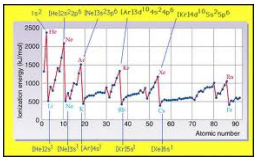
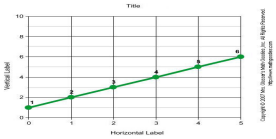
Trends

def: Patterns which repeat themselves.



- The periodic table has patterns from one period to the next called: **periodicity of properties. Examples are**: boiling point, melting point, reactivity.

Example of a pattern Not a pattern

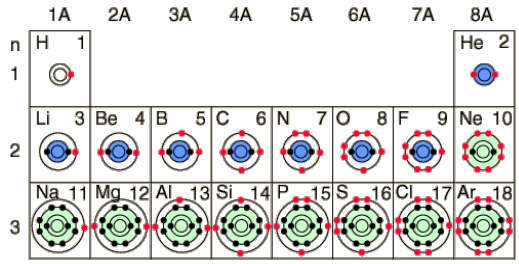
Important trend variables

1. The number of orbits

The more orbits an element has, the greater distance there is between the p+ in the nucleus and the ve on the last orbit. This will cause a weak attraction between p+ (nucleus) and ve.

2.The number of valence electrons

As the ve number increases across the period the p+ number also increases in the nucleus. This causes there to be more attraction bt the ve and the p+ in the nucleus.

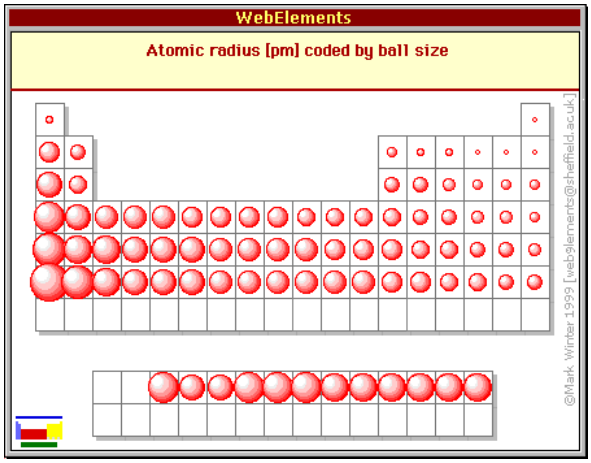


- More orbits = less attraction bt p+ & ve
- More ve = more " " " "

These 2 variables will cause the trend to increase or decrease as it goes across the period and down a group.

Trend Examples

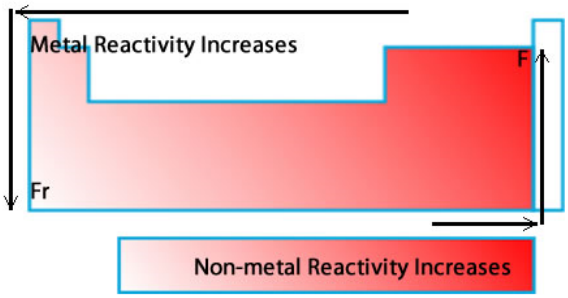
1- Atomic Radius (size of the atom)



Trend going down the group ↓	Trend going across the period ←
As you go down the group the number of **orbits** increases= more distance bt ve and p+ which allows the atom to have more space to increase in size.	As you go across the period the number of **ve increases** = more attraction bt the p+ and the ve. The attraction does not allow the atom to increase in size.

https://www.youtube.com/watch?v=ba2yN2HtPTA

2- Reactivity



Metal: Trend going down the group ↓	As you go down the group the reactivity increases because there are more orbits = less attraction bt ve and p+ = high reactivity when electrons are donated.
Metal: Trend going across the period ←	As you go across the period there are less ve = less attraction ...
Non-metal: Trend going up the group ↑	As you go up the group there are less orbits = more attraction bt ve and p+ = high reactivity when electrons are accepted.
Non-metal : Trend going across the period →	as you go across the period there are more ve = more attraction bt the ve and p+ ...

https://www.youtube.com/watch?v=J7b2aBKa6-U

Which metal has the largest chemical reaction? Why?

Fr= Most orbits and least ve = least attraction.

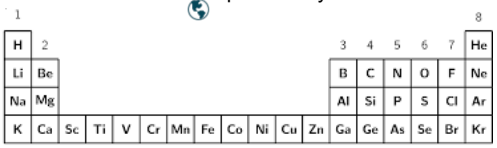
Which non-metal has the largest chemical reaction? Why?

F= least orbits and most ve = most attraction.

