Quiz: Ch 6 & 7
AP Chem
Version E (30 pts)

$\Delta E = h\nu$ $\quad c = \lambda\nu$ $\quad E_n = \frac{-2.178 \times 10^{-18}}{n^2}$ $\quad c = 3.0 \times 10^8 \text{ m s}^{-1}$ $\quad h = 6.63 \times 10^{-34} \text{ J s}$

Use significant figures for atomic masses as recorded on the Periodic Table and for the constants as given to you. Show your work for all problems involving calculations and be sure to box your final answer and include sensible units

1. (3 pts) Briefly describe Wolfgang Pauli's contribution to present-day quantum mechanical theory.

2. One particular line in the atomic spectrum of hydrogen is part of the Paschen series.
   a. (3 pts) Calculate the change in energy, in J, associated with this electronic transition that begins from an excited state equivalent to that of the valence electron of cesium.

   b. (2 pts) Calculate the wavelength, in nm, of the radiation associated with the spectral line.

3. For the element lanthanum,
   a. (3 pts) Give one of the permissible quantum number sets for the highest energy electron.

   b. (3 pts) Give the complete electronic configuration.

4. (3 pts) Sketch the shape and orientation of the d_{xz} electron density plot. Be sure to label your axes.

5. Consider atoms of potassium, calcium, and strontium. Circle the element that correctly fits the description, than provide a brief explanation (in 1 to 2 sentences) for your choice in terms of atomic structure.
    a. (4 pts) (Potassium / Calcium / Strontium) has the smallest atomic radius because…

    b. (4 pts) (Potassium / Calcium / Strontium) has the largest (most negative) electron affinity because…

6. The successive ionization energies for an unknown element are:
    $I_1 = 580$ kJ/mol
    $I_2 = 1815$ kJ/mol
    $I_3 = 2740$ kJ/mol
    $I_4 = 11{,}600$ kJ/mol

    a. (2 pts) Briefly explain why successive ionization energies are increasing.

    b. (3 pts) To which family in the periodic table does the unknown element most likely belong? Explain briefly.