ADEYEMI COLLEGE OF EDUCATION
ONDO, ONDO STATE

DEPARTMENT OF CHEMISTRY
NCE PROGRAMME (COURSE OUTLINE)

NCE I - FIRST SEMESTER

CHE 111 GENERAL CHEMISTRY **2 Credits Compulsory**

Objectives:

At the end of the course the students should be able to:

- Define the concepts taught in relation to atoms and molecules
- describe how protons and neutrons were discovered a explain the principles underlying the periodic table and its properties
- and explain the types of chemical bonding.

Topics:

Concepts of the atom and the molecule

- Discharge of electricity through gases
- Determination of elm of cathode rays
- Determination of the charge of an electron
- Discovery of protons and neutrons Experiments of Rutherford and Chadwick
- Electronic structure of the elements
- Isotopes and mass spectrometry
- Atomic orbital, Bohr atom, Dual nature of matter
- Quantum numbers
- Uncertainty principle Hydrogen orbitals
- Many electron systems, Electrons spin, principle
- Pauli Exclusion Principle, The Periodic Table Valence shell electrons
- Ionization Potential Electron Affinity. Atomic and Ionic radii, Electro negativity.
- Types of chemical bonds: electrovalent, covalent, dative, hydrogen, metallic and Octet Lewis Formulae.
- Multiple electron-pair bonds. Odd Electron compounds

CHE 112 INTRODUCTORY ORGANIC CHEMISTRY I 1 Credit Compulsory

Objectives:

At the end of the course the students should be able to:

- State the characteristics of organic compounds and their relationship to other branches of chemistry
- differentiate between pi and sigma bonds in relation to hybridization, bond length, bond energy and bond angle
- state the classes of organic reaction using homolytic and heterolytic fission
- explain the concept of acids and bases.

Topics:

Characteristics of Organic Chemistry and its relationship to other branches 0f atoms through covalent bonding resulting in chain formation. Review of ground state electronic structures especially **C, H, O, N, S,** etc. Hybridization; Review or atomic orbitals. Sigma and Pi-bonds Molecular orbitals and their relations to structure Bond characteristics: length, angle and strength. Electronegativity, polarization and its effects on physical properties. intermolecular forces and their relationships to physical properties, Classification of reactions as involving hemolytic and heterolytic Fission. Cabonium ions and free radicals as reactant intermediates. Acids and Bases. Electrophiles and Nuclcophiles. Functional groups and homologous series.

CHEMISTRY PRACTICALS I 1 credit, (3 hours/week) Compulsory

Objectives:

At the end of the course the students should be able to:

- State various safety precautions in the chemistry laboratory.
- Detect the presence of anions and cations using wet, dry and group analysis, carry out simple experiment involving acid-base titration.

Topics:

(a). Safety in the Chemistry laboratory precautions

(b). Qualitative Analysis

i). Detection of Anions: SO_4^{2}, SO_3^{2}, SO_5^{2}, NO_2, CO_3, HCO_2, Cl^-. Br^- and I^-

ii) Detection of cations: Groups l-6

(c). Volumetric analysis

i). Weighing

ii). Preparation of standard solutions

iii). pH scale and choice of indicator

iv). Acid -Base titrations: e.g. NaOH/HCl:H_2SO_4/NaOH

CHE114 CHEMISTRY METHODOLOGY I 1 Credit Compulsory

Philosophical elements of science education:

Objectives:

At the end of the course the students should be able to:

- Explain the nature and structure of science
- Explain the issues in science education

Topics:

Nature and structure of science

Role of science, the scientist, the science teacher and society

The concept or integration in science and chemistry

Other issues in Science Education:

Professional growth of the science/chemistry teacher Science, religion and culture

Science clubs and fairs

Exhibitions in chemistry

Conferences, clubs, seminars, symposia and Workshops

NCE 1 SECOND SEMESTER

CHE 121 INTRODUCTORY PHYSICAL CHEMISTRY 1Credit Compulsory

Objectives:

At the end of the course the students should be able to:

- Explain the key concepts taught
- Solve simple calculation of lattice energies using Born ~ Haber cycle
- Describe simple homonuclear diatomic molecules and ions.

Topics:

Valence bond theory. Molecular orbital approach (qualitative treatment only) Directional character of covalent bonds, hybrid orbitals. Hybridization involving orbitals of complex compounds. Hesenberg's rules, valence shell, electron pair repulsion. Resonance. Delocalized orbital. Bond length. Dipole moments. Partial covalent bond character, electronegativity and hydrogen bonding. Rare gases compounds. ionic crystals. Madelung constant. Calculations of lattice energies using Born~Haber cycle. The covalent bond. Description of simple homonuclear diatomic molecules and ions including CO and NO. Basic concepts of quantum mechanics.

