Assignment KEY

Use the information in this section to answer the following questions. When done, check your answers using the key provided.

1. a. Explain how an atoms number of valence electrons can help a young scientist predict the chemical reactivity of that atom.

All electrons want a full outer shell; atoms will react with other elements to empty or fill their outer shells. If the valence shell of an atom is close to empty, it requires less energy to lose an electron than to gain quite a few-these atoms will be quite reactive. Conversely, if the valence shell is close to full, these atoms will also be quite reactive.

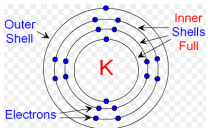
b. Based on their position on the periodic table, predict the relative reactivities of the following elements:

a) Cs vs. Ba
b) C vs. F
c) Na vs Ar
d) Mg vs Si

2. Why is it more difficult for fluorine to lose an electron than for sulfur to do so?

Flourine has a higher ionization energy than sulfur. This is because of electron shielding. Electron shielding describes the ability of an atom's inner electrons to shield its positively-charged nucleus from its valence electrons. When moving to the right of a period or down a group, the number of electrons increases and the strength of shielding increases. As a result, it is harder for fluorine to lose an electron than sulfur.

3. It is relatively easy to pull one electron away from a potassium atom, but very difficult to remove a second one. Explain why.



Removing 1 electron from K empties its valence shell. The 3rd shell is full once the 4th shell is empty, which means these electrons are held very tightly.

4. Which should have a higher ionization energy: an atom of indium (atomic number 49) or an atom of aluminum (atomic number 13)? Why?

Aluminum would have a higher ionization energy because the electron shielding would be greater in indium.

5. Scientists are trying to synthesize element 119. Based on your knowledge of the trends in the periodic table, predict 2 physical properties and 1 chemical property for element 119.

Answers may vary, but possible properties include:

Physical: low electronegativity, large atomic radius, low ionization energy

Chemical: highly reactive

Challenge! Since atoms are mostly empty space, why don't objects pass through one another?

a) The nucleus of one atom repels that nucleus of another atom when it gets close
b) The electrons of the atoms repel one another when they get too close
c) the electrons of one atom attract the nucleus of a neighboring atom to form a barrier
d) atoms actually do pass through one another, but only in the gaseous phase