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 – e.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, Brönsted-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 non-living 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, mutation)
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** (compounds 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** (compounds 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** (compounds and functions of the human circulatory system, blood circulation, compounds and functions of blood, lymphatic system)
11. **Immune system** (compounds 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 elements would NOT you find in a phospholipid?

a) Ca b) O c) H d) N

2. How many different canonical amino acids exist?

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) $CuSO_4 + Fe \longrightarrow FeSO_4 + Cu$ b) $Cl_2 + 2\ KOH \longrightarrow KCl + KClO + H_2O$

c) $FeO + CO \longrightarrow Fe + CO_2$ d) $CaO + 2\ HCl \longrightarrow CaCl_2 + H_2O$

5/ Which of these heterocycles contain sulfur heteroatoms in their molecules?

a) pyridine b) purine c) thiophene d) furan

6/ $NaNO_3$ is:

a) sodium nitrate b) sodium nitrite c) sodium hyponitrite d) sodium pernitrate

7/ Which of the following statements about hydrocarbons is correct?

a) Alkanes contain at least one carbon–carbon double bond.

b) Aromatic hydrocarbons are characterized by a conjugated system of pi-electrons in a ring structure.

c) Alkynes are saturated hydrocarbons with only single bonds.

d) Carbon cannot form covalent bonds with other carbon atoms.

8/ Which reactions are characteristic for alkanes and cycloalkanes?

a) addition r. b) radical r. c) elimination r. d) neutralization r.

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 catalyzes 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

5/ Which of the following statements about the human digestive system is correct?

a) The pancreas secretes bile that emulsifies fats.

b) The stomach is the primary site for carbohydrate digestion.

c) Salivary amylase begins the breakdown of starch in the mouth.

d) The large intestine is responsible for most nutrient absorption.

6/ Which of the following statements about plants is correct?

a) Xylem transports organic nutrients from leaves to roots.

b) Phloem is responsible for the transport of water and minerals.

c) Photosynthesis occurs mainly in the mesophyll cells of leaves.

d) Bryophytes have well-developed vascular tissues for conduction.

7/ Which hormone is secreted by the adrenal medulla and is responsible for the “fight or flight” response?

a) Cortisol

b) Epinephrine (Adrenaline)

c) Insulin

d) Thyroxine