

3. Exercise General Chemistry

28.01.2025

WS 2024/25

Due Jan 30st, 2024, 2pm c.t., AR-H100

3.1

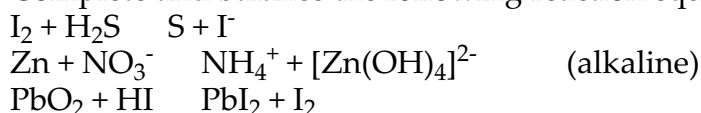
Calculate the mole fraction of sodium hydroxide in a 0.01 molar sodium hydroxide solution.

3.2

Oxalic acid reacts with KMnO_4 to form Mn^{2+} and carbon dioxide. 0.1265 g of oxalic acid ($\text{H}_2\text{C}_2\text{O}_4 \cdot 2 \text{H}_2\text{O}$) consume 40.6 ml of a KMnO_4 solution during the titration. What is the concentration of the KMnO_4 solution?

3.3

Complete and balance the following reaction equations:



3.4

The half-life period of a 1st order reaction is 1 s. Calculate the 10th life period, i.e. the time when only 1/10 of the starting concentration is still there. What is the relationship between half life time and nth life time?

3.5

Nitrosyl chloride decomposes in the gas phase to $\text{NOCl} \rightarrow \text{NO} + \frac{1}{2} \text{Cl}_2$. At 180° C, the following NOCl values for partial pressure are found as a function of time:

t/s	0	500	1000	1500	2000	2500
p/Torr	500	413	351	306	271	243

Does the decay occur after a 1st or 2nd order reaction? Determine the reaction rate constant.

3.6

For a reaction, the following reaction rate constants are determined as a function of the temperature:

$t/^\circ\text{C}$	25	35	45	55
k/s^{-1}	1	1,30	1,66	2,09

Calculate the activation energy.

3.7

80.1 g SO_3 is introduced into an evacuated reaction vessel with a volume of 1 dm³ at an elevated temperature. The equilibrium mixture contains only half of the SO_3 introduced. What is the equilibrium constant K_c of the SO_2/SO_3 equilibrium $\text{SO}_2 + \frac{1}{2} \text{O}_2 \leftrightarrow \text{SO}_3$?