

INTEGRATED ACADEMIC STUDIES IN MEDICINE
ADMISSION EXAM PROGRAMME
CHEMISTRY SYLLABUS

GENERAL CHEMISTRY

1. ATOMIC STRUCTURE. THE PERIODIC TABLE OF ELEMENTS

- Atomic energy levels and sublevels. Electron configurations. Atomic and mass number of elements. Ionization energy and electron affinity. Hund's rule. The Pauli exclusion principle.

2. CHEMICAL BONDS

- Ionic bond. Covalent bond (nonpolar, polar, coordinate). Hydrogen bond. Intermolecular forces.

3. FUNDAMENTAL CHEMICAL LAWS

- The law of definite proportion (Proust's law). The law of multiple proportions (Dalton's law). Gay-Lussac's law of combining volumes. Avogadro's law.
- Calculations with chemical formulas and equations. Stoichiometry of chemical reactions.

4. ENERGY CHANGES IN CHEMICAL REACTIONS

- The internal energy of a system. Enthalpy, entropy and free energy. Thermochemical equations.

5. THE RATE OF CHEMICAL REACTION. CHEMICAL EQUILIBRIA

- Chemical equilibria in solutions of sparingly-soluble electrolytes – the solubility product constant.

6. CLASSIFICATION OF INORGANIC COMPOUNDS

- Oxides. Hydrides. Bases. Acids. Salts. Amphoteric electrolytes. The theory of acids and bases: the Proton or Brønsted-Lowry theory.

7. SOLUTIONS

- Quantitative expressions of concentration of a solution: molar concentration (molarity), mass concentration, molality, mole and mass fractions.
- Colligative properties of solutions
- Colloid solutions

8. ELECTROLYTE SOLUTIONS

- Electrolytic dissociation. Dissociation constant and degree of dissociation. Ionic concentration. Ion-product constant for water (K_w). Hydrogen ion exponent (pH).

9. NEUTRALIZATION. HYDROLYSIS. BUFFER SOLUTIONS

10. OXIDATION-REDUCTION REACTIONS

- Oxidation state. Balancing oxidation-reduction equations. Oxidizing and reducing agents. Electropotential series and standard electrode potential. Electrolysis, converting chemical energy into electrical energy. Galvanic cells.

INORGANIC CHEMISTRY

11. GENERAL CHARACTERISTICS OF S-, P- AND D-BLOCK ELEMENTS AND THEIR COMPOUNDS.

ORGANIC CHEMISTRY

12. STRUCTURE AND BONDING IN ORGANIC COMPOUNDS. CLASSIFICATION OF ORGANIC COMPOUNDS . ISOMERISM IN ORGANIC COMPOUNDS

13. HYDROCARBONS

- Alkanes (nomenclature, chemical properties)
- Alkenes (nomenclature, chemical properties)
- Alkynes (nomenclature, chemical properties)
- Alkadienes

- Cycloalkanes
- Arenes (nomenclature, chemical properties)

14. ALKYL AND ARYL HALOGENIDES

15. ORGANIC COMPOUNDS CONTAINING OXYGEN

- Alcohols (nomenclature, classification, chemical properties)
- Phenols (nomenclature, chemical properties)
- Ethers
- Aldehydes and ketones (nomenclature, chemical properties)
- Carboxylic acids (classification, nomenclature, chemical properties)
- Substituted carboxylic acids
- Carboxylic acid derivatives (acyl chlorides, anhydrides, amides and esters)
- Carbonic acid derivatives

16. ORGANIC COMPOUNDS CONTAINING SULFUR

17. ORGANIC COMPOUNDS CONTAINING NITROGEN

- Nitro compounds
- Amines
- Amino acids (nomenclature, synthesis, chemical properties)
- Peptides

18. HETEROCYCLIC COMPOUNDS

19. CARBOHYDRATES

- Monosaccharides (nomenclature, classification of monosaccharides , chemical properties)
- Oligosaccharides and polysaccharides

20. LIPIDS

- Fatty acids
- Neutral fats