General and Inorganic Chemistry (3rd course) (6 CFU)

Nomenclature of inorganic compounds.

Periodic trends (atomic radius, ionic radius, electronegativity, electronic affinity, oxidation states, bond enthalpy, etc).

Lewis Acids and Bases. HSAB theory.

Hydrogen. Generation of H2. Industrial methods for the production of H2 (CG, PO, SRM, WGSH, electrolysis of H_2O). Monohydrogen. Reactivity of H_2. Homolytic and heterolytic H_2 (homogeneous and heterogeneous) activation; dihydrogen- and dihydride complexes and their spectroscopic (IR, NMR) properties. Ionic, covalent and interstitial hydrides.

Oxygen. Chemical properties and reactivity. Singlet oxygen: reactivity and preparation. Oxides, peroxides, superoxides: properties and reactivity. Ozone.

Group 1 metals. Preparation and reactivity with H_2, halogens, O_2. Thermal decomposition of peroxides and superoxides. Hydroxydes, industrial synthesis of NaOH. Carbonates, Solvay process, trona process. Nitrates, sulfates.

Group 2 metals. Preparation and reactivity. Hydrides, carbonates, oxides and peroxides. Coordination compounds.

Group 13 elements. Preparation and reactivity. Compounds with H, halogens, oxygen. Latimer diagrams.

Group 14 elements. Preparation and reactivity. Compounds with H, halogens, oxygen. Carbides. Inorganic Carbon-nitrogen inorganic compounds (cyanides, etc).

Group 15 elements. Preparation and reactivity. Frost diagrams. Compounds with H, halogens, oxygen. Oxoacids.

Group 16 (S, Se, Te, Po) elements. Preparation and reactivity. Industrial recovery of S. Compounds with H, halogens, oxygen. Oxoacids.

Group 17 elements. Preparation and reactivity. Compounds with H, oxygen. Oxoacids.

Group 18 elements. Reactivity. Compounds of Xe with F and oxygen.

Coordination compounds. Classification of ligands. Stability of complexes. Chelate effect, macrocyclic effect.
Types of isomerisms in coordination compounds.
Stereoisomerism in tetra-, penta-, hexa-coordinated complexes.
Coordination number (2 to 9) and coordination geometries: relationshisps. Fluxionality and tautomerism in complexes.

Complexes with π-acid ligands.
Carbonyl complexes.Bonding, spectroscopic properties, preparation methods. Reactions. Reactivity of coordinated CO.

Complexes with phosphane ligands.Bonding. Cone angle.

Complexes with olefins. Fluxionality of coordinated olefins. Insertion into MH and MC bonds and β-elimination. Reactivity of coordinated olefins.

Main aspects of the chemistry of transition metals.