CHEMISTRY – topics for written part

The structure of the atom. Atomic mass. Principal chemical laws. Subatomic particles (electrons, protons, neutrons). General arrangement of electrons, protons and neutrons, atomic number. Isotopes. Arrangement of electrons in principal energy levels. Valence electrons. Electron-dot formulas of elements. Arrangement of the electrons in sublevels. Orbitals. The periodic classification of the elements. The periodic law. The periodic table, periods and groups. General characteristics of the groups. The structure of compounds, valence, oxidation number, ions, cations, anions, electrovalent or ionic bond, covalent bond, co-ordinate covalent bond, polyatomic ions and their formulas. The use of the periodic table for predicting oxidation numbers, properties, formulas and types of bonding in compounds. Structural formulas of molecules and polyatomic ions. Chemical nomenclature and properties of inorganic compounds, systematic chemical names. Binary compounds containing two non-metals, binary compounds containing a metal and a non-metal, ternary and higher compounds. Acids, bases and salts. Calculations involving elements and compounds, mole, Avogadro's number, molar volume of a gas, empirical formulas, molecular formulas. Molecular mass (weight) or molecular formulas. Chemical equations. Calculations, involving chemical equations. Stoichiometry. Gases, liquids and solids. Water, polarity of water, hydrogen binding in water, chemical and physical properties of water, reactions of water, hydrates, hydrogen peroxide, ozone. Solutions and colloids. Types of solutions, solubility, concentrations of sulutions, colligative properties of solutions. Colloids. Acids, bases and ionic equations, definitions and properties of acids and bases. Bronsted-Lowry theory. pH and pOH, ionisation of water, electrolytes and nonelectrolytes. Oxidation-reduction equations and electrochemistry. Definitions of oxidation and reduction, oxidising and reducing agents. Reaction rates and chemical equilibria. Reversible and irreversible reactions. Organic chemistry. Chemical nomenclature (IUPAC) and properties of organic compounds. Hydrocarbons. Classification of the hydrocarbons. Alkanes, alkenes, addition polymers, alkines. Aromatic hydrocarbons. Derivatives of the hydrocarbons. Organic halides, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, esters, amides, amines, amino acids, nitro-derivatives of the hydrocarbons. Heterocyclic compounds. Proteins, structure and properties. Carbohydrates, structure and properties. Isomerism, stereoisomerism, stereoisomers, cis-trans isomerism. Nucleosides, nucleotides, nucleic acids. Enzymes, hormones and vitamins. Lipids, properties and basic structures.