THE COLLEGE OF THE BAHAMAS
SCHOOL OF NATURAL SCIENCES & ENVIRONMENTAL STUDIES
CHEMISTRY DEPARTMENT

CHEM 136 – COLLEGE CHEMISTRY FOR HEALTH SCIENCE

COURSE OUTLINE

RATIONALE:

It is important that Health Scientists have a good under standing of Chemistry and its relationship to life processes.

COURSE OBJECTIVES

Upon completion of this course, under the subheadings listed below, students should be able to:

1. NUCLEAR REACTIONS

(a) explain what is meant by radioactivity
(b) name the thee types of nuclear radiation
(c) explain the terms nuclear
(d) write nuclear equations
(e) explain the tem "half-life"
(f) define the following units of radiation-curie, roentgen, rad, and rem.
(g) explain what is mean by LD_{50}^{30}
(h) explain how radiation can damage cells
(i) explain and give examples of stage one and stage two radiation effects
(j) discuss the use of some radioactive isotopes used in medical diagnosis and therapy
(k) explain the three methods by which radiation can be delivered to malignant tissue-teletheraapy

2. BONDING

(a) explain the emission spectrum of hydrogen in terms of energy levels
(b) write the electronic configuration of elements in the forms of $1s^2$ $2s^2$ ... etc.
(c) discuss trends of some fundamental properties in the periodic table as related to atomic structure
(d) state the different types of chemical bonding and relate bond type to atomic size, electronegativity, ionization energy and electron affinity of bonding atoms.
(e) recognize that all types of bonding are electrostatic in nature

3. REACTION KINETICS

(a) state the factors which affect the rate of chemical reactions
(b) deduce the rate law and order of a reaction from experimental data
(c) discuss the collision theory of enzyme activity
(d) discuss the lock and key theory of enzyme activity
(e) discus factors which affect enzyme activity
(f) define the terms substrate, apoenzyme, cofactor coenzyme, activator, prosthetic group, holoenzyme, zymogen

4. SOLUTIONS AND SOLUTION EQUILIBRIA

(a) discuss the differences among a true solution, a collodial dispersion and a suspension
(b) describe the process of diffusion and osmosis and relate these to crenation, haemolysis, dialysis and haemodialysis, and the transport of substances in the body
(c) calculate the concentration of solutions in molarityy gram per dm^3 volume-volume percent, weight-volume percent, equivalent per dm^3, and be able to inter-convert these units

(d) perform calculations involving dilution of solution
(e) explain what is meant by a system in dynamic equilibrium
(f) write equilibrium expressions for various homogeneous and heterogenous systems in equilibrium
(g) state Le Chatelier's principle and apply it to equilibrium systems
(h) state the Bronsted-Lowry theory of acids and bases and apply it to acqueous and non-acqueous systems
(i) define pH and pOH
(j) calculate pH from hydrogen ion or hydroxide ion concentration
(k) calculate the pH of solutions of strong acids, strong bases weak acids, weak bases
(l) explain what is meant by a buffer solution
(m) discuss the functioning of carbonic acid/bicarbonate system in blood
(n) discuss how respiratory and metabolic acidosis and alkalosis occur

5. INTRODUCTION TO ORGANIC CHEMISTRY

(a) identify structural characteristics of the four classes of hydrocarbons
(b) state the typical reactions of alkanes, alkenes and benzene
(c) identify the main functional groups found in organic molecules and name organic compounds according to IUPAC rules
(d) illustrate the different types of structural isomerism and steoreoisomerism

6. ALCOHOLS, ALDEHYDES, KEYTONES, ETHERS

(a) distinguish primary, secondary, and tertiary alcohols in terms of chemical structure and reactivity
(b) write equations for the typical reactions of alcohols, ethers, aldehydes and ketones
(c) give some examples of some medicinal uses of some alcohols, phenols, ethers aldehydes and ketones

7. ORGANIC ACIDS AND THEIR DERIVATIVES

(a) differentiate between saturated and unsaturated acids
(b) write equations for the conversions of carboxylic acids to esters and anhydrides including phosphorylated anhydrides
(c) write equations for the decarboxylation of carboxylic acids
(d) write equations for the hydrolysis of esters (including triglycerides) and anhydrides
(e) give examples of medicinal uses of some carboxylic acids and their derivatives

8. AMINES AND THEIR DERIVATIVES

(a) distinguish among primary, secondary and tertiary amines in terms of chemical structure
(b) write equation for the systhesis and hydrolysis of amides
(c) give examples of medicinal uses of some carboxylic acids and their derivatives
(d) write the general formula of an amino acid
(e) write the structure of a zwitterion and state what is meant by isoelectric point of an amino acid
(f) relate the acid-base properties of amino acid to chemical structure
(g) write equations to illustrate peptide bonding
(h) describe what is meant by the primary, secondary and tertiary and quarternary structure of proteins.
(i) state at least three ways in which proteins can be denatured
(j) describe tests for proteins

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9. CARBOHYDRATES

(a) classify carbohydrates as aldoses or ketoses
(b) classify carbohydrates as monosaccharides, dissaccharides or polysaccharides,
(c) classify monosaccharides as trioses, tetroses, pentoses, etc.
(d) classify sugars as reducing on non-reducing
(e) write the open chain and Haworth structure of glucose, galactose, fructose and ribose
(f) write the formulae of sugars and derived sugars encountered in carbohydrate metabolism
(g) discuss reactions of monosaccharides as alcohols, aldehydes or ketones
(h) define glycogenesis and glycogenelysis
(i) discuss hypoglycaemia, hyperglycaemia and the glucose tolerance test
(j) describe the Molisch and\Benedict's tests

10. ENERGY AND BIOCHEMICAL REACTIONS–CARBOHYDRATE METABOLISM

(a) define anabolism, catabolism, metabolism
(b) recognize the role of ATP in the storage and release of energy
(c) write an overall equation for cellular respiration
(d) write an overall equation for anaerobic glycolysis
(e) outline the essential reactions and discuss the essential features of the glycolytic sequence
(f) outline the essential and discuss the essential features of Krebs cycle
(g) discuss the processes involved in the
(h) state the function of the cytochrome system
(i) write the overall reaction for the reaction for the respiratory chain
(j) account for the total number of mole of ATP formed in the Emden-Meyerhof and Krebs cycle

11. MAJOR METABOLIC PATHWAYS

(a) discuss the process of lipid catabolism
(b) discuss the major features of lipid anabolism and calculate the ATP yield from the oxidation of a lipid
(c) discuss the major features of protein anabolism
(d) discuss the major features of protein catabolism including deamination and decarboxylation
(e) recognize the major linkage points among carbohydrate, lipid and protein metabolism

TEXT: LIVING CHEMISTRY 'AN INTRODUCTION TO GEN. ORGANIC & BIOLOGICAL CHEMISTRY, 2nd Ed. HARCOURT BRACE-JOVANOVICH, 1986

EVALUATION

Assignments & Tests	15%
Mid-tem Test	15%
Laboratory	20%
Final Examination	50%
Total	100%