

# Periodic Trends Quiz

1. From which of the following is it easiest to remove an electron?

- a. Mg          b. Na          c. Al          d. S

B. Sodium is the biggest atom, so it loses electrons the easiest.

2. Which of the following influenced your answer to number one the most?

- a. nuclear charge (number of protons)          b. valence electrons  
c. inner shell electrons          d. shielding effect

A. Since the atoms listed are in the same period on the periodic table, the one with the fewest protons would be the largest.

3. What is the most probable oxidation state of the alkaline earth metals?

- a. -3   b. +2   c. +3   d. -1   e. none of these

B. The alkaline earth metals have two electrons in their outer shell. They would tend to lose these, so their oxidation state (charge) would be +2.

4. Which of the following elements is most nonmetallic? (most likely to gain an electron)

- a. oxygen   b. fluorine   c. sulfur   d. chlorine

B. The smallest elements would be most likely to gain electrons (unless they have a full outer shell like the noble gases). F is the smallest.

5. Which of the following has a smaller radius?

- a. chlorine   b. chlorine ion   c. they are the same

A. Atoms with 5 or more valence electrons tend to gain electrons. Chlorine has 7, so it will gain electrons when it becomes an ion. When it gains it gets bigger, so the chlorine atom is smaller.

6. Which of the following is most likely to gain electrons in a chemical reaction?

- a. magnesium   b. chlorine   c. fluorine   d. oxygen

C. The smallest atoms tend to gain. F is the smallest

7. Low ionization energy is characteristic of:

- a. metals   b. non-metals   c. metalloids   d. liquids

A. Metals tend to lose electrons when they react. Since they are big, and have lose electrons easily, they have a low ionization energy.

8. Which of the following is the smallest?

- a. Ne          b. F<sup>-</sup>          c. Na<sup>+</sup>          d. Mg<sup>++</sup>

D. These all have the same number of valence electrons, so the one with the most protons will be smallest.

9. Rank the following elements by **increasing** atomic radius: sulfur, oxygen, neon, aluminum

Size decreases as you move up and to the right, so.....

Ne, O, S, Al

10. Rank the following elements from high to low electronegativity: carbon, aluminum, oxygen, potassium.

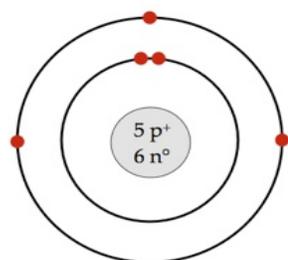
Electronegativity decreases as you move down and to the left, so....

O, C, Al, K

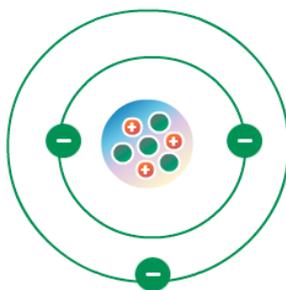
11. Why does Chlorine have a higher ionization energy than Sulfur?

Chlorine has more protons than sulfur, but the same number of energy levels. Since the energy levels are the same, more protons makes the atom smaller.

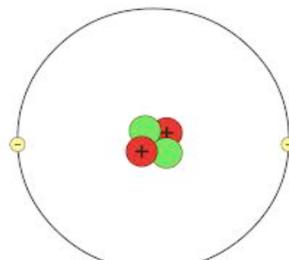
Use the following diagrams to answer questions 12-17



A



B



C

12. Which of the atoms has the highest Ionization energy? C.... it is the smallest with 2 protons and two electrons.

13. Which of the atoms has the smallest radius? See above

14. Which of the atoms has the easiest electron to be removed?

B. It has one valence electron

15. Which of the atoms is the largest?

B. Both A and B have two energy levels, but A has more protons, which makes it smaller.

16. Assuming the atoms are neutral, write the element names above the diagram. From L to R B, Li, He

17. Rank the diagrams from lowest to highest electronegativity.

Helium is lowest. Its outer shell is full, so it has NO electronegativity. Lithium is second and Boron is third. Boron and Lithium have the same number of energy levels, but Boron has more protons.

18. Why do the noble gases lack electronegativity values? They have full outer shells, so they do not attract electrons.

19. Indicate which element pair has the **smaller** atomic radius.                      Answers In Bold Italics

a. Na or *Li*                      b. Sr or *Mg*                      c. *C* or Ge                      d. Se or *O*

20. Indicate which element pair has the **lowest** ionization energy.

a. *Li* or B                      b. Mg or *Sr*                      c. *Cs* or Al

21. Indicate which is the **largest** in each pair.

a. *Na* or  $\text{Na}^+$                       b. S or *S*<sup>2-</sup>                      c. I or *I*                      d. *Al* or  $\text{Al}^{3+}$

Positive ions (CATIONS) have lost electrons, so they are smaller. Negative ions (ANIONS) have gained electrons, so they are larger than their atoms.

22. The ions  $\text{O}^{2-}$ ,  $\text{F}^-$ ,  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ , and  $\text{Al}^{3+}$  have the same total number of electrons as Neon. Which has the smallest radius and which has the largest radius? Explain your answer to receive credit.

These all have the same number of electrons. Be sure you know why.

The smallest then would  $\text{Al}^{3+}$ , since it has more protons pulling on the same number of electrons. The largest would have the fewest protons.  $\text{O}^{2-}$