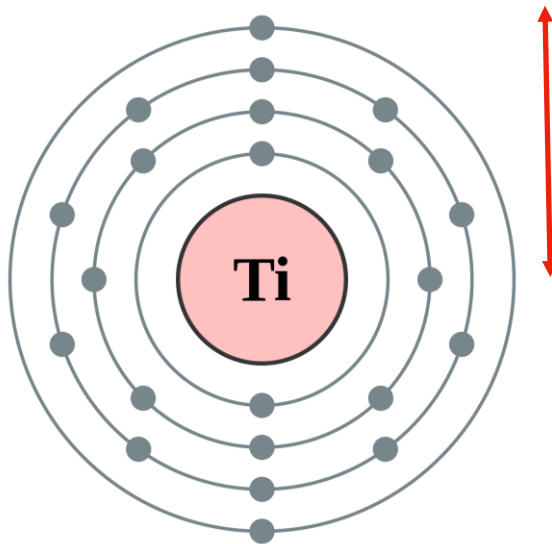


Atomic Radius

What is Atomic radius?

Atomic radius is generally stated as being the total distance from an atom's nucleus to the outermost orbital of electron. In simpler terms, it can be defined as something similar to the radius of a circle, where the center of the circle is the nucleus and the outer edge of the circle is the outermost orbital of electron. As you begin to move across or down the periodic table, trends emerge that help explain how atomic radii changes. The effective charge (Z_{eff}) of an atom is the net positive charge felt by valence electron. Z_{eff} greatly affect the atomic size of atom. As Z_{eff} decreases the size of the atom increases.



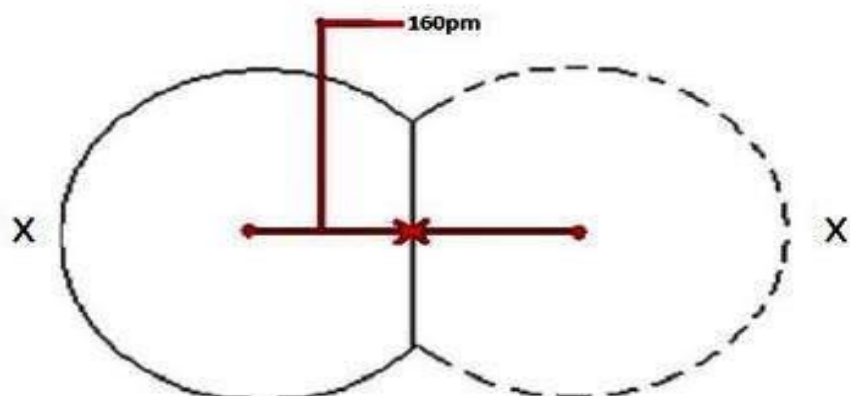
Because there is more screening of the electron from the nucleus

- Type of Atomic Radius

- (based on types of bonds)

