مدارس التكنولوجيا التطبيقية
Applied Technology Schools

Grade 10 Advanced Chemistry
Course Specification (AY 26 – 27)

Course Name: Chemistry

Course Code: CHM51

Grade: 10

Aim: The Grade 10 Chemistry course provides students with a foundation to support future advanced coursework in Chemistry. The course will allow students to cultivate their understanding of Chemistry through inquiry-based investigations as they explore topics such as Electrons in Atoms, the Periodic Table and The Periodic Law, Ionic Compounds and Metals, Covalent Bonding, Chemical Reactions, The Mole, Stoichiometry, Mixtures, Forces of Attraction, and Solutions.

Textbook: Inspire Chemistry

Course Outline:

	Term 1
	Topic 1: Electrons in Atoms
	Inspire Chemistry – Module 4
1.1	Quantum Theory and the Atom
1.2	Electron Configuration
2	**Topic 2: The Periodic Table and Periodic Law**
	Inspire Chemistry – Module 5
2.1	Classification of elements
2.2	Periodic Trends
	Topic 3: Ionic Compounds and Metals
	Inspire Chemistry – Module 6
3.1	Ion Formation
3.2	Names and Formulas for Ionic Compounds
	Term 2
	Topic 4: Covalent Bonding
	Inspire Chemistry – Module 7
4.1	The Covalent Bond
4.2	Naming Molecules
4.3	Molecular Structures
4.4	Molecular Shapes

4.5	Electronegativity and Polarity
5	Topic 5: Chemical Reactions
	Inspire Chemistry – Module 8 – Lesson 2: Classifying Chemical Reactions
5.1	Classifying Chemical Equations
	Inspire Chemistry – Module 8
5.2	Classifying Chemical Equations
	Topic 6: The Mole
	Inspire Chemistry – Module 9
6.1	Moles of compounds
	Topic 7: Stoichiometry
	Inspire Chemistry – Module 10
7.1	Defining Stoichiometry
	Term 3
7.2	Stoichiometric Calculations
7.3	Limiting Reactants
7.4	Percent Yield
	Topic 8- Forces of attractions
	Inspire Chemistry – Module 11
8.1	Forces of Attraction
	Topic 9 – Mixtures and Solutions
	Inspire Chemistry – Module 13
9.1	Types of Mixtures
9.2	Solution Concertation
	Topic 10 – Gases
	Inspire Chemistry – Module 12
10.1	The Nature of Gases
10.2	The Ideal Gas Law

	Term 1
1	Topic 1: Electrons in Atoms
1.1	Subtopic 1.1 – Quantum Theory and the Atom
	Inspire Chemistry – Module 4 – Lesson 1: Light and Quantized Energy, Lesson 2: Quantum Theory and the atom
1.1.1	Describe Bohr's model of the hydrogen atom according to the quantum mechanical theory, utilizing AI tools to create a mindmap/ infographic/ visula to define the concept.
1.1.2	Explain what energy levels and energy sublevels mean, utilizing AI tools to create a mindmap/ infographic/ visula to define the concept.
1.1.3	Differentiate between the ground and excited states of an atom.
1.1.4	Describe the atomic orbitals and their shapes.
1.1.5	Analyze the relationship between the principal quantum number (n) and the distance between an atom's electron and the nucleus. Explain how an increase in the value of n corresponds to a larger atomic size.
1.1.6	Apply the concept of the principal quantum number to determine the energy state of an electron in an atom. Describe how n=1 represents the innermost electron shell, corresponding to the ground state of an electron.
1.1.7	Evaluate the process of absorption and emission of energy by electrons in terms of changes in the principal quantum number. Explain how electrons transition between energy levels by absorbing or emitting photons, resulting in changes in the value of n.
1.1.8	Calculate the number of orbitals and electrons in the energy levels.
1.1.9	Relate the principal quantum number to the total number of orbitals of the principal energy levels and the number of orbitals in sub-energy levels
1.2	Subtopic 1.2 – Electron Configuration
	Inspire Chemistry – Module 4 – Lesson 3: Electron configuration
1.2.1	Define electron configuration
1.2.2	Explain the Aufbau principle, the Pauli exclusion principle, and Hund's rule
1.2.3	Predict the orbital diagrams.
1.2.4	Describe the noble-gas notation.
1.2.5	Write the electron configuration, orbital diagram, and noble gas notation of different elements.
1.2.6	Explain the electron configuration in transition metals.
1.2.7	Investigate and discuss the valence electrons while determining their importance.
1.2.8	Determine the number of valence electrons in atoms.
1.2.9	Explore Lewis (electron-dot) structure.
1.2.10	Represent the electron-dot structure of atoms using simulations, moly-mods, and ball & stick models.
2	Topic 2: The Periodic Table and Periodic Law
2.1	Subtopic 2.1 Classification of elements
	Inspire Chemistry – Module 5 – Lesson 2: Classification of the elements
2.1.1	Use the electron configuration notation, orbital notation, and noble gas notation of an element (Atomic number, Z 1 – 36) to identify the name and symbol of an element, utilizing AI tools to create a mindmap/ infographic/ visula to define the concept.
2.1.2	Use the electron configuration notation, orbital notation, and noble gas notation of an element (Atomic number, Z 1 – 36) to determine the number of valence electrons of an element.

