City Governments Of Addis Ababa Education bureau
Curriculum development and implementation directorate.

Subject———chemistry————————————— GRADE ---11---------- make up class						
No	Unit	Content	Sub content	No of periods (at normal condition)	No of condensing periods	Objectives of the unit
1	1	Fundamental concepts in chemistry	-the scope of chemistry -measurements and units in chemistry -chemistry as experimental science	15	2	After completing this unit, students will be able to: • understand the scope and major fields of chemistry; • select and use appropriate SI units and prefixes; • understand the causes of uncertainty, precision and accuracy in measurement; • express the results of any calculation involving experimental data to the appropriate number of decimal places or significant figures; • use scientific notations to avoid ambiguity and to make it easier to understand; • know how to round off significant figures using rounding off procedures; • understand how to use significant figure in calculations and dimensional analysis as an aid in problem solving; • use scientific method in

						solving problems; • demonstrate an understanding of experimental skills in chemistry; • demonstrate knowledge of laboratory procedures.
2	2	Atomic structure and periodic table	-historical development of the atomic nature of substances -Daltons atomic theory and the modern atomic theory -early experiments to characterize the atom -makeup of the nucleus -electromagnetic radiation and atomic spectrum -the quantum mechanical model of the atom -electronic configurations and orbital diagrams -electronic configurations and the periodic table of the elements	28	4	After completing this unit, students will be able to: • understand the historical development of atomic structure; • explain the experimental observations and inferences made by some famous scientists to characterize the atom; • list and describe the subatomic particles; • explain the terms atomic mass and isotope; • understand electromagnetic radiation, atomic spectra and Bohr models of the atom; • do calculations involving atomic structure; • describe the quantum mechanical model of the atom and the related postulates and principles; • demonstrate an understanding of periodic law and how electronic configurations of atoms are related to the

						orbital diagrams and be able to explain periodic trends;
3	3	Chemical bonding and structure	-introduction -ionic bonding -covalent bonding and molecular geometry -metallic bonding -chemical bonding theories -types of crystals	32	5	After completing this unit, students will be able to: • understand that a chemical bond is an attractive force between particles; • demonstrate an understanding of the formation and general properties of substances containing ionic, covalent and metallic bonds; • draw Lewis structures for simple ionic and covalent compounds; • understand the origin of polarity within molecules; • describe the formation and nature of hydrogen bonds, dipole-dipole forces and London forces; • know the three different but related bonding models (Lewis model, valence bond model and molecular orbital model) and recognize the usefulness of the bonding theories in explaining and predicting molecular properties (bond angle, bond length, bond energy, etc); • explain how the properties of a substance (solid or liquid)

						depends on the nature of the particles present and the type of intermolecular forces; • appreciate the importance of intermolecular forces in plant and animal life; • explain how the valence shell electron pair repulsion (VSEPR) model can be used to predict molecular shape; • know the types of crystalline solid (ionic, molecular, covalent network, or metallic) formed by a substance and describe their properties; • conduct experiments to observe and analyze the physical properties of different substances to determine the type of bonding present; and • apply the scientific enquiry skills for this unit: observing, inferring, predicting, classifying, comparing and contrasting, making models, communicating, asking questions, applying concepts, relating cause and effect and making Generalizations.
4	4	Chemical kinetics	-rate of reaction -theories of reaction rates	19	3	After completing this unit, students will be able to:

			-rate equation or rate law -reaction mechanism			• explain what is meant by reaction rate and perform the activities to determine it; • demonstrate an understanding of the dependence of reaction rate on the nature of reactants, the surface area of solid reactants, the concentration of the reactants, the temperature of a system and catalysts; • determine the reaction rates, using experimental data and calculations; • describe how reaction rate theories (collision theory and transition state theory) can be used to explain changes in reaction rates; • determine the rate laws and order of reactions from data on initial concentrations and reaction rates; • understand that most reactions occur as a series of elementary steps in reaction mechanisms; • appreciate the importance of chemical kinetics in industry and in living organisms; and • demonstrate scientific enquiry skills including observing, predicting,

						comparing and contrasting, communicating, asking questions, drawing conclusions, applying concepts, relating cause and effect, making Generalizations and problem solving.
5	5	Chemical equilibrium and phase equilibrium	-chemical equilibrium -phase equilibrium	18	3	After completing this unit, students will be able to: • understand how equilibrium is established; • explain characteristics of dynamic equilibrium; • state the law of mass action and write an expression for the equilibrium constants, Kc and Kp, from a given chemical reaction; • apply the law of mass action to calculate Kc, Kp, concentration and pressure of substances in equilibrium; • understand how the reaction quotient is used to indicate the position of equilibrium; • state Le Chatliers' principle and use it to predict and explain the effects of changes in temperature, pressure, concentration and presence of catalyst on a reaction;

