**General and Physical Chemistry for Medical Students–Syllabus**

**In the first half of semester A - eight hours a week**

**Sackler faculty of medicine**

**Tel-Aviv University-Israel**

 **General Chemistry:**

**Chemistry and Measurement: Introduction to Chemistry, Matter: Physical State and Chemical Constitution, Measurements, Units.**

**Atoms, Molecules, and Ions: The Structure of the Atom, Isotopes, Atomic Weights, Periodic Table of the Elements, Chemical Substances,**

 **Chemical Reactions: Equations.**

**Stoichiometry: Molecular Weight and Formula Weight, The Mole Concept, Mass Percentages from the Formula, Elemental Analysis: Percentages of Carbon, Hydrogen, and Oxygen. Determining Formulas, Molar Interpretation of a Chemical Equation, Amounts of Substances in a Chemical Equation, Limiting Reactant: Theoretical and Percentage Yields.**

**Intermolecular Forces:**  **Comparison of Gases, Liquids, and Solids, Phase Transitions, Properties of Liquids: Surface Tension and Viscosity, Intermolecular Forces; Explaining Liquid Properties, Classification of Solids by Type of Attraction of Units.**

**Chemical Reactions: Ionic Theory of Solutions, Molecular and Ionic Equations, Precipitation Reactions, Acid–Base Reactions, Oxidation–Reduction Reactions, Balancing Oxidation–Reduction Equations,** **Molar Concentration**

 **Diluting Solutions, Titration.**

**Gases:** **Gas Pressure and Its Measurement, Empirical Gas Laws, The Ideal Gas Law, Stoichiometric Relationships with Gases, Gas Mixtures; Law of Partial Pressures, Kinetic Theory of Gases(briefly); Diffusion and Effusion.**

**Colligative Properties: Ways of Expressing Concentration, Boiling-Point Elevation and Freezing-Point Depression, Osmosis.**

**Electronic Structure and Bonding: Electron Configurations, Atomic Orbitals, Electron Spin and the Pauli Exclusion Principle, Hund’s Rule,**

**Building-Up Principle and the Periodic Table, Atomic and Ionic radius, The Atomic Spectrum of Hydrogen.**

**Describing Ionic Bonds, Describing Covalent Bonds, Polar Covalent Bonds; Electronegativity, Lewis structure, Formal Charge, Delocalized Bonding: Resonance, Exceptions to the Octet Rule, Bond Length and Bond Order, The Valence-Shell Electron-Pair Repulsion (VSEPR) Model, Dipole Moment and Molecular Geometry, Orbital Hybridization, Description of Multiple Bonding.**

**Chemical Equilibrium + Acids and Bases: Chemical Equilibrium—A Dynamic Equilibrium, The Equilibrium Constant, Heterogeneous Equilibria; Solvents in Homogeneous Equilibria, Qualitatively Interpreting the Equilibrium Constant, Predicting the Direction of Reaction, Calculating Equilibrium Concentrations, Removing Products or Adding Reactants (Le Chatelier's Principle)**

**Brønsted–Lowry Concept of Acids and Bases, Relative Strengths of Acids and Bases, Solutions of a Strong Acid or Base, The pH of a Solution, Solutions of a Weak Acid or Base, Acid–Base Properties of Salt Solutions, Buffers, Lewis Concept of Acids and Bases.**

**Kinetics and Thermodynamics :**

**Definition of Reaction Rate, Reaction Order, Dependence of Rate on Concentration, Temperature and Rate; Transition-State Theories, Arrhenius Equation, Reaction Mechanisms: Elementary Reactions, The Rate Law and the Mechanism, Catalysis.**

**Energy and Its Units**, **First Law of Thermodynamics; Work and Heat, Enthalpy of Reaction, Thermochemical Equations, Applying Stoichiometry to Heats of Reaction, Measuring Heats of Reaction, Hess’s Law, Standard Enthalpies of Formation. Estimating Enthalpy change from Bond Energies.**

**Entropy, Free Energy and Spontaneity, Change of Free Energy with Temperature, Relating*G*° to the Equilibrium Constant,** **Interpretation of Free Energy.**

**Voltaic Cells (Galvanic Cells), Notation for Voltaic Cells, Standard Cell Potentials, Equilibrium Constants from Cell Potentials, Nernst Equation.**

**Bibliography:**

1. General Chemistry, Darrell Ebbing , Steven D. Gammon.
2. Chemistry , Steven S. Zumdahl , Susan A. Zumdahl.
3. General Chemistry: Principles and Modern, Ralph H. Petrucci , F. Geoffrey Herring , Jeffry D. Madura , Carey Bissonnette.

**Dr. Haj Yahya Anan**