2.1.3	Identify the characteristics of the elements in each of the blocks (*s*, *p*, *d*, and *f*) of the periodic table.
2.1.4	Use the electron configuration notation, orbital notation, and noble gas notation of an element (Atomic number, Z 1 – 36) to identify the **location** and the **type** of an element in the periodic table (period, group, block, metal, nonmetal, transition metal or metalloid)
2.1.5	Predict the electron configuration of elements based on their position in the periodic table (period and group)
2.1.6	Predict the position of the elements in the periodic table based on their electronic configuration.
2.2	Subtopic 2.2 – Periodic Trends
	Inspire Chemistry – Module 5 – Lesson 3: Periodic Trends
2.2.1	Explore and explain the periodic trends by conducting research and creating a poster.
2.2.2	Explain the periodic trend of atomic radii across a period and down a group.
2.2.3	Explore and explain the ionization energy (first ionization & Second energy)
2.2.4	Explain the difference in size between an atom and its ion (anion or cation)
2.2.5	Describe the trend of ionic radii across a period and down a periodic table group.
2.2.6	Define isoelectronic species while listing some examples of it according to the relative size of the ion or atom.
2.2.7	Explain the periodic trend of electronegativity across a period and down a periodic table group.
3	Topic 3: Ionic Compounds and Metals
3.1	Subtopic 3.1 – Ion Formation
	Inspire Chemistry – Module 6 – Lesson 1: Ion formation.
3.1.1	Explain the octet rule
3.1.2	Evaluate how the number of valence electrons influences elements' reactivity, chemical behavior, and bonding tendencies.
3.1.3	Describe how ions (cations and anions) form to fulfill the octet rule using the electron-dot diagram (Lewis Structure).
3.1.4	Analyze the electron transfer and sharing processes during ionic and covalent bonding.
3.1.5	Predict the formation of Z^{+2}, then explain what pseudo-noble gas configuration means using a lab experiment.
3.1.6	Apply the knowledge of electron configurations to write out the electron configuration of ions (metals, non-metals, transition metals) based on their atomic numbers.
3.1.7	Predict the necessary changes (gain, lose, or share electrons) that must occur for each atom to achieve a noble-gas configuration.
3.2	Subtopic 3.2 – Names and formulas for ionic compounds
	Inspire Chemistry – Module 6 – Lesson 3: Names and formulas for ionic compounds
3.2.1	Explain the energy transformation when an ionic bond forms while identifying the type of elements involved and the movement of electrons.
3.2.2	Use the Lewis diagram (electron-dot structure) to explain how elements from the periodic groups combine to form an ionic compound.
3.2.3	Investigate the physical properties of ionic compounds, such as melting and boiling points, conductivity when solid, molten, or aqueous, and solubility in water.
3.2.4	Lab 3 – Experiment to study the properties of ionic compounds (Solubility, conductivity, physical properties)

