compounds containing elements that more than one oxidation number.		*K.L.B. BK IV Pages 109-116*	
	3,4	Displacement reactions.	Explain change of oxidation numbers during redox / displacement reactions. Arrange elements in order of their reducing power.	Class standard experiments: reacting metals with solutions containing metal ions. Taking note of reactions and those that do not take place; and tabulating the results.	Metals: Ca, Na, Zn, Fe, Pb, and Cu. Solutions containing Ca^{2+}, Mg^{2+}, Zn^{2+}, Fe^{2+}.	*K.L.B. BK IV Pages 116-120*	
	5	The oxidizing power of an element.	Arrange elements in order of their oxidizing power.	Teacher demonstration / group expts: Adding halogens to solutions containing halide ions. Tabulate the results. Discuss the results and arrive at the *oxidizing power* series of halogens.	*Halogens:* *Cl_2 (g),* *Br_2 (l),* *I_2 (s).* *Halides:* *KCl, KBr, KI.*	*K.L.B. BK IV Pages 120-122*	

2	1	Cell diagrams.	Define the terms electrode, potential and e.m.f. of an electrochemical cell. Describe components of a cell diagram. Draw cell diagrams using correct notations.	Teacher demonstration: Zinc/ copper cell. Q/A & discussion: changes in oxidation numbers. Exposition: cell diagram and deducing the direction of electron flow.	*Zinc/ copper cell.*	*K.L.B. BK IV Pages 123-128*	
	2	Standard Electrode Potentials.	Identify standard conditions for measuring electrode potentials. Define the term standard electrode potential of a cell. Write half reactions of electrochemical cells.	Descriptive and expository approaches: teacher exposes new concepts.		*K.L.B. BK IV Pages 129-131*	
	3,4	Standard electrode potential series.	Recall the order of standard electrode potentials. Compare oxidizing and reducing powers of substances.	Q/A: review reactivity series, oxidizing agent, reducing agent. Exposition: the order of standard electrode potentials. Discussion: oxidizing and reducing powers of substances.		*K.L.B. BK IV Pages 131-133*	
	5	Emf of a cell.	Calculate emf of a cell using standard electrodes potentials.	Q/A: review half-cells. Worked examples; supervised practice. Assignment.		*K.L.B. BK IV Pages 133-136*	
3	1	Possibility of a reaction to take place.	Predict whether a reaction will take place or not using standard electrode potentials.	Worked examples. Oral exercise. Assignment.		*K.L.B. BK IV Pages 136-137*	

3	2	Primary and secondary chemical cells.	Describe the functioning of primary and secondary chemical cells.	Exposition of new concepts and brief discussion Assignment.		*K.L.B. BK IV Pages 138-141*	
	3,4	Electrolysis of dilute NaCl.	Define the term electrolysis. Explain the concept of preferential discharge of ions.	Teacher demonstration: electrolysis of dilute sodium chloride with carbon electrodes. Test for gases collected. Write down equations of reactions at each electrode. Discussion: preferential discharge of ions at electrodes.	Dilute sodium chloride voltameter.	*K.L.B. BK IV Pages 141-144*	
	5	Electrolysis of brine.	Identify products of electrolysis of brine**.**	Teacher demonstration/ group experiments. Test for the products of electrolysis. Write relevant equations.	Brine voltameter.	*K.L.B. BK IV Pages 144-146*	
4	1	Electrolysis of dilute sulphuric (VI) acid.	Identify products of electrolysis of dilute sulphuric (VI) acid.	Teacher demonstration/ group experiments. Test for the products of electrolysis. Write relevant equations.	Sulphuric acid voltameter.	*K.L.B. BK IV Pages 146-148*	
	2	Factors affecting electrolysis.	Explain factors that affect electrolytic products discharged at electrodes.	Q/A: review the electrochemical series of elements. Teacher writes down order of ease of discharge of ions at electrodes. Discussion: other factors; giving suitable examples.		*K.L.B. BK IV Pages 153-5*	