1. Covalent Radius
2. Ionic Radius
3. Metallic Radius

Covalent radius

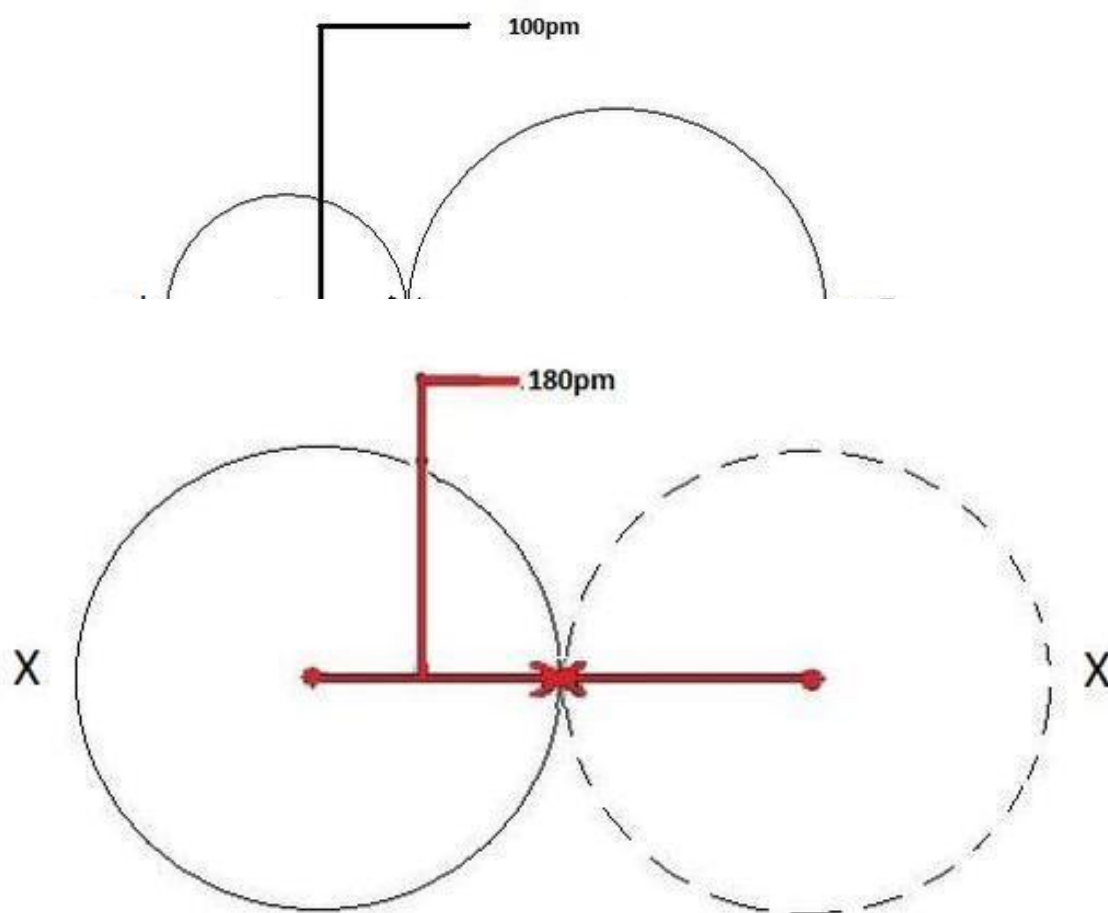


When a covalent bond is present between two atoms, the covalent radius can be determined. When two atoms of the same element are covalently bonded, the radius of each atom will be half the distance between the two nuclei because they equally attract the electrons. The distance between two nuclei will give the diameter of an atom, but you want the radius which is half the diameter.

Ionic radius

The ionic radius is the radius of an atom forming ionic bond or an ion. The radius of each atom in an ionic bond will be different than that in a covalent bond. This is an important concept. The reason for the variability in radius is due to the fact that the atoms in an ionic bond are of greatly different size. One of the atoms is a cation, which is smaller in size, and the other atom is an anion which is a lot larger in size. So in order to account for this difference, one must get the total distance between the two nuclei and divide the distance according to atomic size. The bigger the atomic size, the larger radius it will have. This is

depicted in Figure as shown below where the cation is displayed on the left as X^+ , and



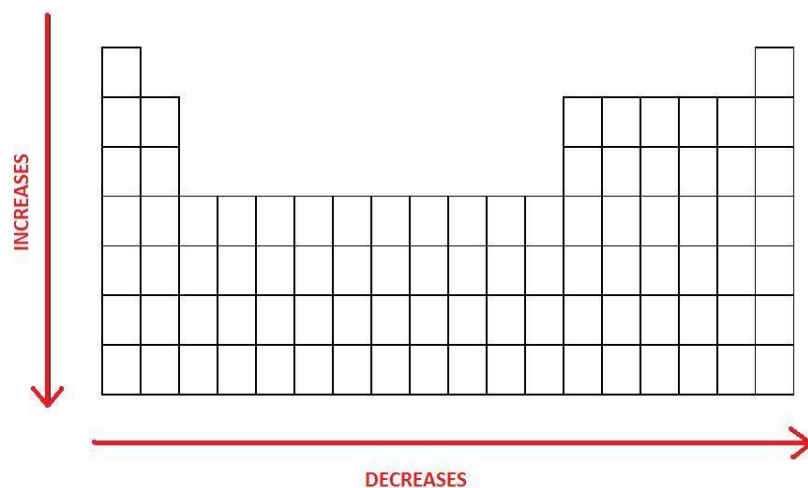
clearly has a smaller radius than the anion, which is depicted as Y^- on the right.

Metallic Radius

The metallic radius is the radius of an atom joined by metallic bond. The metallic radius is half of the total distance between the nuclei of two adjacent atoms in a metallic cluster. Since a metal will be a group of atoms of the same element, the distance of each atom will be the same in the figure below

-Periodic Trends of Atomic Radius

- An atom gets larger as the number of electronic shells increase; therefore the radius of atoms



increases as you go down a certain group in the periodic table of elements.

- In general, the size of an atom will decrease as you move from left to the right of a certain period.

EXCEPTIONS: Because the electrons added in the transition elements are added in the inner electron shell and at the same time, the outer shell remains constant, the nucleus attracts the electrons inward. The electron configuration of the transition metals explains this phenomenon. This is why Ga is the same size as its preceding atom and why Sb is slightly bigger than Sn.

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