3.2.5	Predict how formula units relate to the composition of an ionic compound.
3.2.6	Write the chemical name of an ionic compound containing monoatomic and polyatomic ions (including oxyanions)
3.2.7	Write the chemical formula (using the stock method) of an ionic compound containing monoatomic and polyatomic ions.
	Term 2
4	Topic 4: Covalent Bonding
4.1	Subtopic 4.1 – The Covalent Bond
	Inspire Chemistry – Module 7 – Lesson 1: The covalent bond
4.1.1	Identify the type of elements involved in the covalent bond with the movement of electrons, utilizing AI tools to create a mindmap/ infographic/ visula to define the concept.
4.1.2	Explain how the octet rule applies to covalent bonds.
4.1.3	Describe, using Lewis structure and ball and stick diagram, the difference among single, double, and triple bonds
4.1.4	Differentiate between sigma and pi bonds.
4.1.5	Explain the properties of covalent compounds in the solid phase regarding conductivity, hardness, and melting point.
4.1.6	Identify the relationship between the type of a covalent bond (single, double, and triple) and its bond length, strength, and dissociation energy.
4.2	Subtopic 4.2 – Naming Molecules
	Inspire Chemistry – Module 7 – Lesson 2: Naming molecules.
4.2.1	Define binary molecular compound.
4.2.2	Name a binary molecular compound based on its molecular formula (up to deca-)
4.2.3	Determine the chemical formula of a compound from its name.
4.2.4	Describe the difference between a binary acid and an oxyacid.
4.2.5	Name an acid (binary acid and oxyacid) given its chemical formula and vice versa.
4.2.6	Lab 4 – Build molecular models for molecular compounds
4.3	Subtopic 4.3 – Molecular Structures
	Inspire Chemistry – Module 7 – Lesson 3: Molecular structures
4.3.1	Compare structural formula, space-filling molecular model, and ball-and-stick molecular model.
4.3.2	Draw Lewis structures for several covalent compounds with single bonds and multiple bonds.
4.3.3	Draw Lewis structures for several polyatomic ions.
4.3.4	Determine the exceptions of the octet rule (odd number of valence electrons, sub octets and coordinate covalent bonds, expanded octets)
4.4	Subtopic 4.4 – Molecular Shapes
	Inspire Chemistry – Module 7 – Lesson 4: Molecular shapes
4.4.1	State the basis for the VSEPR bonding model.
4.4.2	Determine, using the VSEPR model, the bond angle, bonding, and non-bonding domains for different molecules or ions (including exceptions to the octet rule).
4.4.3	Determine, using the VSEPR model, the electron domain geometry and molecular geometry for different molecules or ions (including exceptions to the octet rule)
	Students must be able to Draw & Model the Lewis Structure of each species given.

	Focus on the following molecules: (H_2O, NH_3, CO_2, Cl_2, Br_2, F_2, N_2, H_2, CH_4)
4.5	Subtopic 4.5 – Electronegativity and Polarity
	Inspire Chemistry – Module 7 – Lesson 5: Electronegativity and polarity
4.5.1	Describe the polar covalent bond.
4.5.2	Differentiate between polar covalent and non-polar covalent bonds by comparing the location of the shared electrons.
4.5.3	Determine, using the VSEPR model, the polarity of different molecules or ions (including exceptions to the octet rule)
5	Topic 5: Chemical Reactions
5.1	Subtopic 5.1 – Classifying Chemical Equations
	Inspire Chemistry – Module 8 – Lesson 2: Classifying Chemical Reactions
5.1.1	Predict the outcomes of a synthesis, combustion & decomposition reaction while writing the general equation, particulate diagram, and some examples
5.1.2	Predict the outcomes of a single-replacement reaction while writing the general equation, particulate diagram and some examples
5.1.3	Explain how an activity (reactivity) series of metals is organized
5.1.4	predict if a metal can replace hydrogen or another metal in a solution while writing the products of the reaction; if any, Using the activity (reactivity) series of metals
5.1.5	Lab 6 – Perform a practical experiment to predict the relative reactivity of certain metallic elements
5.1.6	Predict the outcomes of a double-replacement reaction while writing the general equation, particulate diagram, and some examples
5.1.7	Predict what happens to the anions in a double-replacement reaction
5.1.8	Lab 7 – Conduct practical experiments or develop simulation software to compare the types of reactions (synthesis, decomposition, single displacement, double displacement)
5.1.9	Design an experiment of a synthesis reaction while writing the balanced chemical equation & the particulate diagram
5.2	Subtopic 5.2- Reactions in Aqueous Solutions
	Inspire Chemistry – Module 8 – Lesson 3: Reactions in Aqueous Solutions
5.2.1	List three common types of products produced by reactions that occur in aqueous solutions
5.2.2	Compare a net ionic equation and a complete ionic equation
5.2.3	Identify spectator ions in a given chemical equation
5.2.4	Write a balanced chemical equation, complete ionic equation, net ionic equation, and word equation for reactions that form precipitates (using solubility rules)
5.2.5	Use solubility rules to predict the result of a double displacement reaction
5.2.6	Predict the outcomes the three reactions that take place in aqueous solutions
5.2.7	Write a balanced chemical equation, complete ionic equation, net ionic equation, and word equation for reactions that form water (Reaction of a strong acid with a strong base)
5.2.8	Write a balanced chemical equation, complete ionic equation, net ionic equation, and word equation for reactions that form gases (Reaction of acid with metal, metal carbonate, metal bicarbonate, metal sulfite, metal sulfide, and reaction of a base with an ammonium salt)