CHE 122 INTRODUCTORY INORGANIC CHEMISTRY 1 Credit Compulsory

Objectives: At the end of the course the students should be able to:

- Mention the general properties of the element in relation to the periodic table
- Describe the procedure for the extraction of some metals

Topics: General properties of the elements in relation to the periodic table. Groups/family Periods of elements. Shielding effects. Nuclear charge. Stable configurations. Atomic and ionic radii. Characteristics of transition elements. Occurrence and extraction of the following metals: Aluminum, Sodium and Calcium.

CHE 123 INTRODUCTORY ORGANIC CHEMISTRY II 1 Credit Compulsory

Objectives:

At the end of the course the students should be able to:

- Decline concepts
- Name organic Compounds using IUPAC rules
- Differentiate between alkane, alkenes and alkynes From simple chemical reactions
- Explain the concepts of isomerism
- Able to relate the importance of petroleum to everyday life.

Topics:

Introduction to the rules of IUPAC nomenclature as compared with trivial or common names of compounds, Chemistry of the Alkanes: relative inertness, oxidation, halogenations, pyrolysis and catalytic cracking of Alkanes. Mechanism and orientation of halogenations. Chemistry of Alkenes and alkynes. Bond dissociation energy, heat of reaction, energy of activation, rate of reaction and transition state. lsomerism: Structural, geometrical and optical. Applied alkene chemistry: Petroleum chemistry, fuel and petrochemical, energy considerations. Brief elementary introduction to stereochemistry including elements of symmetry and chirality. Optical activity and operation of a polarimeter. Fischer projection and assignment of configuration cg D (1) 2,3 dihydroxypropanal (glyceraldehyde's).

CHE 124 CHEMISTRY PRACTICALS II 1 Credit (3 hours/week) Compulsory

QUALITATIVE ORGANIC ANALYSIS

Objectives:

At the end of the course the students should be able to carry out simple experiment to:

- Test for unsaturation,
- Elemental analysis of organic molecules and
- Test of Functional groups of organic compound

Topics:

- Test for unsaturation
- Detection of the following elements in organic molecules: **N, S, Cl, Br, I, C, H, O.**
- Detection of the following functional groups, carboxyl, hydroxyl, alkanoate, amine, alkanal and alkanone.
- Distinguishing the classes of amines Distinguishing alkanals from alkanones Distinguishing classes of alkanols.

CHE 125 CHEMISTRY LABORATORY TECHNIQUES 1 Credit Compulsory

Objectives: At the end of the course the students should be able to:

- To assemble, improvise and maintain simple equipment/apparatus

Topics:

(1). Management of the Chemistry laboratory
(2). Maintenance of equipment
(3). Improvisation of simple laboratory apparatus
(4). Setting up apparatus for demonstrating
  (a). Preparation of gases as in SSCE syllabus
  (b). Preparation of salts
  (c). Simple distillation
  (d). Steam distillation
  (e). Sublimation
  (f). Fractional crystallization
  (g) Paper chromatography
  (h). Heating under reflux
  (i). Using drying agents
(5). Determination of melting and boiling points
(6). Tests for oxidizing and reducing agents

CHE 126: APPLICATION OF MATHEMATICS TO CHEMISTRY 1 Credit

Objectives:

At the end of the course the students should be able to:

- To apply basic mathematical skills/Operation to solve problems in chemistry.
- To demonstrate competence in the use of various mathematical principles to facilitate the learning of chemistry

Topics:

Observation and measurement, precision of experimental measurements. SI Units of measurement, cg. distance, volume, concentration, time, mass, density, etc. Proportion: Application to mole concept, stoichiometry and volumetric analysis. Ratio, percentage, rates and reciprocals. Quadratic equation and indices. Standard forms and Logarithms, Application to pH calculations.

Graphical solution to simple equations and linear simple simultaneous equations. Application to equilibrium and kinetic calculations Plotting of graphs and estimating slopes intercepts etc. Application to physical chemistry problems Simple treatment of differentiation and integration of Functions (rational and algebraic Functions). Differential equations involving separable variables. Application to kinetic theory of gases, rate law and thermodynamics.

