

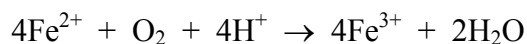
CHEM1102 Problem Sheet 10 (Week 13)

Work through the ChemCAL modules "Reaction Rates and Chemical Kinetics 1" and "Reaction Rates and Chemical Kinetics 2"

- What are the systematic names of (a) $K_2[PtF_6]$ and (b) $[CoCl_2(NH_3)_4]Cl \cdot 2H_2O$?
- What is the formula for (a) tetraamminezinc(II) sulfate-2-water
(b) tetraaquaoxalatochromium(III) ion?
- How many isomers are possible for the square planar complex ion $[Pt(NH_3)_2Cl_2]$?
- Which one of the following compounds is a coordination isomer of $[Cr(H_2O)_5Cl]SO_4$?
 - $[Cr(H_2O)_6]Cl_3$
 - $[Cr(H_2O)_6]SO_4$
 - $[Cr(H_2O)_5SO_4]Cl$
 - $[Cr(H_2O)_5Cl]Cl_2$
- Without consulting data tables, write the ground state electronic configuration of the following atoms and ions. For example, Ti is $[Ar]4s^23d^2$.

(a) Mn (b) Cr (c) Ni^{2+} (d) Fe (e) Fe^{3+} (f) Cu^{2+} (g) Zn^{2+}

- Given the initial rate data below, what is the rate law for the following reaction?



Experiment	$[Fe^{2+}] / \text{mol L}^{-1}$	$[O_2] / \text{mol L}^{-1}$	$[H^+] / \text{mol L}^{-1}$	Rate = $-d[O_2]/dt / \text{mol L}^{-1} \text{ s}^{-1}$
1	1×10^{-3}	1×10^{-3}	0.1	5×10^{-4}
2	2×10^{-3}	2×10^{-3}	0.1	8×10^{-3}
3	2×10^{-3}	1×10^{-3}	0.2	8×10^{-3}
4	2×10^{-3}	2×10^{-3}	0.2	1.6×10^{-2}

- What is the rate equation for the reaction?
 - What is the value of the rate constant, k , for this reaction?
 - What is the initial rate of formation of Fe^{3+} in experiment 3?
- The half-life for the first order decomposition of $N_2O_5(g)$ is 6.00×10^4 s at 20°C .
 - Calculate the rate constant, k , at this temperature.
 - What percentage of the N_2O_5 molecules will have reacted after one hour?

8. Dinitrogen tetroxide decomposes according to the equation below.
At 30 °C, the value of k is $5.1 \times 10^6 \text{ s}^{-1}$. At 50 °C, the value of k is $1.9 \times 10^7 \text{ s}^{-1}$.
What are the activation energy, E_a , and pre-exponential factor, A , for this reaction?