6	Topic 6: The Mole
6.1	Subtopic 6.1 – Moles of compounds
	Inspire Chemistry – Module 9 – Lesson 3: Moles of Compounds
6.1.1	Recall the difinintions of molar mass, moles, and atomicity
6.1.2	Calculate the number of atoms in an element or compound given moles and vice versa
6.1.3	Describe what a subscript in a chemical formula indicates
6.1.4	Describe the relationship between the mole information of a substance and its chemical formula
6.1.5	Identify the number of moles of atoms and ions for a given chemical formula of a compound (ionic and molecular)
6.1.6	Calculate the number of moles of atoms (elements) in a given moles of a compound
6.1.7	Calculate the number of moles of ions in a given moles of a compound
6.1.8	Describe how to determine the molar mass of a compound and how the molar masses of the ions that make up this compound relate to the law of conservation of mass
6.1.9	Calculate the mass of a given moles of a compound and vice versa
6.1.10	Explain how a chemical formula is used to determine the number of moles in a given mass of compound
6.1.11	Calculate the number of representative particles present in given mass of a compound (ionic and molecular) and vice versa
7	Topic 7: Stoichiometry
7.1	Subtopic 7.1 – Defining Stoichiometry
	Inspire Chemistry – Module 10 – Lesson 1: Defining Stoichiometry
7.1.1	Define stoichiometry
7.1.2	Explain the importance of the law of conservation of mass in chemical reactions
7.1.3	Interpret a balanced chemical equation in terms of moles, mass, and representative particles (atoms, molecules, and formula units)
7.1.4	Compare the mass of the reactants and the mass of the products in a chemical reaction while explaining how these masses are related
7.1.5	Describe a mole ratio
7.1.6	Identify the source from which a chemical reaction's mole ratios are derived
7.1.7	Write a balanced chemical equation for a word equation while determining the possible mole ratios
	Term 3
7.2	Subtopic 7.2 – Stoichiometric Calculations
	Inspire Chemistry – Module 10 – Lesson 2: Stoichiometric Calculations
7.2.1	Explain why a balanced chemical equation is needed to solve a stoichiometric problem
7.2.2	List the steps included in stoichiometric calculations
7.2.3	Calculate the number of moles of a reactant or a product given the number of moles of another reactant or product
7.2.4	Calculate number of moles of H_2 needed to react with 0.60 moles of N_2.
7.2.5	Calculate the mass of a reactant or a product given the number of moles of another reactant or product and vice versa
7.2.6	Calculate the mass of C_2H_2 produced when 4.00 moles of CaC_2 reacted.
7.2.7	Calculate the mass of CaC_2 needed to react with 3.60 g of H_2O.
7.3	Subtopic 7.3 – Limiting Reactants

	Inspire Chemistry – Module 10 – Lesson 3: Limiting Reactants
7.3.1	Describe the reason why a reaction between two substances comes to an end
7.3.2	Distinguish between limiting reactant and excess reactant in a chemical reaction
7.3.3	Explain the importance of using an excess reactant in a chemical reaction
7.3.4	Identify limiting and excess reactant in a chemical reaction given the particulate diagram of reactants
7.3.5	Identify limiting reactant and excess reactant in a chemical reaction given the number of moles of reactants
7.3.6	Identify limiting reactant and excess reactant in a chemical reaction given the mass of reactants
7.3.7	Calculate the mass of excess reactant that remains after the reaction is complete
7.3.8	Calculate the number of moles of excess reactant that remains after the reaction is complete
7.3.9	Calculate the mass of product(s) produced in a chemical reaction given a particulate diagram, mass or mole of the reactants
7.3.10	Calculate number of moles of product(s) produced in a chemical reaction given a particulate diagram, mass, or mole of the reactants
7.3.11	Lab 8 – Conduct an experiment to determine the limiting reactant, the quantity of the products and of the reactant in excess in a chemical reaction
7.4	Subtopic 7.4 – Percent Yield
	Inspire Chemistry – Module 10 – Lesson 4: Percent Yield
7.4.1	Define the percent yield of a chemical reaction
7.4.2	Distinguish between theoretical yield and actual yield in stoichiometric calculations
7.4.3	Explain why the actual yield is usually less than the calculated theoretical yield
7.4.4	Calculate percent yield and theoretical in a chemical reaction
7.4.5	Predict the efficiency of a givin chemical reactionusing eaither types of yield (theoretical yield, actual yield, or percent yield)
	Topic 8- Forces of attractions
8.1	Subtopic 8.1 – Forces of Attraction
	Inspire Chemistry – Module 11 – Lesson 2: Forces of Attraction
8.1.1	Compare between intramolecular and intermolecular forces
8.1.2	Compare and contrast intramolecular forces (Ionic, covalent, and metallic bonding) with respect to structure, type of atoms involved, strength and physical properties of the compound formed
8.1.3	Explore & explain the intermolecular forces (dispersion forces, dipole-dipole forces, and hydrogen bond) with respect to type of molecules involved and strength, support your calim with examples.
8.1.4	Explain why hydrogen bonds are stronger than most dipole-dipole forces, support your calim with examples.
8.1.5	Compare between a temporary dipole and a permanent dipole, using examples
8.1.6	Explain why dispersion forces are weaker than dipole-dipole forces, support your calim with examples.
8.1.7	Predict the relative sttrenght of chemicak compounds/ molecules, utilizing the frrces of attraction concepts
9	Topic 9 – Mixtures and Solutions
9.1	Subtopic 9.1 – Types of Mixtures
	Inspire Chemistry – Module 13 – Lesson 1: Types of Mixtures

