



CHEMISTRY

Inorganic chemistry

1. Basic terminology, definitions
atom, molecule, element, compound, ions, metallic, non-metallic
2. Czech chemical nomenclature
Element – its symbol, oxidation number, oxides, hydroxides, acids (hydra acids, oxy acids),
acid salts, ions, binary compounds
3. Compounds – types of formulas
4. Chemical bond
types, polarity, intermolecular forces, electronic structure formulas
5. Molecular shapes – hybridisation
6. Basic chemical calculations
Mass of atoms and molecules, amount of substance, calculations of chemical formulas and
equations
(mole, molar mass, molar volume, calculations of the percentage composition of the
compound, calculations from chemical equations)
7. Systems of substances – mixtures
dispersions, solutions (solubility, concentration of solutions, mixing and dilution of solutions,
calculations of changes in the composition of solutions), diffusion, osmosis
8. Chemical reactions – types
9. Thermodynamics, thermochemical laws
10. Reaction kinetics, types of reactions, rates and energy of reactions
11. Chemical equilibrium – factors, electrolytic dissociation, proteolytic balance, precipitation
equilibrium, solubility equilibrium
(theory of acids and bases, dissociation, Ionic product of water, pH and pOH – calculations,
neutralisation, titration, salt hydrolysis)
12. Oxidation-reduction reactions (electrolysis, galvanic series)
13. General properties of elements and their compounds in the periodic table – according to their
respective groups

Organic chemistry

1. Bonds in organic compounds
denticity, carbon hybridization, properties of bonds between carbons, classification of organic
compounds
2. Nomenclature of organic compounds
Alkanes, unsaturated hydrocarbons, alicyclic hydrocarbons – naming and writing formulas
3. Isomers – constitutional, configurational, conformational
4. Reactions of organic compounds
types, oxidation-reduction reactions, reagents, bond polarity, Inductive and mesomeric effect
5. Hydrocarbons – physical & chemical properties, use, importance
(alkanes, cycloalkanes, alkenes, alkynes, aromatic hydrocarbons)
6. Hydrocarbon derivatives – types, chemical & physical properties





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- halogen derivatives
- organometallic compounds
- Alcohols
- Thiols
- Phenols
- Ethers
- Aldehydes and ketones
- Carboxylic acids
- Carboxylic acid derivatives – substitution and functional (halogen acids, hydroxy acids, oxoacids, amino acids, carboxylic acid salts, carboxylic acid esters, acyl halogenides, anhydrides, amides, nitriles ...)
- Carbonic acid derivatives
- Carbonyl compounds – overview
- Nitro compounds
- Amins
- 7. Heterocyclic compounds – five-membered and six-membered heterocycles

Chemistry of natural compounds

1. Carbohydrates – Optical Activity, cyclic structures, Chemical reactions, mono-di-polysaccharides
2. Lipids – acylglycerols, waxes, phospho- and glycolipids
3. Isoprenoids – terpenes, steroids, steroid hormones, bile acids
4. Peptides and proteins – structure, types
5. Enzymes – composition, function, types
6. Nucleic acids – nucleotides, structures of nucleic acids, genetic code and its characteristics
7. Vitamins – soluble in water and fats
8. Alkaloids

Biochemistry

1. Metabolism – types, classification of organisms according to their metabolism, oxidation-reduction reaction, enzymatic and hormonal regulation of metabolism
2. Photosynthesis – apparatus, pigments, primary and secondary phase, products
3. Citric acid cycle (Krebs cycle) – importance, energy yield, course, products
4. Respiratory chain, ATP synthesis – enzymes, electron transfer, aerobic and substrate phosphorylation
5. Biosynthesis of nucleic acids – replication, transcription, regulation
6. Protein metabolism – amino acid biosynthesis, protein biosynthesis – in association with biology, protein breakdown, amino acid transformation, detoxification of ammonia and urea formation
7. Carbohydrate metabolism – glycolysis, alcoholic fermentation, aerobic breakdown of carbohydrates, glycogen
8. Lipid metabolism – β -oxidation, energy yield, synthesis of carboxylic acids

