

This worksheet is **due Wednesday, December 8 by 11:59 PM**. To complete the assignment, show in *detailed steps* how to get the answer that is given for each of the problems. *Failure to use this form for work and answers will result in a point penalty.*

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Problem 1: If the de Broglie wavelength of an electron is 555 nm, what is its velocity? The mass of an electron is  $9.1 \times 10^{-31}$  kg.

*Answer to Problem #1:  $1.3 \times 10^3$  m/s*

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Problem 2: What is the energy of a photon of blue light that has a wavelength of 450 nm? What is the energy per mole?

*Answer to Problem #2:  $4.4 \times 10^{-19}$  J; 260 kJ (270 kJ ok if more than 2 sig J value used)*

Problem 3: What is the electron configuration for  $\text{Cr}^{2+}$ ?  $\text{Cr}^{3+}$ ? Which is more paramagnetic? How many unpaired electrons does each paramagnetic ion have? (Use **orbital box notation** and **give the electron configuration for both ions** to receive credit!)

*Answer to Problem #3: The more paramagnetic species,  $\text{Cr}^{2+}$ , has four unpaired electrons.*

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Problem 4: Photography lenses incorporate small amounts of silver(I) chloride in the glass of the lens. The following reaction occurs in the light, causing the lens to darken:  $\text{AgCl(s)} \rightarrow \text{Ag(s)} + \text{Cl}$   
The enthalpy change for this reaction is  $3.10 \times 10^2$  kJ/mol. Assuming all this energy is supplied by light, what is the maximum wavelength of light that can cause this reaction?

*Answer to Problem #4:  $3.86 \times 10^{-7}$  m*

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Problem 5: Using a strict interpretation of the  $n + l$  rule, how many protons would an atom need to create a ground state electron configuration with one electron in a 5g orbital? (Give the **electron configuration starting with [Rn]** for the atom to receive credit)

*Answer to Problem #5: 121 protons*