3- ionization	4- electronegativity
Energy required to remove an electron from the atom.	The degree to which an element tends to gain electrons.

https://www.youtube.com/watch?v=0EnK4EXLDUc

https://www.youtube.com/watch?v=mEszSvBMd7Q



Trend going up the group ↑	Trend going across the period →
For ionization less orbits = more attraction = more energy needed to remove an electron from the orbit. **For EN** less orbits = more attraction = makes it easier to gain electrons.	More ve = more attraction = ...

Group 8 has no electronegativity energy

because they do not attract electrons since their orbits are full.

a) Which element(s) has the weakest ionization/electronegativity? Why?

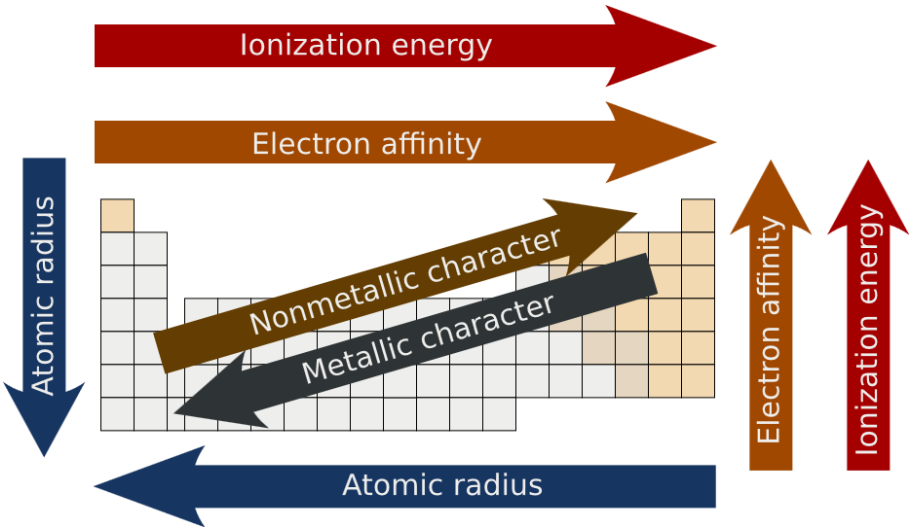
Fr - most orbits and least ve = weakest attraction.

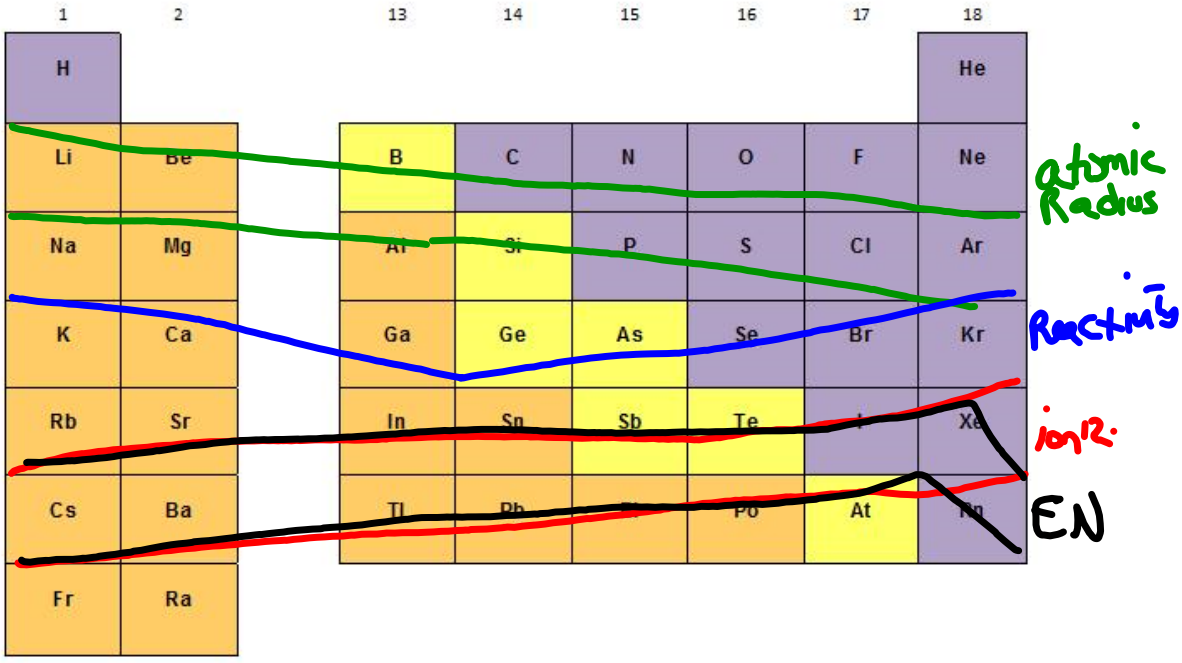
b) Which element(s) has the strongest ionization/electronegativity?

