SCHEME OF WORK CHEMISTRY FORM 4 2022

TERM I ENDARASHA BOYS

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| **2** |  |  |  |  | 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. |  |  |  |
|  | 1 | ACIDS, BASES AND SALTS. | Strength of acids. Acids in aqueous form. | By the end of the lesson, the learner should be able to:  Define an acid in terms of hydrogen ions.  Explain strength of acids in aqueous form in terms of number of hydrogen ions present. | Magnesium strip, zinc carbonate,  2M HCl,  2M H2SO4,  2M ethanoic acid. | K.L.B. BK IV Pages 1-4 |
|  | 2-3 | ACIDS, BASES AND SALTS. | pH values of acids.  Electrical conductivities of aqueous acids. | By the end of the lesson, the learner should be able to: 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 |  |
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|  | 4 | ACIDS, BASES AND SALTS. | Definition of a base in terms of hydroxide ions.  Neutralization reaction. | By the end of the lesson, the learner should be able to: Define a base in terms of hydroxide ions.  Determine the results of reaction of an acid and a base. | 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. 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. | Red litmus paper, calcium hydroxide solid.  1M HCl,  Calcium hydroxide, universal indicator. | K.L.B. BK IV Pages 6-7 |  |
| 5 | ACIDS, BASES AND SALTS. | Strength of bases. | By the end of the lesson, the learner should be able to: 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 |  |
| **3** | 1 | ACIDS, BASES AND SALTS. | Dissolving hydrogen chloride gas in water / methylbenzene. | By the end of the lesson, the learner should be able to: 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 |  |
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|  | 2-3 | ACIDS, BASES AND SALTS. | Dissolving ammonia gas in water/ methylbenzene. Amphoteric oxides. | By the end of the lesson, the learner should be able to: Investigate effect of a polar / non-polar solvent on ammonia gas.  Define an amphoteric oxide.  Identify some amphoteric oxides. | Carry out litmus tests on the resulting solution.  Make observations and deductions thereof.  Write down related balanced chemical equations.  Class experiment: Carry out acid / base reactions with metal oxides.  Q/A: make deductions from the results.  Writing and balancing relevant equations. | Ammonia gas, Methylbenzene. 2M Nitric acid 2M NaOH, HNO3.  Amphoteric oxides. | K.L.B. BK IV Pages 11-12  K.L.B. BK IV Pages 12-14 |  |
| 4 | ACIDS, BASES AND SALTS. | Precipitation Reactions. | By the end of the lesson, the learner should be able to: 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 Mg2+, Al3+, Ca2+, etc.  Make observations and discuss the results. | Soluble carbonates e.g. Na2CO3, K2CO3, (NH4)2CO3  Salt solutions containing Mg2+, Al3+, Ca2+, etc. | K.L.B. BK IV Pages 14-16 |  |
| 5 | ACIDS, BASES AND SALTS. | Precipitation Reactions. | By the end of the lesson, the learner should be able to: 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 Mg2+, Al3+, Ca2+, etc.  Make observations and discuss the results. | Soluble carbonates e.g. Na2CO3, K2CO3, (NH4)2CO3  Salt solutions containing Mg2+, Al3+, Ca2+, etc. | K.L.B. BK IV Pages 14-16 |  |
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| **4** | 1 | ACIDS, BASES AND SALTS. | Solubility of chlorides sulphites and sulphates.  Equations for formation of insoluble chlorides, sulphites and sulphates. | By the end of the lesson, the learner should be able to: Find out cations that form (in)soluble  chlorides, sulphates and sulphites.  Write down equations for formation of insoluble chlorides, sulphites and sulphates. | Class experiments: measure 2cc of 0.1M solution containing Pb2+ 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. Q/A: review observations made in the above experiments. Discuss the solubility of the cations.  Write relevant ionic equations. | 0.1M solution containing Pb2+, 2M NaCl solution, 2M sodium sulphate, source of heating. student book | K.L.B. BK IV Pages 16-17 |  |
| 2-3 | ACIDS, BASES AND SALTS. | Complex ions. | By the end of the lesson, the learner should be able to: Explain formation of complex ions. | Add drops of 2M sodium hydroxide / 2M ammonia solution to a solution containing Mg2+, Zn2+, etc.  Make observations and discuss the results. | 2M Sodium hydroxide (2M ammonia solution),  solution containing Mg2+, Zn2+, etc. | K.L.B. BK IV Pages 18-20 |  |
| 4 | ACIDS, BASES AND SALTS. | Solubility of a salt at a given temperature. | By the end of the lesson, the learner should be able to: 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 |  |
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|  | 5 | ACIDS, BASES AND SALTS. | Problems solving on solubility. | By the end of the lesson, the learner should be able to:  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 |  |
| **5** | MID TEM EXAMS AND BREAK | | | | | | | |
| **6** | 1 | ACIDS, BASES AND SALTS. | Effect of temperature on solubility of a solute in a solvent. | By the end of the lesson, the learner should be able to: Investigate the effect of temperature on solubility of a solute in a solvent. | Experiments involving solubility of KClO3 at different temperatures. Note temperatures at which crystallization occurs.  Oral questions and discussion. | KClO3 thermometers, source of heat. | K.L.B. BK IV Pages 22-25 |  |