NCE II – FIRST SEMESTER

CHE 211 THE GASEOUS STATE 1 CREDIT Elective

Objectives

At the end of the course the students should be able to

- define the gas laws
- derive the ideal gas equation
- list instruments For measuring gas pressure
- state the Fundamental kinetic theory of gases
- derive gas laws From ideal gas equation

Topics:

The physical states of matter. Measurement of gas pressure, the barometer anti manometer, The gas laws: Boyle's law, Charles' law equation at state, and Dalton's law of partial pressures. ldeal gas equation: PV ~ nRT. Derivation from Boyle's and Charles' laws. Kinetic theory of gases. Derivation of the fundamental kinetic theory equation from the kinetic theory i.e. $PV - mne^2$.

The distribution of molecular velocities Derivation of gas laws from ideal gas equation. Determination of molecular mass of real gases. The nature of intermolecular forces and deviations from ideal behavior. The mean force path of gas molecules. The heat capacities of gases and the equi-partition of energy.

CHE 212 ENVIRONMENTAL AND INDUSTRIAL (CHEMISTR) 1 Credit Compulsory

(Industrial visit is a major requirement of this course)

Objectives: At the end of the course the students should be able to:

- list the different types of pollutants and their effects on the environment
- describe the techniques involve in some industrial processes
- list some of the means of contacting HIV and its preventive measures
- mention some sexually transmitted infections

Topics:

A study of the composition of soil and water. Environmental pollution: air, water and soil. Solvent extraction, ion exchange and their application to industrial trioxonitrate (V) acid, sodium hydroxide, washing soda, baking soda, soaps, detergents, glass, alcohol, matches, iron and steel. Production and utilization oil timber. Trips to related industries, a report should be written and this should form 20 00 of the continuous assessment. Acid rain formation and its effects on the environment. Oil pollution and its hazards. Environmental studies and HIV education (Le. HIV transmission, other sexually transmitted infections, body Abuse, prevention and control).

CHE 213 CHEMISTRY PRACTICALS III 1 Credit (3hours/week) Compulsory

REDOX TITRATIONS:

Objectives:

At the end of the course the students should be able to:

- manipulate equipment to carry out simple redox titration
- determine the partition coefficient of iodine between polar and non-polar solvents
- measure the pH of solutions

Topics:

Balancing of redox equations

Redox titrations using KMnO4 with iron (H) ammonium tetraoxosulphate (VI) and Sodiumdioxonitrate (III).

Iodine with $Na_2S_2O_35H_2O$.

Silver trioxonitrate (V) with sodium chloride and mixture of KClO; and K_2SO_4, $K_2Cr_2O_7$ with iron (II) Ammonium tetraoxosulphate (VI).

Determination of the partition coefficient of iodine between carbon tetrachloride and water.

Determination of molecular weight by freezing point depression.

Kinetic studies of hydrolysis of esters.

Measurement of pH using indicators.

Buffer solutions and pH meter.

CHE 214 NUCLEAR CHEMISTRY 1 Credit Elective

Objectives:

At the end of the course the students should be able to:

- define the concept of radioactivity classify nuclear reaction as artificial and natural
- state Einstein equation and its application in solving mention the uses and application of radioactivity
- Simple problems
- identify radioactive isotopes and calculate the half-life radioactive substances
- list the effects of nuclear reaction on the environment

Topics:

Nuclear stability. Natural artificial radioactivity: Alpha, beta and gamma rays.
Einstein's mass-energy equation. Kinetic calculations of half-life
identification of Radio Isotopes. Application and uses of radioactivity tracers, dating and nuclear reactors
Effects of nuclear reactions on the environment

CHE 215 CHEMISTRY OF NON-METALS 1 Credit Compulsory

Objectives:

At the end of the course the students should be able to:
list the chemical and Physical properties of non-metals.
State the differences and similarities among the groups V, VI & VII
describe the peculiarity of the first row elements and mention the factor responsible for the peculiarity 8 describe the extraction of sulphur
mention the types of oxides, hydrides and oxy acids formed by non .\ metals & their properties and uses

Topics:

Physical and chemical properties of non-metals. Group V, VI and VII. Extraction of sulphur. Peculiarity of the first row elements. Detailed treatment of group trends. Group similarities and differences. Simple inorganic compounds; hydrides, oxides and oxyacids including their properties and uses.

