

General and inorganic chemistry I: Required knowledge

This document describes the scope of knowledge that students are expected to know from their previous studies before enrolling into the GIC I course. The areas indicated below will not be further addressed in the course.

Inorganic nomenclature

Symbols and names of all elements

Oxidation state and charge of an ion – the difference in notation and meaning (*e.g.* Ti^{IV} vs Ti^{4+} , S^{II} vs SO_4^{2-})

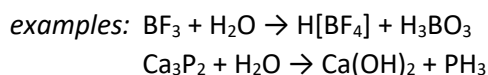
Common oxidation states of s- and p-block elements (*e.g.* determine oxidation state of all atoms in KOH , BaO_2 , H_2O , SO_5^{2-} , TiO^{2+} , H_6TiO_6)

Names and formulae of the following groups of ions and compounds:

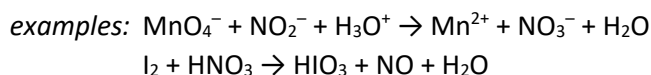
- monoatomic cations (*e.g.* Cu^{2+} , K^+)
- monoatomic and simple polyatomic anions (*e.g.* O^{2-} , O_2^{2-} , S^{2-} , H^- , Cl^- , NH_2^- , NH_2^{2-} , N^{3-} , OH^-)
- oxyanions (*e.g.* SO_4^{2-} , SO_3^{2-} , BrO_4^- , H_2PO_4^- , TeO_6^{6-})
- binary hydrides (*e.g.* P_2H_4 , H_2Te , HI)
- binary salts, oxides, hydroxides and other common inorganic compounds (*e.g.* H_2O , NH_3 , NaOH , $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, Ag_2S , Li_3PO_4 , CaO , BaO_2)
- acids (*e.g.* HCl , H_2S , H_2SO_4 , H_6TiO_6)
- simple coordination compounds (*e.g.* $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$, $\text{H}[\text{BF}_4]$, $[\text{Al}(\text{OH})_4]^-$)

Operations with chemical equations

Balancing reactions without redox processes



Balancing molecular and ionic reactions with one oxidation and reduction process.



Periodic Table (PT)

Orientation in the PT: what is a group and period, where can metals and non-metals be found in the PT, basic groups (alkali metals, alkali earth metals, chalcogens, halogens, noble gases)

Trends in electronegativity across the PT

Structure of atoms and molecules

Quantum numbers, their allowed values and significance, atomic orbitals

Electron configuration of atoms and ions

Ionic and covalent bond – their basic differences

Chemical reactions

Chemical equilibrium (definition of the equilibrium constant and pH)

Le Chatelier's principle (change of the equilibrium by changing concentration or temperature)

Systematic inorganic chemistry

Physical properties and structure of basic non-metals (H_2 , O_2 , N_2 , halogens, S, allotropes of carbon and phosphorus, B)

Physical properties and basic reactivity of metals (*e.g.* Au vs Fe in reactions with H_2O , HCl, HNO_3)