

Chemistry 153
Second Exam
Monday
7 November, 2005



Name -----

Full credit will be given to correct answers only when ALL the necessary steps are shown.

DO NOT GUESS THE ANSWER.

This is a close book exam, and you are responsible to be sure that your exam has no missing pages (5 pages).

If you consider that there is not enough information to solve a problem you have to specify the missing information and describe the problem solving procedure.

Honor Statement

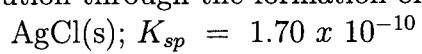
I have neither give nor received aid in this examination.

Full signature -----

$$\begin{aligned}h &= 6.626 \times 10^{-34} \text{ J s} \\c &= 2.9979 \times 10^8 \text{ m s}^{-1} \\m_e &= 9.109 \times 10^{-31} \text{ kg} \\k_B &= 1.380 \times 10^{-23} \text{ J K}^{-1}\end{aligned}$$

Problem 1 (12.5 points)

Calculate how many grams of silver chloride will dissolved in 1.000 L of 1.00 M $NH_3(aq)$ solution through the formation of the complex ion $Ag(NH_3)_2^+(aq)$; $K_f = 1.70 \times 10^7$



Problem 2 (12.5 points)

Quantum mechanics predicts that the binding energy of the ground state of the H atom is $=13.61 \text{ eV}$.

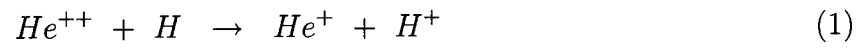
a) Calculate the minimum wavelength of light that will ionize H atoms in their ground state.

b) Assume the atom is ionized by collision with an electron that transfers all its kinetic energy to the atom in the ionization process. Calculate the speed of the electron before the collision. Express your answer in $m \text{ s}^{-1}$.

c) Calculate the temperature required to ionize a H atom on its ground state by thermal excitations.

Problem 3 (12.5 points)

The following reaction might occur in the interior of a star:



Calculate the electronic energy change in eV. Assume all species to be in their ground state.

Problem 4 (12.5 points)

Predict the electronic configuration, and bond order for the ground state of the superoxide ion O_2^- and the peroxide O_2^{2-} . Which ion is paramagnetic?