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|  | 2-3 | ACIDS, BASES AND SALTS. ACIDS, BASES AND SALTS. ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Effects of various salts on soap.  Removal of hardness of water.  Endothermic and Exothermic Reactions. | By the end of the lesson, the learner should be able to: Determine the effects of various salts on soap.  Identify ions for hardness of water. Identify methods of removing hardness of water.  State merits & demerits of hard water.  To differentiate between endothermic & exothermic reactions. | Group experiments: form soap lather in distilled water, tap water, rainwater, dilute solution of sodium chloride and solutions containing Ca2+ and Zn2+.  Note volume of soap that forms lather readily.  Review results of above experiments.  Probing questions & brief discussion.  Assignment. Investigate temperature changes in solution formation.  Obtain changes in temperature when ammonium nitrate and sodium hydroxide are dissolved in water, one at a time. | distilled water, tap water, rainwater, dilute solution of sodium chloride and solutions containing Ca2+ and Zn2+.  student book Ammonium nitrate, Sodium hydroxide, thermometers. | K.L.B. BK IV Pages 25-27  K.L.B. BK IV Pages 27-29 |  |
| 4 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Energy level diagrams. | By the end of the lesson, the learner should be able to: 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. | student book | K.L.B. BK IV Pages 33-35 |  |
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|  | 5 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Enthalpy Notation. Change of state. | By the end of the lesson, the learner should be able to: 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 |  |
| **7** | 1 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | CAT | By the end of the lesson, the learner should be able to: |  |  |  |  |
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|  | 2-3 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Molar heat of solution.  Molar heat of solution of H2SO4. | By the end of the lesson, the learner should be able to: Determine molar heat of solution of given substances.  Determine molar heat of solution of H2SO4. | Dissolve known masses of ammonia nitrate / sodium hydroxide in known volumes of water.  Determine temperature changes.  Calculate molar heat of solution. Supervised practice.  Dissolve some known volume of conc. H2SO4 in a given volume of water.  Note the change in temperature.  Work out the molar heat of solution of H2SO4. | Ammonia nitrate / sodium hydroxide, thermometers.  Conc. H2SO4,  thermometers. | K.L.B. BK IV Pages 40-41  K.L.B. BK IV Pages 42-45 |  |
| 4 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Molar heat of solution of H2SO4. | By the end of the lesson, the learner should be able to: Determine molar heat of solution of H2SO4. | Dissolve some known volume of conc. H2SO4 in a given volume of water.  Note the change in temperature.  Work out the molar heat of solution of H2SO4. | Conc. H2SO4,  thermometers. | K.L.B. BK IV Pages 42-45 |  |
| 5 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Enthalpy of combustion. Enthalpy of combustion. | By the end of the lesson, the learner should be able to: 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 |  |
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| **8** | 1 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Molar heat of displacement of ions. | By the end of the lesson, the learner should be able to: 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 |  |
| 2-3 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Molar heat of displacement of ions.  Molar heat of solution of neutralization. | By the end of the lesson, the learner should be able to: Define the term molar heat of solution of displacement of ions. Determine the molar heat of solution of displacement of ions. Define the term neutralization.  Determine the molar heat of neutralization of HCl with NaOH. | 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.  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. | Zinc, iron, magnesium, copper sulphate solution.  2M HCl of known volume, 1M / 2M sodium hydroxide. | K.L.B. BK IV Pages 48-50  K.L.B. BK IV Pages 50-53 |  |
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|  | 4 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Standard enthalpy changes. | By the end of the lesson, the learner should be able to: Define the term standard enthalpy change.  Denote standard enthalpy change with the correct notation. | Exposition & brief discussion. | student book | K.L.B. BK IV Pages 54-56 |  |
| 5 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Hess?s Law. | By the end of the lesson, the learner should be able to: 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. | student book | K.L.B. BK IV Pages 56-57 |  |
| **9** | 1 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Heat of solution hydration energy and lattice energy. | By the end of the lesson, the learner should be able to: 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. | student book | K.L.B. BK IV Pages 60-64 |  |
| 1 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Heat of solution hydration energy and lattice energy. | By the end of the lesson, the learner should be able to: 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. | student book | K.L.B. BK IV Pages 60-64 |  |
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|  | 2-3 | ENERGY CHANGES IN PHYSICAL & CHEMICAL PROCESSES. | Heat values of fuels.  Environmental effects of fuels. | By the end of the lesson, the learner should be able to: Define the term fuel. Describe energy changes when a fuel undergoes combustion. Outline factors considered when choosing a suitable fuel.  Outline some environmental effects of fuels.  Identify measures taken to reduce environmental pollution. | Probing questions and brief discussion.  Q/A & open discussion. | student book | K.L.B. BK IV Pages 64-66  K.L.B. BK IV Pages 67-68 |  |
| 4 | RATES OF REACTION  & REVERSIBLE REACTIONS. | Effect of concentration on rate of a reaction | By the end of the lesson, the learner should be able to:  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 | RATES OF REACTION  & REVERSIBLE REACTIONS. | Effect of time of reaction on the rate of reaction. | By the end of the lesson, the learner should be able to: 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.  100cm3 0.5M HCl,  syringes, stoppers, tubes and connectors. | K.L.B. BK IV Pages 75-79 |  |
| **10** | END OF TERM EXAMS | | | | | | | |