CHE 216 PROPERTIES OF IONIC COMPOUNDS 1 Credit Compulsory

Formation of ions, ionization Potential and electron affinity. Formation of an ionic solid Arrangement of ions in crystals. Diffraction of electro-magnetic radiation. Experimental methods of X-ray diffraction. Bragg's equation. The Structure of Sodium Chloride from X-ray diffraction. Avogadro's number from lattice dimensions. Effects of ion size on crystal geometry. Electrolytic solutions. Dissociation of strong and weak bases. Electromotive force and Galvanic cells. Faraday's laws and electrode reactions.

i). Position in the Periodic Table
ii). General characteristics (1^{st}, 2^{nd} and 3^{rd} row) of transition elements.
iii). Electronic structure of the atoms and ions (1^{st} row only)
iv). Bonding in transition elements
- Crystal Field Theory (CFT)
- Adjusted Crystal Field Theory (ACFT)
- Ligand Field Theory (LFT). Emphasis should be on CFT, while ACFT and LFT should be mentioned only.

v). Formation of complexes: lsomerism and stability of complexes
vi). Physical and chemical properties of 1^{St} row transition elements, their compounds and uses. Extraction of Fe
vii). Lanthanide contraction, chemical behavior and periodic comparison

CHE 217 LIQUID STATE AND COLLOIDS 1 Credit Compulsory

General comparison of solids, liquids and gases. The liquefaction of gases and the critical state. Vapour Pressure. Boiling point. Freezing point. Sublimation. Viscosity of liquids. Surface tension. Vapour pressure of solutions. Ideal solutions and Raoult's law. Non-ideal solutions and Henry's law. Boiling points of solutions containing Volatile compounds. Immiscible components. Dilute solutions containing non-volatile solutes. Colligative properties: Vapour Pressure lowering, boiling point elevation, freezing point lowering and osmotic pressure. The Nerrist Distribution law.

The colloidal state preparation and properties of hydrophilic and hydrophobic colloids. Stability of colloids. Separation of colloids. Surface phenomenon and adsorption Chromatography: gas, solid and liquid. Catalysis.

NCE II SECOND SEMESTER

CHE 321 ORGANIC CHEMISTRY I 2 Credits Compulsory

(MECHANISM IN EACH OF THE VARIOUS REACTIONS IN THE COURSE IS NECESSARY)

Objectives:

At the end of the course the students should be able to:

- a describe the geometry of saturated hydrocarbons
- identify electrophiles and nucleophiles in a chemical reaction
- state Markornikov's rules and its application unsymmetrical olefins
- describe the reactions of unsaturated hydrocarbons including dienes

Topics:

Chemistry and molecular geometry of alkanes. Electrophilic and nucleophilic addition. Oxidative cleavage and its application in structural determination (eg. Ozonolysis).
Relative stabilities of carbonium ions. The Markownikoff's rule: radical addition.
Reduction. Polymerization: addition of polymers from alkenes and vinyl compounds, natural and Synthetic rubber. Conjugated dienes: electrophilic 1,2- and 1,4-additions to conjugated dienes. Resonance orbital interaction. Alkynes chemistry: acidity of CE C and reactions of C≡C and reactions of –C≡C–

CHE 222 METAL, ALLOYS AND TRANSITION ELEMENTS 2 Credits

Objectives

Objectives:

At the end of the course the students should be able to:

- state the physical and chemical properties of metals and alloys
- state valence and molecular orbital theories as apply to solids
- classify compounds 33.00nductors, semi-conductors and insulators
- mention the properties of group I, II, III and IV elements
- identify the transition elements in the periodic table
- Write the electronic configuration of the 1st row transition elements
- Describe the physical and chemical properties of the 1st row transition elements, their compounds and uses,
- Explain the lanthanide Contraction.

Topics:

Physical and chemical properties of metals. Arrangement of atoms in metals. Bonding in metals. Valence bond theory of metallic bond.

Molecular orbital approach to the theory of solids. Free electron theory of metals.

Structure of pure metals. Insulators and semiconductors.

Alloy: classification of alloys.

Structure of simple allows, interstitial couples and bonding

Group 1/the Alkali metals. Group II/ the alkaline – earth metals. The elements of groups IIIA (Boron group). IVA (Carbon group)

CHE 223 CHEMISTRY PRACTIC'ALS IV 1 Credit, (3 hours/week) Compulsory

Objectives:

At the end of the course the students should be able to

- Describe the various separating techniques
- State the criteria for determining purity of a substance
- Verify Raoult's law for ideal solutions

Topics:

Separation techniques solvent – solvent extraction, column chromatography etc. Criteria for purity; Determination of melting point;
Determination of boiling point. Determination of solubility and solubility products. Determination of equilibrium constant. Verification of Raoult's Law.

