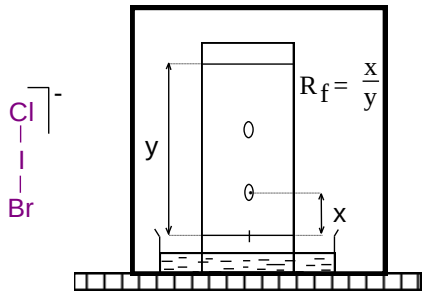
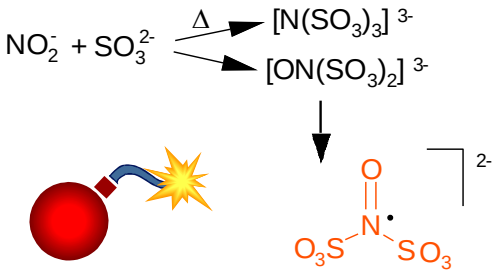
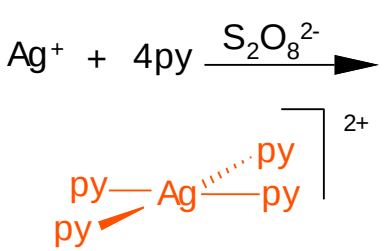
INORGANIC CHEMISTRY - LABORATORY

OBJECTIVES	PROBLEMS	PICTOGRAM	No.
1. Halogen compounds: 1.1. Synthesis of ICl and $[IBrCl]^-$ 1.2 Thin-layer chromatograhyof of halide alkali metal salts	properties of halogens, structure of interhalogen compounds EX_n, model VSEPR a laboratory method for preparation of chlorine		
2. Nitrogen compounds – synthesis of: 2.1. $K_2ON(SO_3)_2$ – Fremy'ego salt 2.2. $Mg_3N_2 \Rightarrow NH_3$ 2.3. N_2	structure and chemical properties of nitrogen compounds; Frost diagram Common techniques for the synthesis of nitrogen(3–,1–,0) compounds; Victor Meyer's method for determination of the amount of nitrogen in Mg_3N_2		
3. Preparation and properties of $S_2O_8^{2-}$ ion - synthesis of 3.1 $K_2S_2O_8$ and 3.2 $[Ag(py)_4]^{2+}$	Nernst equilibrium, standard potentials E^o, electrolysis, structure and properties of peroxodisulfate ion electrochemical synthesis of peroxydisulfate ion: $2SO_4^{2-} \Rightarrow S_2O_8^{2-}$ synthesis of silver(2+) complexes		

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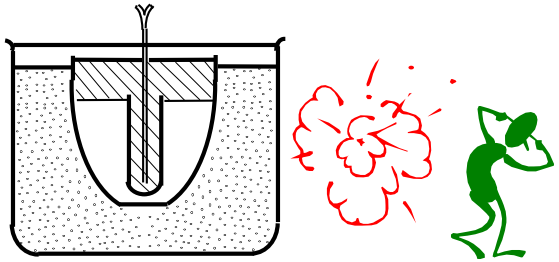
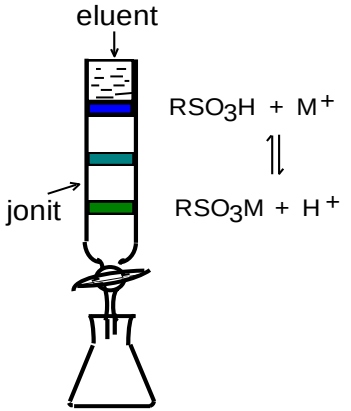
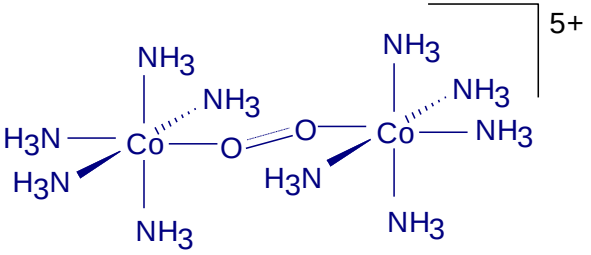
4. Aluminthermy – synthesis of metals: 4.1. Synthesis of Fe 4.2. Synthesis of Cr	redox reactions in solid state, Elingham's diagram, preparation of the metals from their oxides by heating with reducing agent reactions carried out at high temperatures. Endo and exothermic reactions, ignition mixtures		
5. Aqua-complexes of d-block elements – synthesis, ion exchange separation, spectroscopic characterisation 5.1. $[Cr(H_2O)_6]^{3+}$, $[CrCl(H_2O)_5]^{2+}$, $[CrCl_2(H_2O)_6]^{+}$	ligand substitution reactions, hydrolysis, absorption spectra of aqua complexes spectrochemical series of ligands chromatographic methods, ion-exchange chromatography, UV-Vis spectra		
6. Dioxygen and it's transition metal complexes – synthesis of: 6.1. $[\{Co(NH_3)_5\}_2(\mu\text{-}O_2)]^{4+}$ 6.2. $[\{Co(NH_3)_5\}_2(\mu\text{-}O_2)]^{5+}$	structure and properties of dioxygen in term of electron configuration TOM configurations, structure of dioxygen complexes simple one-pot synthesis of dioxygen compounds, synthesis procedure with the use of gas bottle (150 atm!)		

