

CHEMISTRY LIST OF TOPICS

1. **Nature of chemistry** (matter, mass and weight, substances and mixtures);
2. **Atoms, molecules and ions** (naming of elements, inorganic and coordination compounds);
3. **Atomic structure and periodic table** (atomic number, mass number, Bohr's theory of the atom, isotopes, radioactivity, properties of elements – i.g. main group elements IA-VIIA, metals);
4. **Bonding – general concepts** (types of bonding, orbitals, hybridization);
5. **Physical chemistry** (chemical kinetics, chemical equilibrium, spontaneity, entropy, enthalpy and free energy, thermochemistry, thermodynamics);
6. **Liquids and solids** (electrochemistry, properties of solution, stoichiometry, colloid solutions);
7. **Acids and bases** (Arrhenius theory, Brønsted-Lowry theory, Lewis theory, strengths of acids and bases, salts hydrolysis, buffer solutions, calculation of pH);
8. **Reactions** (types of reactions, oxidation numbers, balancing of redox equations, oxidizing and reducing agents);
9. **Hydrocarbons** (IUPAC nomenclature, special properties of carbon, alkanes, alkenes and alkynes series, aromatic hydrocarbons, reactions of hydrocarbons);
10. **Derivatives of hydrocarbons** (nomenclature, alkyl - halides, alcohols, phenols, quinones, ethers, aldehydes, ketones, carboxylic acids, carboxylic acid derivatives, amines, thiols);
11. **Heterocyclic compounds** (nomenclature, nonaromatic heterocycles, aromatic heterocycles, five and six- membered ring containing heterocycles with one and more heteroatom(s), heterocycle derivatives);.
12. **Carbohydrates** (monosaccharides, disaccharides and polysaccharides);
13. **Lipids** (simple and complex lipids, fatty acids, waxes, phospholipids, isoprenoids, terpenes and steroids);
14. **Amino acids, peptides and proteins** (structure of amino acids, acid-base properties, peptide bond, four levels of protein structure);
15. **Nucleic acids** (purine and pyrimidine bases, nucleosides, nucleotides, polynucleotides and their conformation, DNA, RNA - structure, genetic code, major types of RNA);
16. **Biochemistry** (chemical and biological properties of vitamins and hormones).

BIOLOGY LIST OF TOPICS

1. **Characteristics of life** (properties of living matter, differences between living and nonliving matter)
2. **The building blocks of organisms** (biopolymers, structure and function of carbohydrates, lipids, proteins and nucleic acids)
3. **Cell structure** (prokaryotic and eukaryotic cells. Membrane cell organelles – their structure and function)
4. **Cell division** (cell cycle phases, mechanism and genetic consequences of mitosis, mechanism and genetic consequences of meiosis)
5. **Molecular biology** (process of DNA replication, expression of genetic information, transcription and translation, genetic code, mutations)
6. **The Mendelian genetics** (the basic terms of Mendelian genetics, the crosses and Mendel's principles of segregation and independent assortment, the allelic interactions (complete and incomplete dominance, codominance))
7. **Digestive system** (components of the human digestive system – the digestive tract and glands, functions of the human digestive system, mechanism of digestion)
8. **Urinary system** (organs and functions of the human urinary system)
9. **Respiratory system** (components of the human respiratory system – the respiratory tract and lungs, functions of the human respiratory system, external and internal respiration, mechanics of breathing)
10. **Circulatory system** (components and functions of the human circulatory system, blood circulation, components and functions of blood, lymphatic system)
11. **Immune system** (components and functions of the human immune system, specific and nonspecific defense, blood-group systems)
12. **Hormonal / endocrine system** (endocrine glands and secreted hormones, their functions)
13. **Nervous system** (the basic functions and the constitution of the nervous system, the constitution and types of the neurons, the transfer of the nerve message, the central nervous system: spinal cord and brain, the peripheral nervous system)
14. **Viruses, Bacteria, Protista, Fungi, Bryophyta, Ferns** (characteristics, organization, classification, representatives)
15. **Plants** (plant body, plant tissues, metabolism, classification)
16. **Gymnosperms, flowering plants, crops, ecology** (saprophytes, parasites, symbionts)

CHEMISTRY - EXAMPLE QUESTIONS:

1. Which chemical below would you NOT find in a phospholipid?
a) C b) O c) H d) N
2. How many different amino acids are there?
a) 25 b) 20 c) 16 d) 6 e) 4
3. Which particle in the atom has a negative electrical charge?
a) proton b) gluon c) neutron d) electron
4. Which of these reactions is not oxidation and reduction?
A) $\text{CuSO}_4 + \text{Fe} \longrightarrow \text{FeSO}_4 + \text{Cu}$ B) $\text{Cl}_2 + 2 \text{KOH} \longrightarrow \text{KCl} + \text{KClO} + \text{H}_2\text{O}$
C) $\text{FeO} + \text{CO} \longrightarrow \text{Fe} + \text{CO}_2$ D) $\text{CaO} + 2 \text{HCl} \longrightarrow \text{CaCl}_2 + \text{H}_2\text{O}$

BIOLOGY – EXAMPLE QUESTIONS:

1. The main component of the cell wall of a fungus is:
a) cellulose b) lignin c) silica d) chitin
2. How many times during its life does a biennial plant flower?
a) once b) twice c) many times d) never
3. Amylase catalyses cleavage of:
a) lipids b) cellulose c) proteins d) starch
4. A gene is constituted by the following sequence of nucleotides:
ATACCTGACGGGATGGAC
How many amino acids are encoded by this gene in a polypeptide chain?
a) 1 b) 3 c) 6 d) 9