

# Periodic Trends : Notes/W.S. - 20

## The Atomic Radius

In general as we move from left to right across a period, the atomic radius decreases. The reason for this is that the valence electrons of the outer shell are held more closely to the nucleus because the atomic number and hence the number of protons in the nucleus increases the electrical force of attraction.

If we go down a group, the atomic radius increases. This happens because the number of shells increases. Higher number shells are located farther from the nucleus. There is also something called the "shielding effect". Inner electrons act as a shield to prevent the nucleus from attracting the valence electrons so strongly.

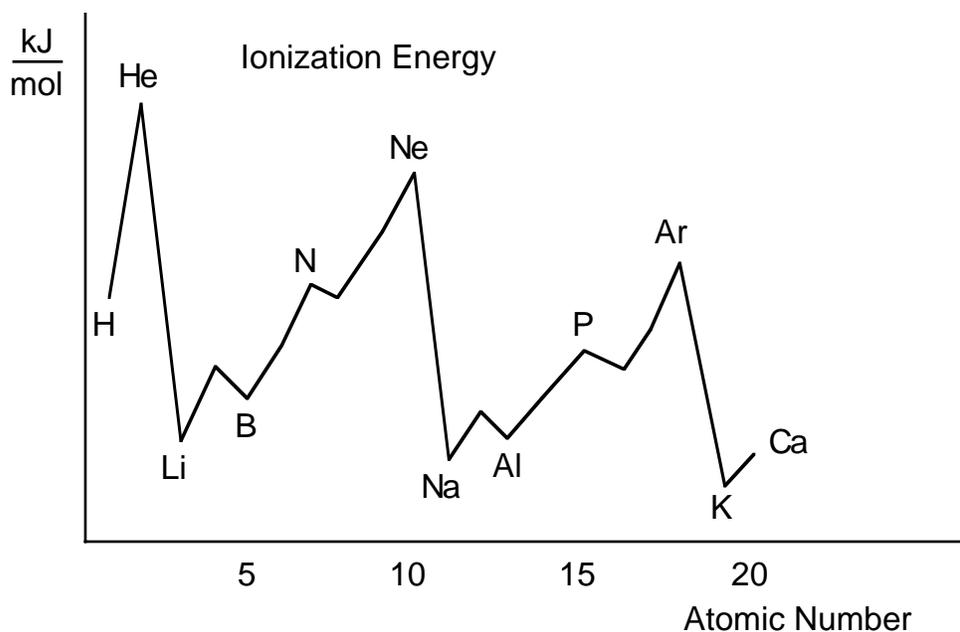
## Ionization Energy

The ionization energy is the energy required to remove one of the valence electrons. This energy is measured in kJ/mol.

The trend is for the ionization energy to increase as we move from left to right across any period. Alkali metals lose their outermost electron easily because of shielding. The noble gases tend to hold on tightly to all eight electrons in their outermost shell because of the octet rule. The diagram below shows ionization energy versus atomic number.

## Metallic properties

As we move across the table from left to right, metallic properties decrease. As we move down a group the metallic properties increase. The reason for this is that more metallic elements lose electrons more easily as the valence electrons are more loosely bound. In general elements with lower ionization energies are more metallic.



Questions :

1)a) Which atom is larger; rubidium or cesium? Explain why.

b) Is a potassium atom larger or smaller than a potassium ion?

2)a) Which atom is smaller; aluminum or chlorine? Explain why.

b) Is a chlorine atom larger or smaller than a chlorine ion?

3)a) What is the ionization energy?

b) What happens to the ionization energy as we go from left to right across a period?

c) In general, which group has the lowest ionization energies?

d) In general, what happens to ionization energies as we go down a group?

4) Which element is more metallic; strontium or cobalt?

b) Which holds on to its valence electrons more strongly; a metal or a non-metal?

Answers : 1)a) Cs, more shells, b) larger, 2)a) Cl, It has more protons holding the valence electrons closer to the nucleus., b) smaller, 3)a) It is the energy required to remove a valence electron., b) It generally increases., c) alkali metals, d) It decreases., 4)a) Sr, b) non-metal.