UNIVERSITI TEKNOLOGI MARA

CHM131: GENERAL CHEMISTRY

Course Name (English)	GENERAL CHEMISTRY APPROVED
Course Code	CHM131
MQF Credit	3
Course Description	This is an introductory course to provide students a firm foundation in general chemistry. The course covers measurement in scientific study, stoichiometry, gases, atomic structure, periodic table, chemical bonding and redox reaction.
Transferable Skills	Demonstrate ability to identify and articulate self skills, knowledge and understanding confidently and in a variety of contexts.
Teaching Methodologies	Lectures, Blended Learning, Lab Work, Case Study, Tutorial, Discussion
CLO	CLO1 Apply the basic concepts and principles of chemistry in properties and interactions of matter. CLO2 Perform (plan, conduct and analyze outcomes of) scientific investigations on basic chemistry concepts and theories. CLO3 Demonstrate effective verbal communication on the basic concepts and theories of chemistry in properties and interactions of matter.
Pre-Requisite Courses	No course recommendations

Topics
1. Units of Measurement in Chemistry 1.1) 1.1 S.I Unit of Mass, Length, Time, Temperature and Amount of Substance 1.2) 1.2 Conversion of S.I units in Chemistry 1.3) 1.3 Significant Figures and Scientific Notation
2. Atoms, Molecules, Ions, and Chemical Equations 2.1) 2.1 The structure of atom 2.2) 2.2 Atomic Symbol, Atomic Number, Mass Number, Isotopes, Molecules, Ions, Molecular Formula, Empirical Formula and Formula of Ionic Compounds 2.3) 2.3 Naming Compounds 2.4) 2.3.1 Ionic Compounds 2.5) 2.3.2 Molecular Compounds 2.6) 2.3.3 Acids and Bases 2.7) 2.3.4 Hydrates 2.8) 2.4 Balancing of Chemical Equations 2.9) 2.5 Atomic Mass, Molecular Mass, Formula Mass 2.10) 2.6 Mole Concepts, Avogadro's number, Molar Mass 2.11) 2.7 Mole Calculations 2.12) 2.8 Stoichiometric Calculation, Limiting Reactants and Percent Yields.
3. The Electronic Structure of Atoms and Periodicity 3.1) 3.1 Introduction to Hydrogen Emission Spectrum, Bohr's Theory 3.2) 3.2 Quantum numbers 3.3) 3.3.1 Principal Quantum Number, n 3.4) 3.3.2 Angular Momentum Quantum Number, l 3.5) 3.3.3 Magnetic Quantum Number, m 3.6) 3.3.4 Electron Spin Quantum Number, s 3.7) 3.3 Atomic Orbital Shapes (limited to s and p orbital only) 3.8) 3.4 Arrangement of electrons 3.9) 3.4.1 The Pauli Exclusion Principles 3.10) 3.4.2 Hund's Rule 3.11) 3.4.3 Aufbau's Principles 3.12) 3.4.4 Electronic Configuration of Atom and Ion: s,p,d,f Notation and Orbital Diagram (including the exceptions)

3.13) 3.5 Periodic Trends of Elements
3.14) 3.5.1 Importance of Atomic Number in the Classification of Elements (Periods and Groups)
3.15) 3.5.2 Radii of Atoms and Ions
3.16) 3.5.3 Ionization Energy
3.17) 3.5.4 Electron Affinity
3.18) 3.5.5 Electronegativity.

4. Chemical Bonds
4.1) 4.1 Definition of the Chemical Bond, Valence Electrons, Noble Gases and Octet Stability
4.2) 4.2 Lewis Electron Dot Symbols, Structure and Formal Charge
4.3) 4.3 Octet Rule and It Exceptions
4.4) 4.4 Ionic Bond, Covalent Bond and Dative Covalent Bond
4.5) 4.5 Valence-Shell Electron Pair repulsion (VSEPR) Theory and Molecular Shape
4.6) 4.6 Dipole Moment and Bond Polarity
4.7) 4.7 Introduction to Intermolecular Forces: Van der Waals Forces (ion-dipole forces, dispersion forces, dipole-dipole forces) and Hydrogen Bond
4.8) 4.8 Effect of intermolecular forces on melting and boiling point of substance

5. Oxidation and Reduction Reactions
5.1) 5.1 Definition of Oxidation and Reduction based on:
5.2) 5.1.1 Transfer of hydrogen
5.3) 5.1.2 Transfer of oxygen
5.4) 5.1.3 Transfer of electrons
5.5) 5.1.4 Change in oxidation number
5.6) 5.2 Determination of Oxidation Number of Elements in Compounds
5.7) 5.3 Definition of Reducing and Oxidizing Agent
5.8) 5.4 Balancing Redox Equations in Acidic and Basic Medium

6. The Gaseous State
6.1) 6.1 Kinetic Molecular Theory
6.2) 6.2 Gas Pressure
6.3) 6.3 The Ideal Gas Law
6.4) 6.3.1 Boyle's law
6.5) 6.3.2 Charles's law and Gay-Lussac's law
6.6) 6.3.3 Avogadro's law
6.7) 6.3.4 Combined Gas Law Problems (determination of molar mass and gas density problem)
6.8) 6.4 Gases in Reaction Stoichiometry
6.9) 6.5 Dalton's Law of Partial Pressure
6.10) 6.6 Graham's Law of Effusion and Diffusion
6.11) 6.7 Real Gases
6.12) 6.7.1 Deviation from ideal behavior
6.13) 6.7.2 Van der Waals Equation (calculation is not involved)

7. Introduction to Chemical Equilibrium
7.1) 7.1 Concept of dynamic equilibrium and reversible reactions
7.2) 7.2 Equilibrium Constant
7.3) 7.2.1 Equilibrium Constant Expressions (Kc and Kp)
7.4) 7.2.2 Correlation between Kc and Kp.
7.5) 7.2.3 Homogeneous and Heterogeneous System
7.6) 7.3 Simple calculations of Kc and Kp
7.7) 7.4 Reaction Quotient
7.8) 7.5 Le Chatelier's Principle: Effect of Temperature, Pressure, Concentration and Catalyst on Chemical Reaction

Assessment Breakdown	%
Continuous Assessment	75.00%
Final Assessment	25.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Lab Exercise	1 Lab Report that need to be submitted including the data sheet.	30%	CLO2
Presentation	Individual presentation.	20%	CLO3
Test	Ongoing Online Test 1	25%	CLO1

Reading List

Recommended Text

- **Martin S. Silberberg 2015, *Chemistry: The molecular Nature of Matter and Change*, 7th Edition Ed., Mc Graw Hills New York**
- **Darrell D. Ebbing,Steven D. Gammon 2016, *General Chemistry*, 11th Edition Ed. [ISBN: 1439049289]**
- **Ralph H. Petrucci,William S. Harwood,Geoff E. Herring,Jeffry Madura 2017, *General Chemistry: Principles and Modern Applications*, 11th Edition Ed., Prentice Hall [ISBN: 013238826X]**

Reference Book Resources

- **Raymond Chang,Kenneth Goldsby 2016, *Chemistry*, 12thEdition Ed., McGraw Hill New York [ISBN: 9781259254581]**

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

Other References: This Course does not have any other resources