CHE 224 BASIC ANALYTICAL CHEMISTRY AND RESEARCH TECHNIQUES

1 Credit Compulsory

Objectives:

At the end 0f the course the students should be able to:

- list the preliminaries title in a research work
- state the types of research design
- differentiate between precision and accuracy
- state the type of statistical tools for analysis a research work
- Identify the units of measurements of some qualities such as time, concentration, mass etc.

Topics:

a). Project work in Chemistry
- i). Title
- ii). Abstract
- iii). Introduction
- iv). Experimental
- v). Results
- vi). Discussion
- vii). Summary & Conclusion
- viii). References

b) Significant figures:
- i). Addition and subtraction
- ii). Multiplication and division

c). Measurement
- i). Accuracy
- ii). Precision
- iii). Error (concept, types, sources, control, estimation)

d). Measures of central tendency: mean, mode, median, ran e, co-efficient of variance, standard deviation

e). Test of significance
chi^2-Tetst and t-test

f). Units of concentration: moldm'3 (molarity), gdm^{-3} (mass concentration), molality, parts per million, percentage concentration

g). Titrations:
- i. Complexometrie titrations
- ii. Precipitation titrations

CHE 225 CHEMISTRY METHODOLOGY II 1 Credit Compulsory

Objectives:

At the end of the course the students should be able to:

- Mention and explain the various methods of teaching chemistry
- Differentiate between lesson note and lesson plan
- Identify the personnel involved in organizing chemistry laboratory
- State the criteria for selecting chemistry text books for use

Topics:

Trends in the teaching of chemistry. Lesson note preparation. Methods of teaching Chemistry. Demonstration, Guided discovery, Discussion, Activity, Tutorial, Project. Organization of the chemistry laboratory Duties of laboratory personnel (technologist, assistant, attendant) Record keeping in the chemistry laboratory Use of Audio-Visual in chemistry teaching (use of films, slides and overhead projector during a chemistry lesson). Computer Assisted Instruction (CA) Games and simulations, concept mapping Evaluation of chemistry textbooks

Practicum in Chemistry teaching (Microteaching)

NCE YEAR III FIRST SEMESTER

EDU 311
TEACHING PRACTICE

NCE III SECOND SEMESTER

CHE 321 CHEMICAL KINETICS 2 CREDITS COMPULSORY

Objectives:
At the end of the course the students should be able to:

- Define reaction rate and identify factors affecting rates of reaction
- Define and explain concepts related to chemical kinetics
- Differentiate between concepts related to chemical kinetics
- Differentiate between molecularity and order of reactions
- Describe the methods for determining reaction order
- List the methods for determining 1st order reaction
- Explain the various theories of reaction rate
- Use steady state approximation to derive theoretical rate law from reaction mechanism

Topics:

The reaction rate: Reaction order. Molecularity. The rate law. Experimental techniques for determining first order reactions. Derivation of firs-order kinetic equation. Example of first order reactions, second order reactions, third order reactions. The half-life of a reaction. Methods for determining the reaction order. Factors affecting rates of reactions. Solvent effects. The Arrhenius theory of reaction rates. The collision theory of reaction rates. The transition state theory of reaction rates, the activated complex relationship between Arrhenius and Transition state theories. Unimolecular gaseous decomposition reactions. Steady state approximation. Reaction mechanisms.

CHE 322 CHEMISTRY OF ALCOHOLS, CARBONYL COMPOUNDS AND MONOCARBOXYLIC ACIDS 2 Credits Compulsory

ALCOHOLS:

Objectives:
At the end of the course the students should be able to:

- Mention the methods of preparation , properties and uses of alcohol
- Describe the reaction of carbonyl compound
- State the Characteristic reactions of Carbonyl compounds
- Mention some reaction of carboxylic acids
- Differentiate between mesomeric and inductive effect
- State the reaction and preparation of some aromatic acid derivative.

Topic
Structure, nomenclature and properties
Methods of preparation
Uses

CARBONYL COMPOUNDS
Chemistry and reactivity of the carbonyl group. Structural Survey of alkana's and alkanones. General characteristics and nomenclature of alkanals and alkanones.
Similarities and contracts with other types of double bonded compounds. Nucleophilic addition to the Carbonyl group. Some examples of aliphatic and aromatic. Alkanones and Alkanals. Special topics related to carbonyl groups. Acetals, ketals and use as protecting groups.
Introduction to reactions of anolate ions. Keto-enol tautomerism. Simple aldol condensation and its synthetic utility. Halogenation of ketones, The haloform reactions. The Cannizaro reaction.