4	3	Application of electrolysis.	Describe some applications of electrolysis.	Probing questions and brief discussion on applications of electrolysis. Practical assignment on electrolysis: electroplating an iron nail with a suitable metal.	Suitable voltameter.	*K.L.B. BK IV Pages 155-7*	
	4	Faraday's law of electrolysis.	Determine quantity of electricity required to deposit one mole of a metal	Group experiments: record initial mass of cathode electrode, final mass, time taken, current flowing. Calculate quantity of electricity using the equation Q = It.	Weighing balance, stop watch, copper sulphate voltameter.	*K.L.B. BK IV Pages 160-161*	
	5	Faraday's law of electrolysis.	State Faraday's law of electrolysis. Solve problems related to Faraday's law of electrolysis.	Discuss above results, leading to Faraday's law of electrolysis. Worked examples. Assignment.	Weighing balance, stop watch, copper sulphate voltameter.	*K.L.B. BK IV Pages 161-4*	
5	1	C.A.T.					
	2	**METALS** Ores of some metals.	Name the chief ores of some metals.	Exposition and brief discussion.		*K.L.B. BK IV Pages 168-9*	
	3	Occurrence and extraction of sodium.	Describe occurrence and extraction of sodium.	Oral questions on electrolysis and equations at electrodes. Brief discussion on occurrence and extraction.	Chart: Down's cell.	*K.L.B. BK IV Pages 170-171*	

	4	Occurrence and extraction of aluminium.	Describe occurrence and extraction of aluminium.	Brief discussion. Write relevant chemical equations.		*K.L.B. BK IV Pages 171-3*	
	5	Occurrence and extraction of iron.	Describe occurrence and extraction of iron.	Brief discussion. Write relevant chemical equations.	Chart: Blast furnace.	*K.L.B. BK IV Pages 173-5*	
6	1,2	Occurrence and extraction of zinc.	Describe occurrence and extraction of zinc by electrolysis and reduction methods.	Brief discussion. Write relevant chemical equations.	Flow chart: extraction of Zinc.	*K.L.B. BK IV Pages 175-9*	
	3	Extraction of lead.	Explain how lead is extracted.	Q/A & brief discussion. Write balanced chemical equations leading to extraction of lead.	Flow chart: extraction of lead.	*K.L.B. BK IV Pages 179-80*	
	4	Occurrence and extraction of copper.	Describe extraction of copper.	Q/A & brief discussion. Write balanced chemical equations leading to extraction of copper.	Flow chart: extraction of copper.	*K.L.B. BK IV Pages 181-183*	
	5	Physical properties of some metals.	State general properties of metals. Explain the difference in physical properties of metals.	Compare physical properties of some metals as summarized in a chart. Q/A & discussion based on physical properties.		*K.L.B. BK IV Pages 183-4*	
7	1,2	Reaction of metals with oxygen.	Explain effect of burning metals in air.	Teacher demonstration / Group experiments. Burning some metals in air. Write relevant equations. Brief discussion.	Common lab. metals.	*K.L.B. BK IV Pages 184-6*	

8	3,4	Reaction of metals with cold water and steam.	Describe reaction of metals with cold water and steam. Arrange the metals in order of reactivity with cold water and steam.	Class experiments: Investigate reaction of some metals with cold water and steam. Analyse the results.	Metals: Al, Zn, Fe, Cu.	*K.L.B. BK IV Pages 186-9*	
	5, 1	Reaction of metals with chlorine.	Describe the reaction of metals with chlorine.	Teacher demonstration in a fume cupboard / in the open. Investigate reaction of metals with chorine Write corresponding equations.	Metals: Al, Zn, Fe, Cu.	*K.L.B. BK IV Pages 189-191*	
	2,3	Reaction of metals with acids.	Describe and explain reaction of metals with acids.	Group experiments: investigate reaction of metals with dilute acids. Teacher demonstration: investigate reaction of metals with concentrated acids. Discuss the observations made and write relevant chemical equations.	Metals: Al, Zn, Fe, Cu. Acids; HCl, HNO_3, H_2SO_4.	*K.L.B. BK IV Pages 191-4*	
	4	Uses of metals.	State uses of some metals and alloys.	Q/A & brief discussion; Uses of Sodium, Aluminium, Zinc, Iron and Copper & some alloys.		*K.L.B. BK IV Pages 194-7*	
	5	Environmental effects of extraction of metals.	Identify some environmental effects of extraction of metals.	Oral questions and open discussion. Assignment / Topic review.		*K.L.B. BK IV Pages 197-8*	

