UNIVERSITI TEKNOLOGI MARA

CHM420: GENERAL CHEMISTRY

Course Name (English)	GENERAL CHEMISTRY APPROVED
Course Code	CHM420
MQF Credit	4
Course Description	This is an introductory chemistry course providing a firm foundation in chemical concepts and principles. This course covers chemical equations and calculations, the mole concept, acids and bases, the periodic table, oxidation-reduction reactions, electronic structure of atoms, chemical bonds and gases
Transferable Skills	Learning: *Obtain the fundamental concepts of chemistry and principles. Interpersonal Skills: *Performing agreed tasks and contributing to team results. Exploration and Implementation Skills: *Instill skill to conduct laboratory experiment. *Analyse and report on experimental finding in a scientific manner.
Teaching Methodologies	Lectures, Blended Learning, Lab Work, Tutorial
CLO	CLO1 Apply the basic concepts and theories on measurements, elements, compounds,chemical equations, stoichiometry , atomic structure & periodic table which is related to principles of chemistry CLO2 Discuss the theories and concepts in chemical equilibrium, acid-base reactions, oxidation-reduction reaction & gaseous state CLO3 Conduct laboratory experiments on stoichiometry and theoretical yield, acid bases, redox & gas law. CLO4 Analyze problem given in a scientific manner
Pre-Requisite Courses	No course recommendations

Topics
1. Introduction: Measurement 1.1) 1.1 SI base units 1.2) 1.2 Significant figures and scientific notation 1.3) 1.3 Dimensional analysis
2. Elements, Compounds, Chemical equations and Stoichiometric calculations 2.1) 2.1 Symbols, formulas and naming of elements, molecules and compounds. 2.2) 2.2 Definitions of the atom, ion, molecule and compound. Mass relationships of atoms: atomic number, mass number, and isotopes. Atomic masses (average), the mole concept/Avogadro's number. 2.3) 2.3 Molecular formula, empirical formula, molecular mass, formula mass, percent 2.4) composition of compounds. 2.5) 2.4 Experimental determination of empirical formulas and molecular formulas. 2.6) 2.5 Writing and balancing chemical equations. 2.7) 2.6 Stoichiometric calculations: Amounts of reactants and products, limiting reactants and reaction yield
3. Atomic Structure and Periodicity 3.1) 3.1 Introduction to the electron, proton, neutron and isotopes. 3.2) 3.2 Planck's quantum theory, Bohr's theory of the hydrogen atom 3.3) (Rydberg equation) 3.4) 3.3 Quantum Mechanics and the quantum numbers (n,l,ml,ms); Pauli's exclusion 3.5) principle, Hund's rule and Aufbau's principle. 3.6) 3.4 Atomic orbitals and the electron configuration of atoms and ions. 3.7) 3.5 Paramagnetism and Diamagnetism

4. The Periodic Table
4.1) 4.1 Development of the periodic table and the classification of the elements.
4.2) 4.2 Periodic variation in physical properties: atomic and ionic radii, electronegativity,
4.3) ionization energy and electron affinity.

5. Chemical Bonding
5.1) 5.1 Valence electrons and the Lewis dot symbol.
5.2) 5.2 The ionic bond of ionic compounds
5.3) 5.3 The covalent bond, the octet rule and writing Lewis structures for covalent
5.4) molecules.
5.5) 5.4 The VSEPR Model: Molecular Geometry
5.6) 5.5 Dative covalent bond, hydrogen bond, van der Waal forces and metallic bond

6. Chemical Equilibrium
6.1) 6.1 Kc and Kp
6.2) 6.2 Equilibrium expressions
6.3) 6.3 Factors affecting Kc and Kp
6.4) 6.4 Conversion of Kc and Kp
6.5) 6.5 Le Chatetier's Principle
6.6) 6.6 Effect of temperature, pressure, concentration and catalyst on chemical
6.7) equilibrium.

7. Acid-Base Reactions
7.1) 7.1 Definitions of acid and base by Arrhenius, Bronsted-Lowry and Lewis.
7.2) 7.2 Definition of weak/strong vs concentrated/dilute acids and bases.
7.3) 7.3 Preparation of standard solutions and the dilution process.
7.4) 7.4 Volumetric analysis, titration curves and indicator choice.
7.5) 7.5 pH, pOH, Kw, pKw
7.6) 7.6 Ka, Kb, pKa and pKb
7.7) 7.7 Degree and percentage ionization
7.8) 7.8 Buffer definition
7.9) 7.9 Buffer action: acidic and basic buffer
7.10) 7.10 Uses of buffer solution
7.11) 7.11 Calculation of pH of buffer solution

8. Oxidation-Reduction (Redox) Reactions.
8.1) 8.1 The concept of oxidation states
8.2) 8.2 The characteristics of oxidation-reduction reactions
8.3) 8.3 Balancing oxidation-reduction reactions in acidic and basic medium.
8.4) 8.2 Stoichiometry of redox reactions.

9. The Gaseous State
9.1) 9.1 Substances that exist as gases and pressure of a gas.
9.2) 9.2 The gas laws: Boyle's law, Charles' law and Gay-Lussac's law, and Avogadro's
9.3) law.
9.4) 9.3 Density calculations and molar mass determination of a gaseous substance.
9.5) 9.4 Stoichiometry involving gases.
9.6) 9.5 Dalton's law of partial pressures.
9.7) 9.6 Graham's law of diffusion and effusion.
9.8) 9.7 Deviation from ideal gas behaviour (van der Waal's equation)

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	1 assignment	10%	CLO4
Test	Test	40%	CLO1
Written Report	Lab report	10%	CLO3

Reading List

Recommended Text

- **Brady,Jesperson and Hyslop 2015, *Chemistry*, 7 Ed., Wiley**
- **Silberberg, M 2014, *Chemistry, The Molecular Nature of Matter and*, 7 Ed., International Edition. McGraw-Hill**

Reference Book Resources

- **Zumdahl, S. 2007, *Chemistry*, 7 Ed., , Houghton Miflin [ISBN:]**
- **Chang, R. 2012, *Chemistry*, 11 Ed., McGraw-Hill, New York**

Article/Paper List

This Course does not have any article/paper resources

Other References

This Course does not have any other resources