CARBOXYLIC COMPOUNDS
Chemistry of the carboxylic acids and derivatives. Polarity, structure and nomenclature of monocarboxylic acids, hydrogen bonding in carboxylic acids and its medication by inductive effects and mesomeric effects.
Some reactions of carboxylic acids. .
Some reactions or carboxylic acid derivatives e.g. anhydrides, acyl halides, esters and amides.
Synthesis and reactions of aromatic sulphonic acids.

CHE 323 NATURAL PRODUCTS AND AMINES 1 Credit Elective

Objectives:

At the end of the course the students should be able to:

- State the Composition, structure and functions of lipids in living organisms
- Mention the types of fatty acids
- Appreciate the economical application of lipids
- State and explain the classes of carbohydrates
- State the characteristics of amino-acids and amines

Topics:

Lipids. Triglycerides: structure, composition and functions in living organisms. Types of fatty acids encountered in lipids. Commercial applications as soaps, edible oils and fats, etc. Carbohydrates: aldoses and ketoses. General features, configuration in relation to 'glyceraldehydes. Aldohexoses structure and chemical reaction. Disaccharides, sucrose, maltose, lactose, etc. Polysaccharides starch, cellulose, etc. Brewing. Proteins: Properties, structure, nomenclature, synthesis and uses. Amino-acids: Their dipolar nature and relationship to proteins. Amines and derivations: General characteristics and nomenclature of amines; structure, physical and chemical properties. Amines as nucleophiles: General reaction of aliphatic and aromatic amines. Quatemacy ammonium compounds. Hoffman Benzene diazonium salts and their reactions.

CHE 324 CHEMICAL EQUILIBRIUM AND THERMODYNAMICS 2 CREDIT

Objectives

At the end of the course the students should be able to:

- Define thermodynamics terms and principles
- State and explain the laws of thermodynamics
- Derive the relationship between heat of reaction at constant pressure and volume
- Explain the dependence of heat capacity and enthalpy of reaction on temperature
- Explain the interdependence of Gibb's fee energy with equilibrium constant, entropy change and temperature
- Define chemical equilibrium and state factors affecting chemical equilibrium
- Determine the pH of solutions
- State the effects of common ions on the solubility of salts
- Calculate the equilibrium constants of ionic salts
- Explain phase rule

Topics:

The nature of thermodynamics. Definition of some thermodynamic terms, including temperature. The first law of thermodynamics. Enthalpy, heat capacity of gases. Reversible adiabatic processes. Thermochemistry, standard states, enthalpy of reactions. Hess's law, relationship between heat of reaction at constant pressure and at constant volume.

Heat of solution, enthalpy of formation of ions in solution. Bond energies, dependence of heat capacity and enthalpy of reaction on temperature. The second law of thermodynamics. Bohr Energy Circle, molecular interpretation of entropy. Examples of entropy calculations. Criteria for equilibrium. The work function and Gibb's free energy. Free energy and the equilibrium constant, equilibrium between phases.

The Claperon equation

The third law of thermodynamics

Law of chemical equilibrium. Equilibrium constant expressed in different units. Variables affecting chemical equilibrium. Effects of pressure, temperature, concentration and catalyst. Aqueous solutions of weak acids and bases. The ionization of water and the pH scale. Buffer solutions.

Polyfunctional acids and bases. Hydrolysis. salts of a weak acid and a weak base. Metallic ions, salts of dibasic acid.

Titration of acids and base3s: strong acids and strong bases, weak acids and weak bases, indicators, complex ion equilibrium. Equilibrium between ions in the solid and liquid phases. Solubility and solubility products: effect of a common ion on the solubility of slightly soluble salts. Equilibrium in systems containing solid and gaseous phases. Phase rule. One component system and two component systems.

CHE 325 CHEMISTRY PRACTICALS V 1 CREDIT (3 HOURS/WEEK) COMPULSORY

Objectives:

At the end of the courses the students should be able to:

- Synthesize and characterize inorganic complex and benzene derivatives

Determine enthalpies of neutralization and combustion
Test for food content

Topic:

Synthesize and characterization of inorganic complexes.
Determination of enthalpies of neutralization and combustion.
Synthesize of some benzene derivatives
Tests for proteins, carbohydrates, sucrose, glucose and lipids

Notes C = Compulsory
E = Elective