

CH 07 blank

1. (6 points) Answer the following questions about ionization energies:
 - (a) Why are ionization energies always positive quantities?
 - (b) Why does the fluorine atom have a larger first ionization energy than the oxygen atom?
 - (c) Why is the second ionization energy of an atom always greater than its first ionization energy?
2. (6 points) The titanium (II) ion is iso-electronic with the calcium atom.
 - (a) Are there any differences in the electron configurations of titanium (II) and calcium?
 - (b) Will the 2s orbital in calcium be more stable than the 2s orbital in titanium?
 - (c) Will calcium and titanium (II) have the same number of unpaired electrons?
3. (8 points) Determine which of the following statements are true and explain why or why not based on shielding effects, quantum shielding, and/or Z_{eff} .
 - a. Electron affinity of the Cesium atom is greater and more exothermic than the fluoride atom.
 - b. The ionization energy of an anion is larger than that of the parent atom.
 - c. The lithium ion is larger than the rubidium ion
 - d. The nitride anion is smaller than the fluorine atom
4. (5 points) Circle the best choice in the list:
 - a. Smallest radius: Ca^{2+} , Sr^{2+} , Ra^{2+}
 - b. Lowest **second** ionization energy: Mg, Ne, Na
 - c. Smallest atom: Sn, I, At

- d. Impossible shell designation: 4g, 5d, 4p
 - e. Largest negative electron affinity: O, B, Na
5. (8 points) Arrange the species in each group in order of **increasing** ionization potential, and explain in each case the reason for the sequence:
- a. Fe, Fe²⁺, Fe³⁺
 - a. (2 points) N, O, F
 - b. (2 points) K⁺, Ar, Cl⁻
6. (5 points) Circle the best choice in the list:
- f. Smallest radius: Ni²⁺, Pd²⁺, Pt²⁺
 - g. Lowest second ionization energy: Ar, K, Ca
 - h. Smallest atom: Sn, I, Bi
 - i. Impossible shell designation: 4g, 5d, 4p
 - j. Most positive electron affinity: Ba, Sr, Cs
7. (8 points) The first ionization energies for the period 2 elements are given below. the values of the ionization energies for groups 3A and 6A drop slightly below the generally increasing trend.

Element	Li	Be	B	C	N	O	F	Ne
IE	520	899	800	1086	1402	1314	1681	2081

- b. (4 points) Draw the box diagrams for the atoms Li, Be, O, and N.
- c. (2 points) Draw the box diagrams for the ions that arise from the first ionization of nitrogen and oxygen.

(2 points) Based on electron configurations, Z_{eff} , and any other trends, explain why the first ionization