ionization - He = Least orbits and orbit is full = strong attraction

EN- F = least orbits and most ve = strong attraction

All trends put together

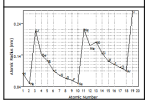
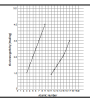




*When answering graph or table questions always locate the elements Li, Na, K because they start the period's trend.

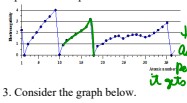
Past exam questions

1. The graphs below show the measurement of atomic radius and the measurement of electronegativity of certain elements as a function of their atomic number.

Graph 1 Atomic Radius versus Atomic Number	***Graph 2*** Electronegativity versus Atomic Number
	

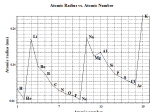
According to the graphs, which of the statements below is TRUE?
A) Both atomic radius and electronegativity increase from left to right across a period.
B) Both atomic radius and electronegativity decrease from left to right across a period.
C) The atomic radius increases and electronegativity decreases from left to right across a period.
D) The atomic radius decreases and electronegativity increases from left to right across a period.

2. The graph below shows the electronegativity of some elements. Describe: the progression of this property for elements within the 3rd period on the periodic table.



Na begins the trend with least EN. As you go across the period EN increases until it gets to the Noble gases and drops to 0.

3. Consider the graph below.



Based on this graph, which of the following statements is correct?
A) The atomic radius increases across the period and decreases down a group.
B) The atomic radius decreases across the period and increases down a group.
C) The atomic radius increases across the period and increases down a group.
D) The atomic radius decreases across the period and decreases down a group.

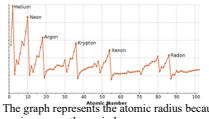
4. The circles below represent the atomic radius of 4 different elements. Determine which of the following elements belong to the appropriate atomic radius. Elements : Ca, Se, O and Rb

5. Elements Z and X are compared. Element Z is larger than Element X. Based on this you could say:
A) Element Z is further to the left side of the periodic table
B) Element X is closer to the bottom of the periodic table
C) Element Z and X are probably in the same group
D) Element Z and X are probably in the same period

6. Which statements are correct?
1. Fluorine is smaller than chlorine because it has more valence electrons.
2. Sodium is more reactive than magnesium because it has less attraction between the nucleus and valence electrons.
3. Neon has more ionization energy than fluorine because it has more valence electrons which creates a strong attraction to the nucleus.
4. Krypton has more electronegativity than bromine because ithas more attraction between the nucleus and valence electrons.
5. Francium is the most reactive element because it has the least number of valence electrons and the most orbits which creates a strong attraction to the nucleus.

A) 2 and 5 B) 2 and 3 C) 1, 4 and 5 D) 2, 3 and 5

7. Use the graph below to determine the correct statement.

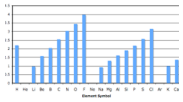


A) The graph represents the atomic radius because the trend is increasing across the period.
B) The graph represents electronegativity because the trend is increasing across the period.
C) The graph represents the ionization because the trend is increasing across the period.
D) The graph represents ionization because the trend is decreasing across the period since it starts with the noble gases.

8. Which element below would have the greatest ionization energy?
A) Argon B) Helium C) Flourine D) Francium

9. Which statements are correct?
A) Argon has a higher ionization than chlorine because it has more valence electrons which creates a larger attraction, and the atom would require less energy to remove an electron.
B) Flourine is more reactive than chlorine because it has less orbits which created a weaker attraction to the nucleus.
C) Sodium is more reactive than lithium because it has more orbits which means it has less attraction to the nucleus and is more reactive when it donates its electrons.
D) Phosphorus has a greater electronegativity than sulphur, but less than silicon because it has more orbits than both elements.

10. The table below represents which type of trend?



A) It is an ionization trend because it is increasing across the period, but drops to zero at the noble gases.
B) It is an atomic radius trend because it is increasing across the period.
C) It is an electronegativity trend because it is increasing across the period.
D) It is an electronegativity trend because it is increasing across the period, but drops to zero at the noble gases.

Attachments

- family 2 atomic radius trend.mp4
- aluminum and halogens
- electronegativity