Periodicity Questions:

Briefly explain each of the following statements.

a) the general trend for the first ionization energy is to increase from left to right across a period in the periodic table, however, the first ionization energy for aluminum is less than the first ionization for Mg;

b) the atomic radius for oxygen is smaller than the atomic radius for Be; (NOTE: Be sure to include both species in your explanation.)

For each of the following;

a) Explain why the first ionization energy for sulfur (S) is smaller than the first ionization energy for chlorine (Cl).

b) Explain why the ionic radius for nitride, N^{3-}, is larger than the ionic radius for fluoride, F^{-}.

Briefly explain each of the following statements.

a) the first ionization energy for sodium is very much smaller than the second ionization for sodium;

b) the atomic radius for potassium is larger than the atomic radius for Ca; (NOTE: Be sure to include both species in your explanation.)

c) Given the following first ionization energies (in units of kJ mol^{-1})

Li	Be	B	C	N	O	F
520	899	801	1086	1402	1314	1681
Na	Mg	Al	Si	P	S	Cl
496	?	578	786	1012	1000	1251

Estimate the first ionization energy for magnesium and describe, at least, three different ionization energy trends, from the periodic table, you used to arrive at your estimate.

d) Is the first ionization energy of fluorine larger, smaller or the equal to the first ionization energy of the other elements in the second period (excluding neon). Explain.

Briefly explain each of the following statements.

a) the first ionization energy for chlorine is larger than the first ionization for phosphorus; (NOTE: Be sure to include both species in your explanation.)

b) the atomic radius for Mg is smaller than the atomic radius for Ba;

c) Metals prefer to lose electrons.

Which of the following ionization energies is the largest?

A) 3rd ionization energy of Al
B) 1st ionization energy of Cs
C) 2nd ionization energy of Ca
D) 1st ionization energy of K
E) 2nd ionization energy of Na

Which of the following is the best explanation for why the 3rd ionization energy in calcium is significantly greater compared to the first ionization energy in calcium.

A. for a given element each successive ionization energy is significantly larger;
B. the third electron is removed from n = 3 shell where the effective nuclear charge is six times higher compared to the effective nuclear charge on an electron in the n = 4 shell;
C. since the inner core electrons in each shell form a spherical shape, removing an electron will always be significantly greater compared to removing electrons from non-spherical orbitals;
D. electron-electron repulsions decrease for each successive inner shell of electrons, lower electron-electron repulsions means higher ionization energy;
E. in calcium since the 3d orbital's are empty, the first ionization energy is significantly smaller than usual, making the third ionization energy appears significantly larger.