UNIVERSITI TEKNOLOGI MARA

CHM083: CHEMISTRY FOR PRE SCIENCE

Course Name (English)	CHEMISTRY FOR PRE SCIENCE APPROVED
Course Code	CHM083
MQF Credit	4
Course Description	This course will interactively engage students cognitively and scientifically in areas of structure of an atom, mole concept, chemical formulae and chemical equations, aqueous solutions, periodic table, chemical bonding, electrochemistry and introductory organic chemistry. Students will explain concepts and theories, make predictions as to the possible outcome of an event, perform investigations via laboratory work and exercises; and in both verbal and writing, discuss the relationships and results obtained with peers and facilitators. The designated lecture session is used to discuss results of investigations leading to its relation to the existing concept, principles or theories. Lecture sessions employ a mixture of lectures and active learning (self and peer discussions). The outcomes shall be assessed through a variety of tools which include the traditional paper examination, scientific investigation and presentation of assignment.
Transferable Skills	confident
Teaching Methodologies	Lectures, Lab Work, Tutorial
CLO	CLO1 Explain the concepts and theories in basic chemistry. CLO2 Display practical skills and techniques for scientific investigation related to concepts and theories in basic chemistry. CLO3 Demonstrate effective verbal communication on the concepts and theories in basic chemistry.
Pre-Requisite Courses	No course recommendations

Topics
1. Structure of an atom 1.1) 1.1 Definition of atom, ion, molecule, element and compound 1.2) 1.2 Sub particles; proton, electron and neutron (charge and relative mass of each sub particle 1.3) 1.3 Atomic/ proton Number and Mass / Nucleon Number (definition) 1.4) 1.3.1 Symbol of an element 1.5) 1.3.2 Determination of sub particles in atom and ion 1.6) 1.4 Isotopes 1.7) 1.4.1 Definition and examples of isotopes 1.8) 1.5 Electronic structure of an atom 1.9) 1.5.1 Shell (K, L, M, N) and orbital (s, p, d, f) (No need to detail out the n, l, m and s quantum numbers. Show the relative energy level of subshell/ orbital s, p, d, f) 1.10) 1.5.2 Writing electron configuration of atoms and ions for the first 20 elements in the Periodic Table according to the shell and subshell
2. Mole concept 2.1) 2.1 Atomic mass unit (a.m.u), atomic mass, relative molecular mass and molar mass 2.2) 2.2 Mole concept 2.3) 2.2.1 Mole and mass 2.4) 2.2.2 Mole and Avogadro's number (NA) 2.5) 2.2.3 Mole and molar volume of gas 2.6) 2.3 Percentage composition of elements 2.7) 2.4 Empirical formula and Molecular formula 2.8) 2.4.1 Definition 2.9) 2.4.2 Examples of calculation

3. Chemical Formulae and Chemical Equations
3.1) 3.1 Formation of chemical formula
3.2) 3.2 Naming of chemical compounds (ionic, covalent and acid compounds)
3.3) 3.3 Writing and balancing chemical equations
3.4) 3.3.1 Steps in balancing equation
3.5) 3.4 Stoichiometry
3.6) 3.4.1 Calculation on quantity of reactants and products involved in simple chemical equation. Examples to show relationship between:
3.7) a) Mole and mole
3.8) b) Mole and mass
3.9) c) Mole and volume of gas

4. Aqueous Solutions
4.1) 4.1 Introduction to solutions (Definition of solvent and solute)
4.2) 4.2 Concentration and molarity of solutions
4.3) 4.2.1 Calculation of number of moles in solutions
4.4) 4.2.2 Units for concentration
4.5) a) g/dm3
4.6) b) mol/ dm3
4.7) 4.2.3 Calculation of concentration and molarity
4.8) 4.2.4 Emphasis on conversion of units: cm3, mL, dm3, L
4.9) 4.2.5 Definition and preparation of standard solution
4.10) 4.3 Dilution of solution: M1V1=M2V2
4.11) 4.4 Concept of acids- bases neutralization (strong acid and strong base)
4.12) 4.4.1 Definition of acid and base by Arhenius, Bronsted –Lowry and Lewis
4.13) 4.4.2 Definition and properties of strong acid, strong base, weak acid and weak base
4.14) 4.4.3 Calculation involving concentration and molarity, pH and pOH
4.15) 4.4.4 Application of the formula: MaVa = a
4.16) MbVb b

5. Periodic Table
5.1) 5.1 Classification of elements based on atomic number
5.2) 5.1.1 Definition of groups and periods
5.3) 5.1.2 Correlation of electron configuration with the groups and periods
5.4) 5.2 Definition:
5.5) 5.2.1 Size of atoms and ions
5.6) 5.2.2 Electronegativity and electropositivity
5.7) 5.2.3 Ionization energy and electron affinity
5.8) 5.3 Changes in physical properties of elements moving down the groups (group 1 to 17) and across the periods (period 1 to 3)
5.9) 5.3.1 Size of atoms and ions
5.10) 5.3.2 Electronegativity and electropositivity
5.11) 5.3.3 Ionization energy and electron affinity
5.12) 5.4 Changes in chemical properties across period 3
5.13) 5.4.1 Metallic properties
5.14) 5.4.2 Properties of oxide