9	1	**ORGANIC CHEMISTRY II (ALKANES & ALKANOIC ACIDS)** Alkanols (Alcohols).	Identify the functional group of alkanols. Explain formation of alkanol molecules.	Q/A: review alkanes, alkenes and alkynes. Teacher exposes new concepts and links them with already known concepts.		*K.L.B. BK IV Page 205*	
	2	Nomenclature of alkanols.	Name and draw the structure of simple alkanols.	Guided discovery of naming system for alkanols. Draw and name structures of alkanols.		*K.L.B. BK IV Pages 206-8*	
	3	Isomerism in alkanols.	Describe positional and chain isomerism in alkanols. Explain formation of primary and secondary alkanols.	Q/A: review the terms positional and chain isomerism. Brief discussion on isomerism. Oral exercise: naming given organic compounds. Written exercise: writing structural formulae for isomers of organic compounds of a given molecular formula.		*K.L.B. BK IV Pages 208-10*	
	4-5	Preparation of ethanol in the lab.	Describe preparation of ethanol in the laboratory.	Group experiments / teacher demonstration. Discuss the fermentation process.	Calcium hydroxide solution, sugar solution, yeast.	*K.L.B. BK IV Pages 210-11*	

10	1	Physical properties of alkanols.	Explain the physical properties of alkanols.	Comparative evaluation of physical properties of alkanols. Q/A & discussion on variation in physical properties of alkanols.		*K.L.B. BK IV Page 212*	
	2	Chemical properties of alkanols.	Describe some chemical reactions of alkanols.	Group experiments/ teacher demonstration to investigate combustion of ethanol and its reaction with metals. Write corresponding chemical equations.		*K.L.B. BK IV Pages 213-5*	
	3	Esters and esterification.	Explain formation of esters. Describe the esterification process.	Teacher exposes and explains new concepts. Assignment.		*K.L.B. BK IV Pages 215-6*	
	4,5	Oxidation of ethanol. Uses of alkanols.	Explain oxidation of ethanol by an oxidizing agent. State uses of alkanols. Explain the effects of alcohol on human health	Q/A: review redox reactions, oxidizing and reducing agents. Brief discussion: oxidation of ethanol using potassium (VII) manganate or potassium (VI) dichromate. Write corresponding chemical equations. Open discussion.		*K.L.B. BK IV Pages 216-8*	
		END OF TERM TWO - MOCK K.C.S.E.					

		SCHEME OF WORK	***FORM FOUR CHEMISTRY 20.....***	***TERM THREE***			
WK NO	**L/ NO**	**TOPIC / SUBTOPIC**	**LESSON / SPECIFIC OBJECTIVES**	**TEACHING / LEARNING ACTIVITIES**	**MATERIALS / RESOURCES**	***REF.***	**REM.**
1	1	Alkanoic (Carboxylic Acids).	Identify the functional group of alkanoic (carboxylic) acids. Explain formation of alkanoic acid molecule.	Q/A: review functional group of alkanols. Brief discussion.		*K.L.B. BK IV Page 219*	
	2,3	Nomenclature of alkanoic acids.	Name and draw the structure of simple alkanoic acids.	Guided discovery of the naming system for alkanoic acids.	Chart: homologous series of alkanoic acids.	*K.L.B. BK IV Pages 219-221*	
	4,5	Lab preparation of ethanoic acid.	Describe laboratory preparation of ethanoic acid.	Teacher demonstration: prepare ethanoic acid in the lab. Brief discussion on preparation of ethanoic acid.	Concentrated H_2SO_4, potassium manganate (VII) Crystals, water bath.	*K.L.B. BK IV Pages 221-223*	
2	1	Physical properties of alkanoic acids.	Explain some physical properties of alkanoic acids.	Compare physical properties of some alkanoic acids. Discuss the difference in physical properties among alkanoic acids.		*K.L.B. BK IV Pages 223-4*	
	2	Chemical properties of alkanoic acids.	Explain some chemical properties of alkanoic acids.	Group experiment: investigate some chemical properties of ethanoic acid. Carry out tests and record observations in a table.	Ethanoic acid, universal indicator, sodium carbonate, magnesium strip, ethanol, conc. H_2SO_4 and sodium hydroxide.	*K.L.B. BK IV Pages 224-5*	

