Isotopes

Note:

- **Isotopes are different atoms of the same element that have the same number of protons but different numbers of neutrons.**

Examples of some isotopes:

Elements	Isotopes		
Chlorine	$^{35}_{17}Cl$	$^{37}_{17}Cl$	
Carbon	$^{12}_{6}C$	$^{13}_{6}C$	$^{13}_{6}C$
Hydrogen	$^{1}_{1}H$	$^{2}_{1}H$	$^{3}_{1}H$

Interpretation of some special symbols:

Example:1

$^{35}_{17}Cl^{-}$

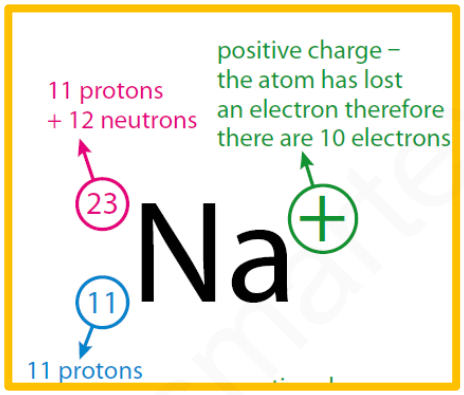
- The above symbol has a 1- charge . This indicates that the above is an ion of Chlorine (the chloride ion) and is formed by accepting an electron. Hence it now has 17+1=18 electrons.
- Z=17 =atomic number=number of protons
- A= mass number=total number of protons and neutrons=35

Example:2

$^{24}_{12}Mg^{2+}$

- The above symbol has a 2+ charge . This indicates that the above is an ion of Magnesium and is formed by losing 2 electrons. Hence it now has 12+2=14 electrons.
- Z=12 =atomic number=number of protons
- A= mass number=total number of protons and neutrons=24

Some More examples for quick reference:



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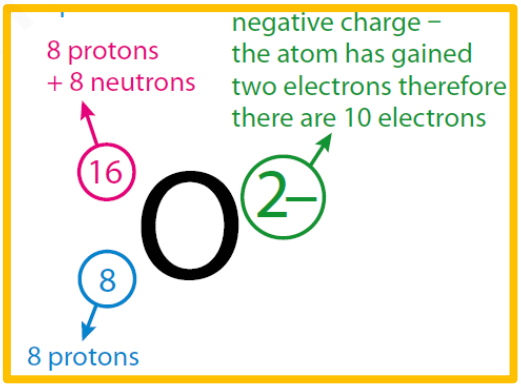
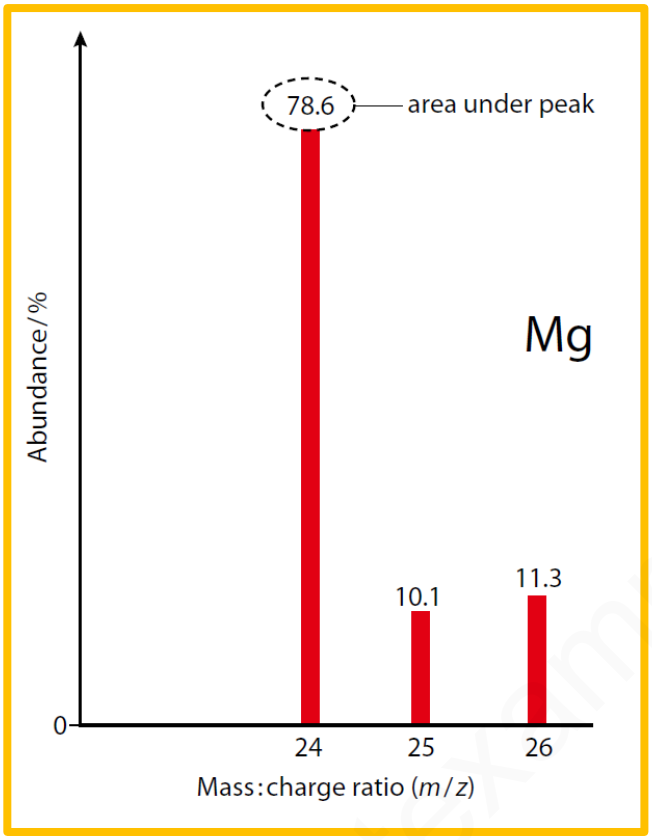


Calculate the relative atomic mass of an element from the relative masses and abundances of its isotopes

Example 1:



- In the adjoining diagram, is shown , a mass spectrum of Magnesium.
- Using a mass spectrometer, the proportion of each isotope present in a sample of an element can be measured.
- The readout of the mass-spectrometer is called as the mass spectrum.
- In the mass spectrum every isotope appears to have one peak. The height of each peak (also called as the area under each peak) is proportional to the number of atoms of the isotope in the sample tested.
- The relative atomic mass can be calculated in the following way:

$$A_r = \frac{(78.6\times24)+((10.1\times25)+(11.3\times26)}{100} = 24.3$$

Note: The scale on the x-axis is m/z, which represents the mass:charge . we can also consider this to be the mass of the isotope. [Detailed explanation has not been provided as it is not required as per the syllabus].