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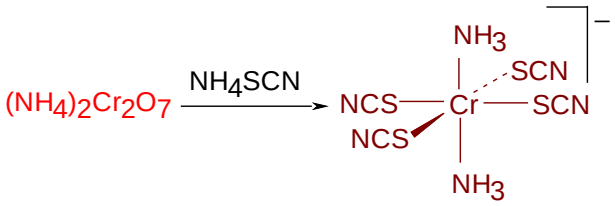
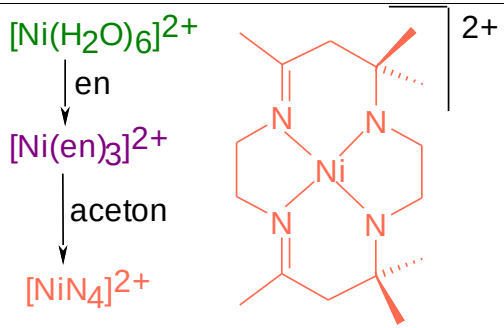
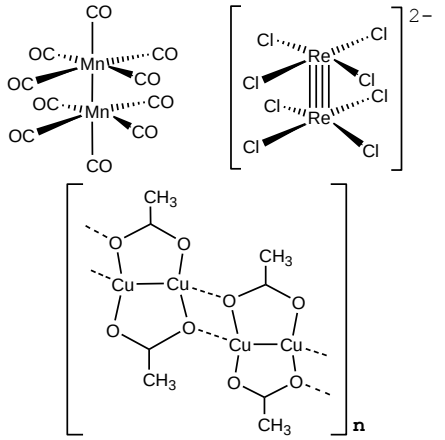
7. Isomerism in coordination chemistry – synthesis of: 7.1. *trans*-$NH_4[Cr(NH_3)_2(SCN)_4]$ 7.2. *trans*- i *cis*-$[Cu(gly)_2] \cdot H_2O$	types of isomerism, stereoisomers, and diastereomers of metal complexes, coordination number; synthesis in a molted salt [Cr], fractional crystallization; isomerisation reaction [Cu]		
8. Chelate complexes – synthesis: 8.1. $[Ni(H_2O)_6]^{2+} \Rightarrow [Ni(en)_3]^{2+}$ 8.2. $[VO(acac)_2]$ 8.3.$[Ni(acac)_2(H_2O)_2]$	chelate effect; coordination modes of β-diketones practical training in basic chemistry laboratory techniques		
9. Polynuclear and polymeric complexes – synthesis: 9.1. $[\{Cr(NH_3)_5\}_2(\mu\text{-}OH)]Cl_5 \cdot H_2O$ 9.2.a copper dust 9.2.b $[Cu_2(CH_3COO)_2]$	polynuclear compounds; bridging ligands; clusters; multiple M-M bonds in complexes, structural properties of mono- and polynuclear transition metal complexes advanced methods of metal complexes synthesis ; synthesis in inert atmosphere		

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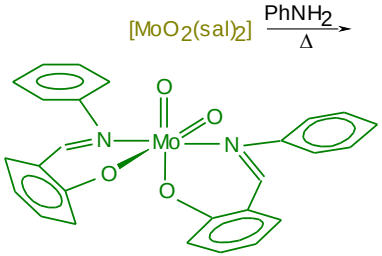
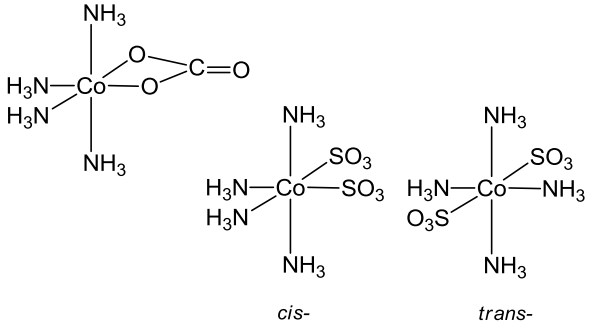
10. Metal complexes with Schiff bases – synthesis: 10.1. $[Mo(O)_2(sal)_2]$ 10.2. $[MoO_2(sal\text{-}N\text{-}Ph)_2]$ 10.3. $[MoO(\mu\text{-}O)(sal\text{-}N\text{-}C_2H_4O)]_2$ 10.4. $[Mo(O)_2(sal\text{-}N\text{-}C_6H_4O)(EtOH)$	Schiff bases and it's complexes; chelate effect; stereoisomers; condensation reactions, coordination properties of Schiff bases practical training in basic chemistry laboratory techniques		
11. Chemistry of Metal Carbonato and Sulphito Complexes – synthesis: 11.1. $[Co(NH_3)_4(CO_3)]NO_3 \cdot ½H_2O$ and ⇒ 11.2. $K[Co(NH_3)_4(SO_3)_2]$	synthesis of metal carbonato and sulphito complexes; substitution reactions in cobalt aqua complexes; coordination modes of carbonato ligands to transition metals synthesis in strong alkaline medium; crystalisation from mother liquor		
12. Oxidation and reduction synthesis: 12.1. NH_4I	synthesis of simple salts, redox reactions in solution influenced by pH; hydrogen peroxide as reducing agent synthesis in strong alkaline medium; methods for preparation and isolation of simple salts	pH = 14 $I_2 + 2e \longrightarrow 2I^-$ $H_2O_2 - 2e \longrightarrow O_2 + 2H^+$	