2	3	Chemical properties & Uses of alkanoic acids.	Write equations for chemical reactions involving acids. State uses of alkanoic acids.	Review and discuss the observations above. Write corresponding chemical equations. Teacher elucidates uses of alkanoic acids.		*K.L.B. BK IV Pages 225-7*	
	4	Soap preparation in the lab.	Describe soap preparation in the lab.	Group experiments, Answer questions based on the experiments already carried out.		*K.L.B. BK IV Pages 227-230*	
	5	Cleaning action of soap.	Describe the nature of a soap molecule. Explain the mode of action in cleaning.	Expository and descriptive approaches. Answer oral questions.		*K.L.B. BK IV Pages 230-232*	
3	1	Effects of hard / soft water on soap.	Explain the effects of hard/ soft water on soap.	Group experiments: form soap lather in different solutions. Deduce the effects of hard/ soft water on soap.	Distilled water, tap water, rainwater, sodium chloride solution. Calcium nitrate, Zinc Sulphate, etc.	*K.L.B. BK IV Pages 232-235*	
	2	Soapless detergents.	Prepare soapless detergents in the lab. State merits of soapless detergents over soaps.	Teacher demonsration. Brief discussion.		*K.L.B. BK IV Pages 235-238*	

3	3	Polymers and polymerization.	Explain the concepts additional and condensation polymerization as methods of making synthetic polymers. Identify some products of polymerization. State merits and demerits of synthetic polymers over natural materials.	Teacher exposes and explains new concepts. Detailed discussion. Assignment.		*K.L.B. BK IV Pages 238-242*	
	4	**RADIOACTIVITY** Definition of radioactivity.	Define radioactivity, a nuclide and radioactive decay. Differentiate between natural and artificial radioactivity.	Q/A: Review the atomic structure. Exposition: symbolic representation of an atom / nucleus. Exposition: meaning of radioactivity and radioactive decay. Discussion: artificial and natural radioactivity.		*K.L.B. BK IV Pages 249-251*	
	5	Alpha particles.	State properties of alpha particles. Describe methods of detecting alpha particles.	Q/A: position of helium in the periodic table. Expository approach:		*K.L.B. BK IV Pages 251-253*	

4	1	Equations involving alpha particles.	Write down and balance equations involving alpha particles.	Q/A: Review atomic and mass numbers. Examples of balanced equations. Supervised practice.		*K.L.B. BK IV Page 257*	
	2	Beta particles. Gamma rays.	State properties of beta particles. Define isotopes and isobars. Write down balanced equations involving both alpha and beta particles. State properties of gamma rays.	Q/A: Review isotopes. Expository approach: teacher briefly exposes new concepts. Examples of equations. Supervised practice. Assignment.		*K.L.B. BK IV Pages 251-253*	
	3	Radioactive Half-Life.	Define the term radioactive half-life. Solve problems relating to half – life	Teacher demonstration: Dice experiment. Exposition of the term half-life. Worked examples. Written exercise	Dice.	*K.L.B. BK IV Pages 253-4*	
	4	Radioactive decay curve.	Plot a radioactive decay curve to deduce the half –life from the curve.	Drawing a radioactive decay curve inferring the half-life of the sample from the graph.	Graph papers.	*K.L.B. BK IV Pages 254-5*	
	5	Nuclear fusion and nuclear fission. Applications of radioactivity.	Differentiate between nuclear fusion and nuclear fission. Describe applications of radioactivity.	Exposition of new concepts accompanied by nuclear equations. Brief discussion: Carbon dating, detecting leakage, medication, agriculture, industry; effect of static charges, etc.		*K.L.B. BK IV Pages 259-260*	
5-6		*REVISION FOR K.C.S.E.*					
7-10		*K.C.S.E. EXAMINATIONS*					