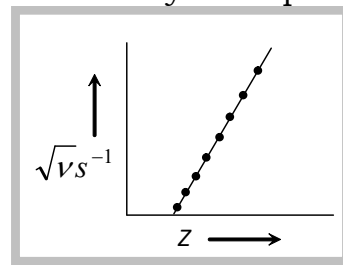


**Atomic number or Nuclear charge**

- (i) The number of protons present in the nucleus of the atom is called *atomic number* ( $Z$ )
- (ii) It was determined by **Moseley**, by giving the relation between atomic number ( $Z$ ) and frequency ( $\nu$ ) of the characteristic X-rays of the element by the equation

$$\sqrt{\nu} = a(Z-b) \text{ or } aZ - ab$$

where,  $\nu = X$ -rays frequency  
 $Z$  = atomic number of the metal  
 $a$  &  $b$  are constant.



- (iii) Atomic number = Number of positive charge on nucleus = Number of protons in nucleus = Number of electrons in neutral atom.
- (iv) Two different elements can never have identical atomic number.

**NOTE :-**

A neutral atom contains equal number of electrons and protons.

**For Cation :**

Number of protons =  $z$

Number of electrons =  $z$  - no. of electrons lost

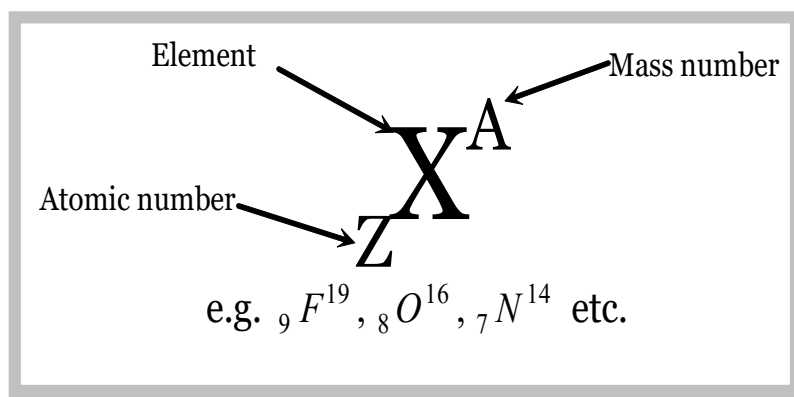
**For Anion :**

Number of protons =  $z$

Number of electrons =  $z$  + no. of electrons gained

**Mass Number**

- (i) The sum of proton and neutrons present in the nucleus is called mass number. Mass number ( $A$ ) = Number of protons + Number of neutrons or Atomic number ( $Z$ ) or Number of neutrons =  $A - Z$ .
- (ii) Since mass of a proton or a neutron is not a whole number (on atomic weight scale), weight is not necessarily a whole number.
- (iii) The atom of an element  $X$  having mass number ( $A$ ) and atomic number ( $Z$ ) may be represented by a symbol,



**Note :**

- A part of an atom up to penultimate shell is a kernel or atomic core.
- Negative ion is formed by gaining electrons and positive ion by the loss of electrons.
- Number of lost or gained electrons in positive or negative ion = Number of protons  $\pm$  charge on ion.

**Worked out Examples**

**Example - 1 :- Calculate the no.of protons,neutron and electrons in  ${}_{17}^{37}\text{Cl}$**

**Sol :** No.of protons = Atomic number( $z$ )=17  
 mass number( $A$ )=37  
 No.of neutrons= $A-Z=37-17=20$   
 No.of electrons=17

**Example - 2 :- Calculate the no.of protons, neutron and electron in  ${}_{7}^{14}\text{N}^{3-}$  ion**

**Sol :** No.of protons=atomic number( $z$ )=7  
 No.of neutrons =( $A-z$ )= $14-7=7$   
 No.of electrons in an ion  
 =  $z$  + magnitude of charge =  $7+3=10$

**Example - 3 :- The no.of electrons ,protons and neutron in a species are equal to 10,11,12 respectively. Assign proper symbol to the species.**

**Sol :** No.of protons=11, hence atomic no. = 11  
 so the element is Na.  
 It has one electron less than the no.of electrons, hence it has a unit +ve charge.  
 No.of neutrons =12  
 Mass number = no.of protons + no.of neutrons =  $11 + 12 = 23$   
 therefore the symbol of that species =  ${}_{11}^{23}\text{Na}^{+}$

**Example - 5 :- What will be the difference in mass number if the number of neutrons halved and the number of electrons doubled in  ${}_{6}^{12}\text{C}$**

**Sol :** Mass no is the sum of protons and neutrons

If  ${}_{6}^{12}\text{C} \rightarrow \text{Initial} \rightarrow \text{final}$   
 protons :    6            - 6  
 Neutrons:    6            - 3  
 mass no :    12           - 9

Hence the decrease in mass no is 25.0%