PRACTICAL PROBLEMS

PROBLEM 1 (practical)

A sample contains two of the following cations: Ag^+, Pb^{2+}, Fe^{2+}, Cr^{3+}, Co^{2+}, Al^{3+}, Mn^{2+}, and one of the following anions: SO_4^{2-}, Cl^-, NO_3^-.

Prove the cations and anions in the sample by means of the following reagents: 2 N-HCl, concentrated H_2SO_4, 2 N-H_2SO_4, 2 N-HNO_3, 2 N-CH_3COOH, NaOH, NH_4OH, H_2O_2, Na_2CO_3, KNO_3/Na_2CO_3, NH_4SCN, $Na_2B_4O_7$, NaF, C_2H_5OH, $BaCl_2$, $AgNO_3$, NH_4Cl, $(NH_4)_2Fe(SO_4)_2$, alizarin B.

Write the results into the attached table in the following way:

a) into the column "Reagent" write the formula of the reagent which was needed to prove whether the cation or anion is present or absent in the sample;
b) into the column "+/–" mark the presence or absence of an ion, proved in the sample, by the sign "+" and "–" , respectively.

PROBLEM 2 (practical)

A solution contains sodium oxalate and oxalic acid.

Determine how many milligrams of sodium oxalate and oxalic acid are contained in the solution under investigation.

The following solutions are at your disposal: $KMnO_4$ (c = 0.01972 mol dm^{-3}), NaOH (c = 0.1019 mol dm^{-3}), concentrated H_2SO_4, and a solution of phenolphthalein.

PROBLEM 3 (practical)

Four unknown organic aliphatic compounds of a general formula A–CH_2–B are numbered from 1 to 4, and given as samples. Some of them may be in an aqueous solution.

Perform the following experiments:

1. Determine the pH value of the solution.
2. Allow the sample to react with hydrochloric acid.
3. Reaction with alkali hydroxide (basic hydrolysis – 5 minutes boiling under a reverse cooler) and a subsequent proof of halides.

Moreover, the following data are at your disposal:

a) One of the compounds under investigation forms an intra-molecular anhydride.

b) The content of carbon and hydrogen (in mass %) as well as the relative molecular mass are known for the same compound, the data being given, however, in an arbitrary order which does not correspond to the numbering of samples.

Determine the functional groups A and B for each substance using results of your experiments as well as the available data.

Write your results into the attached table; mark positive results with sign "+" whereas the negative ones with sign "–".