

COURSE OUTLINE 2018/2019

Faculty	: Science & Technology	
Department	: Chemistry & Chemical Technology	
Course title	: General Chemistry	
Course code	: C1401	
Course weighting	: Course Work (Tests and Practicals) : Exam 50:50	
Student Quota	: Not specified	
Course type	: Compulsory	Course Duration: One Semester
Course Instructors	: M. Sekota	Office number: SCN228

Course synopsis

The course deals with atoms, molecules, and ions. Chemical reactions, Periodicity of elements and their reactions. Bonding and molecular Geometry.

Course aims

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

- Demonstrate understanding of basic concepts of general chemistry i.e the crucial basic building blocks: in particular the meaning and use of chemical formulas and reaction equations, the use of the mole and calculations with it.
- Incorporate the knowledge above to study reactions, how and why they occur by the application of structures of molecules and materials and how they interact.
- Identify and explain what is occurring in chemical reactions, giving reasons why and how changes occur.
- To calculate quantities of matter and the energy that relates to those changes.
- Carry out basic laboratory experiments and link it with theory and write report on their findings.

Course Objectives

The course serves as a prerequisite to all chemistry courses offered by the university. It encourages students to learn rules ideas and concepts and to apply them in solving chemical problems. It also emphasizes on application of logic and relevant understanding to solving chemical problems while working on increasing the understanding which can then be applied successfully to new problems.

Grade descriptions

The general descriptor of grades for A, C and F are as follows:

A	Students will be able to relate facts to principles and theories and vice versa, select and collate information from a number of sources and present it in a clear logical form, use a wide range of variables to solve problems, identify, select and process useful data relevant to solving a problem in hand, and apply this even to unfamiliar problems,
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	generate a hypothesis to explain facts, or find facts to support hypothesis.
C	Students will be able to link facts to situations not mentioned in class, describe correct procedures to multi-stage operation, select a range of information from a given source and present it in a clear logical form, identify patterns to trends in given information, solve problems involving more than one step but with a limited number of variable, generate a hypothesis to explain a given set of facts and data.
F	Students will be able to recall facts from material in class, indicate a correct procedure to a limited step operation, select and present a limited amount of information from a given source, solve problems involving a very limited number of steps, identify trends with guided information or where minor manipulation is required, match a few given hypothesis to observed facts or data.

Course content

Introduction (about 12 lectures) Revision

of basic ideas in Chemistry:

- mixtures & pure substances, elements and compounds;
- laws of conservation of mass and definite proportions;
- Measurements, Significant figures, SI units etc
- Dalton's atomic model for matter;
- atomic structure: Thompson, Mulliken and Rutherford's findings: nuclear atom; isotopes, relative atomic masses of elements;
- moles: molar masses, mole ratios from equations, calculations of moles and masses, limiting reagents, empirical formula, molecular formula;
- Periodic Table: general arrangement; metals & non-metals, ionic compounds, ion charges, formulas & names;
- electron configuration of atom: quantum numbers
- molecular compounds: diatomic molecules; covalent bonding as sharing pairs of electrons; valency rules; introduction to electron-dot diagrams

TEST 1

2. Chemical Reactions (about 9 lectures)

This is mainly focused on understanding reactions and calculations thereof.

- simple description (combination, decomposition, replacement, metathesis reactions); and classification (precipitation, acid-base, redox)
- aqueous solutions and ions: strong and weak electrolytes; ionic equations;
- precipitation reactions – solubility rules;
- acid-base reactions: reaction of H^+ or OH^- , transfer of H^+ ; neutralization reaction, acid + insoluble oxide/hydroxide; soluble hydroxides from oxides; H^+ and anions of weak acids; OH^- and ammonium salts;
- redox: simple ideas of oxidation and reduction; role and transfer of electrons; activity series of metals; oxidation number, redox processes and half equations; balancing redox equations;
- molar concentrations; volumetric analysis calculations

3. Periodicity (about 4 lectures)

- a. atomic properties: atomic and ion size, ionization energy, electronegativity; shell structure of atom and effective nuclear charge;
 - b. brief introduction to periodic group behaviour (I, II, IV, and VII)
- properties of elements, oxides, oxoacids, chlorides, hydrides and oxidation numbers across the 3rd period;

TEST 2

4. Covalent Bonding and Molecular Geometry (about 6 lectures)

- a. reminder of ionic solids: ionic lattice, energy to create ions, and stabilization from lattice energy;
- b. molecules: sharing electron pairs and stabilization, method for constructing electron-dot diagrams – octet limitation only for outer atoms and second period;
- c. Lewis structures and formal charges, simple idea of delocalization (resonance);
- d. shapes of molecules – VSEPR model;
- e. bond strength, length, and polarity;
- f. giant covalent lattices, metals.

TEST 3

1st SEMESTER EXAM

Prescribed text book:

- D.D. Ebbing, S.D. Gammon, *General Chemistry*, Ninth and Tenth Edition, Cengage Learning, Brooks/Cole(2009)

Other recommended books:

- J.C. Kotz, P.M. Treichel, G.C. Weaver, *Chemistry and Chemical Reactivity*, sixth Edition, Thompson, Brooks/Cole(2004)
 - S.S. Zumdahl, D.J. DeCoste, *Chemical Principles*, seventh Edition, Cengage Learning, Brooks/Cole(2012)
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