						• perform an activity to demonstrate the effects of changes in concentration on the position of equilibrium and to determine Kc and Kp values; • explain how equilibrium principles can be applied to optimize the production of industrial chemicals (e.g., production of ammonia and sulphuric acid); and • perform scientific enquiry skills required by this unit: observing, predicting, comparing and contrasting, communicating, asking questions and making Generalizations.
6	6	Carboxylic acids, esters, fats, and oils	-carboxylic acids -esters -fats and oils	20	3	After completing this unit, students will be able to: • write the structural formula and IUPAC names of given carboxylic acids and esters • describe some physical and chemical properties of carboxylic acids and esters; • predict and correctly name the products of organic reaction, including substitution, addition, elimination, esterification, hydrolysis, and oxidation

						reactions; • carry out activities to prepare a carboxylic acid and an ester; • list some important fatty acids; • test for the carboxylic acid and ester functional groups; • understand the structures, properties, and uses of fats and oils; • describe and explain reactions in soap making (saponification); • describe and explain the cleaning action of soap and detergents; • understand the harmful aspects of detergents on the environment when improperly disposed of; • describe scientific enquiry skills used in this unit: observing, classifying, comparing and contrasting, asking questions, drawing conclusions, applying concepts and problem solving.

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Subject—chemistry———————————————— GRADE ------12--------- make up class						
No	Unit	Content	Sub content	No of periods (at normal condition)	No of condensing periods	Objectives of the unit
1	1	Solutions	-homogeneous and heterogeneous mixtures -types of solutions -solubility as an equilibrium process -ways of expressing concentrations of solutions -preparation of solutions -solution stoichiometry -describing reactions in solution -colligative properties of solutions	30	5	After completing this unit, students will be able to: • know the types of solutions; • understand the solution formation process, the rate of solution, the heat of solution and solubility; • describe the dependence of solubility on temperature and pressure of solution; • know how to solve problems involving concentration of solution and to express the result in various units; • describe the behavior of ionic solute in solutions that are unsaturated, saturated and supersaturated, using the concept of equilibrium; • prepare solutions of required concentrations by dissolving a solute or diluting a concentrated solution; • understand the relationship between the colligative properties of solutions and know how to solve problems involving colligative properties

						of solutions; • describe scientific inquiry skills used in this unit: observing, classifying, comparing and contrasting, measuring, asking questions, drawing Conclusions, applying concepts and problem solving.
2	2	Acid –base equilibrium	-acid –base concepts -ionic equilibria of weak acids and bases -common ion effect and buffer solutions -hydrolysis of salts -acid - base indicators	26	4	After completing this unit, students will be able to: • understand the Arrhenius, Brønsted-Lowry and Lewis concepts of acids and bases; • understand the dissociation of water, weak monoprotic and polyprotic acids, and bases; • know how to solve equilibrium problems involving concentration of reactants and products, and a b K , K , pH pOH; • understand the common-ion effect, buffer solutions, hydrolysis of salts, acid-base indicators and acid-base titrations;
3	3	Introduction to chemical thermodynamics	-common thermodynamic terms -first law of thermodynamics	12	1	After completing this unit, students will be able to: • understand the terms: system, open system, closed system and

			and some thermodynamic quantities -thermochemistry -entropy and second law of thermodynamics			isolated system, spontaneous process, state and path function, intensive and extensive property, internal energy, heat and work; • understand the first and second laws of thermodynamics; • compare the energy changes observed when chemical bonds are formed and broken, and relate these changes to endothermic and exothermic reactions; • identify ways in which the terms reactant, product, and heat are combined to form thermodynamic equations representing endothermic and exothermic chemical changes; • understand concepts such as enthalpy change, entropy change and free energy changes; • determine the spontaneity of a given reaction; • demonstrate scientific enquiry skills, including: communicating, measuring, Applying concepts and asking questions.