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

CHEM 135 – COLLEGE CHEMISTRY I

COURSE OUTLINE

1. FURTHER QUALITATIVE ANALYSIS (1 wk.)
   Tests for cations based on solubilities of their hydroxides: Ca^{2+}, Mg^{2+}, Al^{3+}, Zn^{2+}, Pb^{2+}, Cu^{2+}, Ag^{+}, Fe^{2+}, Fe^{3+}
   Tests for anions: SO_4^{2-}, NO^{3-}, CO_3^{2-}, CI^{-}, Br^{-}, I^{-}
   Writing ionic equations to summarise these tests

2. GASES (2 wks.)
   The kinetic theory of gases (qualitative treatment, without derivation), including the Maxwell-Boltzmann distribution. The gas laws, Avogadro's Hypothesis, the general gas equation. Dalton's Law of Partial Pressures, Graham's Law of Diffusion. Calculations based on these laws. Differences between ideal and real gases.

3. STOICHIOMETRY (4 wks.)
   Revision of laws relating to chemical combination. Revision and development of the mole concept. Concentration, including making up of solutions and dilutions. Calculation of empirical and molecular formulae. Simple problems involving the interpretation of balanced equations, including calculations on quantitative electrolysis. Masses and volumes of products and reactants, including gases. Gay-Lussac's Law. Introduction to volumetric analysis. Limiting reagents, percentage yield. How to set out calculations clearly.

4. ATOMIC STRUCTURE AND BONDING (2 ½ wks.)
   Electronic configuration of atoms, to include s, p and d sublevels, and the notation of this. Orbitals, but only in terms of shapes of s and p orbitals and rules for orbital filling, lonisation energy, electron affinity, electropositivity, electronegativity (general trends only, but including relating ionisation energy patters to electron energy sub-levels). Ionic, covalent, dative covalent, and metallic bonding. Relating electronic configurations to blocks in the Periodic Table. Relating properties and bond types to the Periodic Table. Intermolecular forces, including hydrogen bonding, dipole-dipole attraction, Van der Waal's forces. Electronegativity related to bond type. Atomic, metallic, ionic, covalent and Van der Waal's radii. Relationship between properties and intermolecular forces and types of bonding. Shapes of molecules and molecular ions predicted using the V.S.E.P.R. theory. Resonance and delocalisation of electrons (not orbital treatment).

5. THERMOCHEMISTRY (2 ½ wks.)
   Heat and temperature. Exothermic and endothermic reactions. Enthalpy. Molar and specific heat capacities. Standard states and standard enthalpies (fusion, vaporisation, sublimation, reaction, formation, combustion) lonisation energy, electron affinity, lattice energy. Hess's Law including calculation of heats of reaction from heats of formation and heats of combustion. Bond energy term and bond dissociation energy. Calculations based on bond energy terms.

SCIENTIFIC MEASUREMENT, UNITS, AND ERRORS

S.I. units, scientific notation, significant figures, precision and accuracy. Rounding off numbers, unit conversion. Dimensional analysis. This material will not be taught as a separate topic, but rather as and when required throughout the rest of the course.

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LABORATORY WORK

The laboratory work translates the theoretical principles met in the course into practical laboratory situations. Laboratory handbooks/manuals will be issued.

1. Tests for the Identification of Common Metal Ions in Solution
2. Tests for the identification of Common Anions in Solution
3. Identification of Five Unknown Substances
4. An Examination of the Errors Involved in the Measurement of Volume
5. A Determination of the Value of the Gas Constant
6. The Determination of the R.M.M. of a Volatile Organic Liquid
7. The Standardisation of Dilute Hydrochloric Acid Solution
8. The Standardisation of Dilute Sodium Hydroxide Solution
9. The Standardisation of Dilute Potassium Manganate (VII) Solution
10. A Determination of the Enthalpy of Neutralisation of a Strong Acid

EVALUATION

Tests and Assignments	15%
Laboratory Work	20%
Mid-term Examination	15%
Final Examination	50%

TEXTBOOK

John C. Bailar, Therald Moeller, Jacob Kleinberg, Mary E. Castellion, Clyde Metz: Chemistry. Latest International Edition. Publishers: Harcourt Brace Jovanovich
ISBN 0-15-506460-6

READING LIST

Bodner, G. and Pardue, H.L.: *Chemistry; an Experimental Science* 1st edition. Wiley, 1989. ISBN 0-471-87053-6 QD 33. 2. B684

Brady, J.E. and Holum, J.R.: *Fundamentals of Chemistry* 3rd Edition. Wiley, 1988 ISBN 0-06-040805-7 QD 31. 2. B69

Hill, J.C. and Holum, J.S.: *Chemistry in Context*. 2nd Edition. Nelson, 1983
ISBN 0-17-438356-8 QD 33. H54

Ramsden, E.N. *A-Level Chemistry*. Latest Edition. Stanley Thornes Ltd.