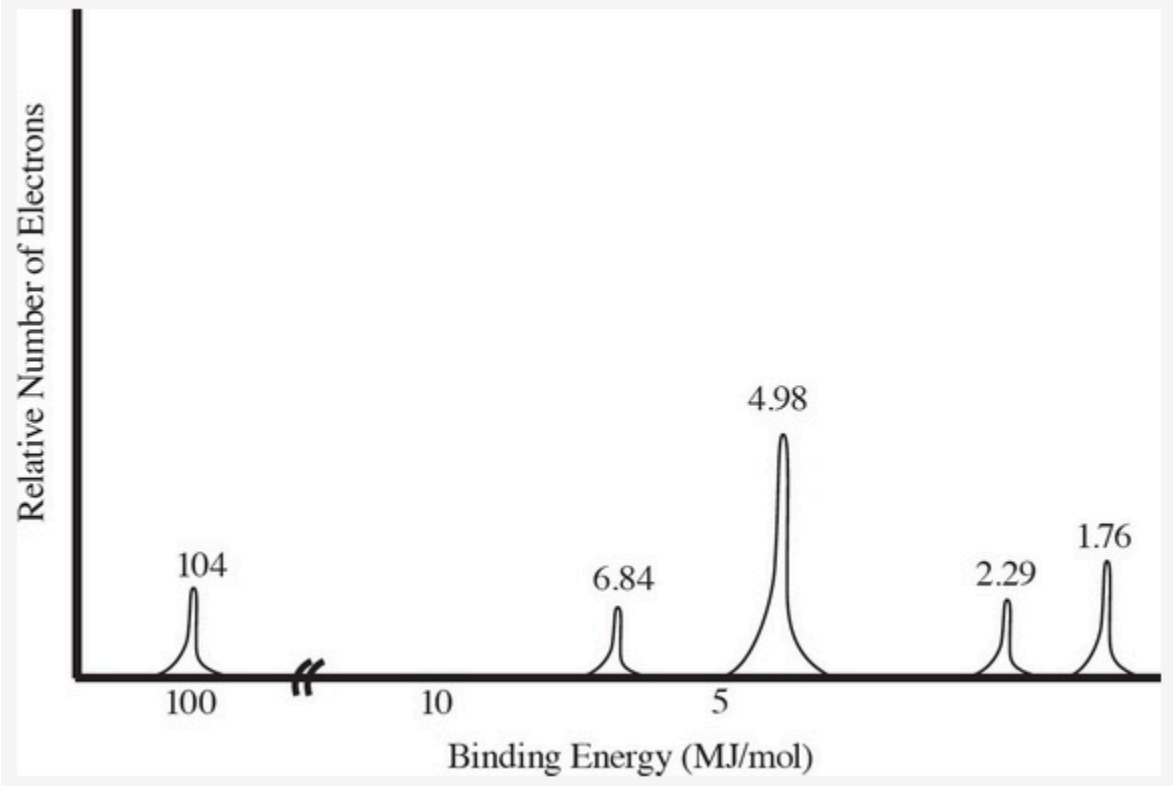
Questions 1-4 refer to the following information.

Use the PES spectra below to answer questions.



1. What element does this spectra represent?

A. Boron
B. Nitrogen
C. Aluminum
D. Phosphorus

2. Which peak represents the 2s subshell?

A. The peak at 104 MJ/mol
B. The peak at 6.84 MJ/mol
C. The peak at 2.29 MJ/mol
D. The peak at 1.76 MJ/mol

3. An electron from which peak would have the greatest velocity after ejection?

A. The peak at 104 MJ/mol
B. The peak at 6.84 MJ/mol
C. The peak at 4.98 MJ/mol
D. The peak at 1.76 MJ/mol

4. How many valence electrons does this atom have?

A. 2
B. 3
C. 4
D. 5

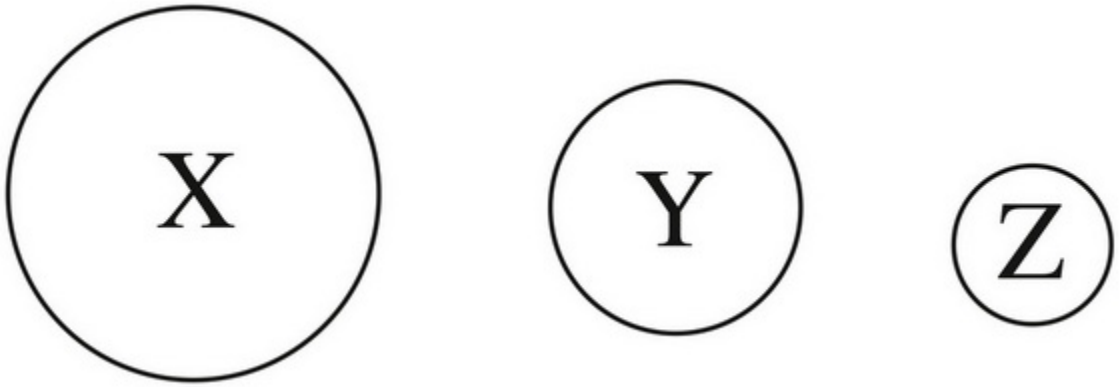
5. Why does an ion of phosphorus, P3-, have a larger radius than a neutral atom of phosphorus?

A. There is a greater Coulombic attraction between the nucleus and the electrons in P3-.
B. The core electrons in P3- exert a weaker shielding force than those of a neutral atom.
C. The nuclear charge is weaker in P3- than it is in P.
D. The electrons in P3- have a greater Coulombic repulsion than those in the neutral atom.

6. A compound is entirely made up of silicon and oxygen atoms. If there are 14.0 g of silicon and 32.0 g of oxygen present, what is the empirical formula of the compound?

A. SiO_2
B. SiO_4
C. Si_2O
D. Si_2O_3

7. The diagram below shows the relative atomic sizes of three different elements from the same period. Which of the following statements must be true?



A. The effective nuclear charge will be the greatest in element X.
B. The first ionization energy will be greatest in element X.
C. The electron shielding effect will be greatest in element Z.
D. The electronegativity value will be greatest in element Z.

8. The first ionization energy for a neutral atom of chlorine is 1.25 MJ/mol and the first ionization energy for a neutral atom of argon is 1.52 MJ/mol. How would the first ionization energy value for a neutral atom of potassium compare to those values?

A. It would be greater than both because potassium carries a greater nuclear charge than either chlorine or argon.
B. It would be greater than both because the size of a potassium atom is smaller than an atom of either chlorine or argon.
C. It would be less than both because there are more electrons in potassium, meaning they repel each other more effectively and less energy is needed to remove one.
D. It would be less than both because a valence electron of potassium is farther from the nucleus than one of either chlorine or argon.

9. Neutral atoms of chlorine are bombarded by high-energy photons, causing the ejection of electrons from the various filled subshells. Electrons originally from which subshell would have the highest velocity after being ejected?

A. 1s
B. 2p
C. 3p
D. 3d

10. The average mass, in grams, of one mole of carbon atoms is equal to

A. the average mass of a single carbon atom, measured in amus
B. the ratio of the number of carbon atoms to the mass of a single carbon atom
C. the number of carbon atoms in one amu of carbon
D. the mass, in grams, of the most abundant isotope of carbon

11. Which of the following statements is true regarding sodium and chlorine?

A. Sodium has greater electronegativity and a larger first ionization energy.
B. Sodium has a larger first ionization energy and a larger atomic radius.
C. Chlorine has a larger atomic radius and a greater electronegativity.
D. Chlorine has greater electronegativity and a larger first ionization energy.