6. Chemical bonding
6.1) 6.1 Introduction to chemical bonding
6.2) 6.1.1 Lewis structure (cross dot structure)
6.3) 6.1.2 Electrovalent/ ionic bonding. Example NaCl, CaO and others (excluding transition metals)
6.4) 6.1.3 Covalent bonding. Example CCl4, H2O and others (limited to compounds which obey octet rules)
6.5) 6.2 Illustrate the formation of electrovalent and covalent bonding based on Lewis structure (examples of compound conform to octet rules only and not involving polyatomic ions.)
6.6) 6.3 Differences in physical properties of electrovalent and covalent compounds

7. Electrochemistry I
7.1) 7.1 Introduction to electrical conductivity
7.2) 7.1.1 Conductor and non-conductor
7.3) 7.1.2 Electrolyte and non-electrolyte
7.4) 7.1.3 Strong electrolyte and weak electrolyte
7.5) 7.2 Electrolysis
7.6) 7.2.1 Definition
7.7) a) Electrolysis
7.8) b) Reduction and oxidation process
7.9) 7.2.2 Reactions at the electrodes
7.10) a) Products of electrolysis of molten salts. Example PbBr2
7.11) b) Products of electrolysis of aqueous solution (concentrated and dilute solution). Example NaCl
7.12) 7.3 Factors affecting the selective discharge of ions
7.13) 7.3.1 The position of ions in the Electrochemical series
7.14) 7.3.2 The concentration of electrolyte
7.15) 7.3.3 The type of electrodes referring to:
7.16) a) Aqueous solution of CuSO4 using
7.17) i. Inert electrode (C/ Pt)
7.18) ii. Cu electrode
7.19) b) Aqueous solution of AgNO3 using
7.20) i. Inert electrode (C/ Pt)

7.21) ii. Ag electrode

8. Introduction to Organic Chemistry
8.1) 8.1 Definition
8.2) 8.1.1 Organic compounds
8.3) 8.1.2 Hydrocarbon
8.4) 8.1.3 Homologous series
8.5) 8.1.4 Functional group
8.6) 8.1.5 General formula
8.7) 8.2 Introduction to homologous series
8.8) 8.2.1 Characteristics
8.9) 8.2.2 Example of homologous series and functional groups: Alkane, Alkene, Alkyne, Alcohol, Aldehyde, Ketone and Carboxylic Acid
8.10) 8.3 Alkanes
8.11) 8.3.1 General formula
8.12) 8.3.2 IUPAC nomenclature of alkanes (C1- C10) and alkyl group (C1- C4)
8.13) 8.3.3 General physical properties of aliphatic alkanes such as physical state, boiling point and density (exclude Cyclic alkanes)
8.14) 8.3.4 Chemical properties
8.15) a) Combustion of alkanes
8.16) b) Substitution reactions of alkanes (Halogenation)

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	Assignment and presentation in groups. Topics are based on syllabus. Long syllabus can be divided into more than one group.Suggested two to three students per group. Duration for presentation is 5-10 minutes per group.	20%	CLO3
Lab Exercise	3 lab session (dry lab). Students need to submit 3 lab report. Format of lab report just like diploma level. Preparation of lab report in term of formatting guided by the lecturer.	20%	CLO2
Test	Test questions mimics Final Examination formatting with Objectives and Subjective question covering chapter 1, 2, and 3.	20%	CLO1

Reading List

Reference Book Resources

- **Hanani Yazid, Marina Mokhtar, Nor Aimi Abdul Wahab, Nurzawani Md Sofian 2016, *Questions and Solutions: Fundamentals of Chemistry*, 1st Ed., Oxford Fajar [ISBN: 9789834715175]**
- **S. Zumdahl 2016, *Introductory Chemistry: A Foundation*, 4th Ed., Thomson Brooks/Cole [ISBN: ISBN-10 03959]**
- **Leo J. Malone, Theodore O. Dolter in collaboration with Steven Gentemann 2013, *Basic Concepts of Chemistry*, 9th Ed., Hoboken, NJ : John Wiley & Sons [ISBN: 9780470938454]**
- **Steven S. Zumdahl,Susan A. Zumdahl 2008, *Chemistry*, 8th Ed., Cengage Learning [ISBN: 9780547125329]**
- **Mohd Zuli Jaafar, Sheikh Ahmad Izaddin, Mazni Musa 2009, *The workbook of basic chemistry I*, UPENA Shah Alam [ISBN: 9673051321]**
- **Mohammad Isa Mohamadin,Ropisah Me,Sheikh Ahmad Izaddin Sheikh Mohd Ghazali,Mazni Musa, *LABORATORY MANUAL For Basic Chemistry*, 1st Ed., UPENA Shah Alam [ISBN: 9789673633562]**

Article/Paper List: This Course does not have any article/paper resources

Other References: This Course does not have any other resources