9.1.1	Distinguish, using examples, between heterogeneous and homogenous mixtures
9.1.2	Define solution, solute, and solvent
9.1.3	Identify, using examples, the various types of solutions (liquid , solid or gas) and identify the solute and solvent in the six types of solutions
9.1.4	Differentiate among different types of mixtures; solution, colloid, and suspension in terms of type of mixture, separation upon standing, separation by filtration and Tyndall effect or scattering of light
9.1.5	Distinguish, using examples, between miscible and immiscible liquids
9.2	Subtopic 9.2 – Solution Concertation
	Inspire Chemistry – Module 13 – Lesson 2: Solution Concentration
9.2.1	Define concentration, molarity, molality emphasising the unit of measurments.
9.2.2	Calculate molarity and molarity when the moles or the mass of solute and volume of solution are given and vice versa
9.2.3	Calculate molality and molarity when the moles or the mass of solute and mass of solvent are given and vice versa
9.2.4	Explain the effect of temperature on molarity and molality
	Topic 10 – Gases
10.1	Subtopic 10.1 – The Nature of Gases
	Inspire Chemistry – Module 12 – Lesson 1: The Gas Laws
10.1.1	Describe the relationship between temperature of the gas, average kinetic energy (KE) of gas particles, and speed of gas particles
10.1.2	calculate volume-pressure changes at a constant temperature using Boyle's law
10.1.3	determine the volume when the pressure is given and vice versa Using the pressure-volume graph
10.1.4	Experiment to investigate the relationship between the pressure and volume of a gas
10.1.5	calculate volume-temperature changes at constant pressure using Charles's law
10.1.6	calculate pressure-temperature changes at constant volume using Lussac's law
10.1.7	determine the pressure when the temperature is given and vice versa Using a pressure-absolute temperature graph
10.1.8	Experiment to investigate the relationship between the pressure and temperature of a confined gas
10.1.9	Explain the importance of combined gas law while writing its mathematical relation
10.1.10	Predict the volume-pressure-temperature changes Using the combined gas law to
10.2	Subtopic 10.2 – The Ideal Gas Law
	Inspire Chemistry – Module 12 – Lesson 2: The Ideal Gas Law
10.2.1	Describe the relationship between an ideal gas and the kinetic molecular theory (KMT)
10.2.2	Explain why there are no true ideal gases in nature while Listing the conditions for gas to behave ideally
10.2.3	Analyze how the ideal gas law applies to real gases using the kinetic molecular theory
10.2.4	List conditions of a gas at STP and RTP, Identifying common units for each variable in the ideal gas law
10.2.5	Identify the units and values of the ideal gas constant, R
10.2.6	calculate the pressure, volume, temperature, and mass of gas when three quantities are given, Using the ideal gas law to
10.2.7	Predict the volume-mole changes at constant pressure using Avogadro's law
10.2.8	Describe the ideal gas law and write the equation that represents it
10.2.9	List examples of gases following ideal behavior over a wide range of temperatures and pressure

This document is created for educational purposes. The material included within the document has been taken from several resources. It is not meant for publication, mass printing, or production. It is made to support Applied Technology School students for AY 2026 – 2027.