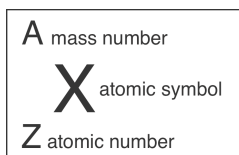
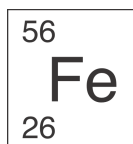


MiniChem 4: The Atom

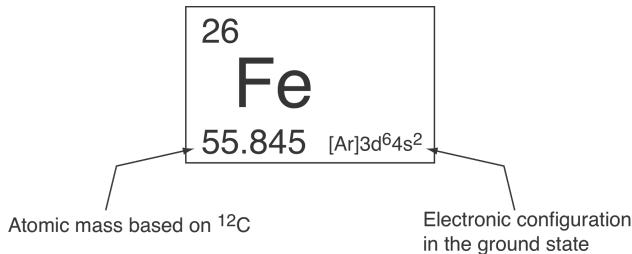
Anatomy of the atomic symbol



Z represents the number of protons (which is also the number of electrons) and A represents the number of protons + the number of neutrons. The symbol below represents iron-56 one of the isotopes of iron (that with 30 neutrons). Iron has 3 other isotopes: iron-54, iron-57 and iron-58.



In periodic tables only the atomic number is reported along with the atomic mass of the element - note that the atomic mass is expressed in atomic units - and the representation of the element is usually as shown below:



Isotopes

An atom might have more than one isotope. Hence its atomic mass is the weighted average of the atomic masses of each isotope:

$$M_x = \sum_{i=1}^{\# \text{ isotopes}} w_i M_i^x \quad \text{and} \quad \sum_{i=1}^{\# \text{ isotopes}} w_i = 1$$

Example: Iron (Fe) has 4 naturally occurring isotopes. Their relative abundance is 5.845% for ⁵⁴Fe, 91.754% for ⁵⁶Fe, 2.119% for ⁵⁷Fe and 0.282% for ⁵⁸Fe.

The atomic mass of each these isotopes is 53.9396105 u, 55.9349375 u, 56.9353940 u and 57.9332756 u, respectively. Thus the atomic mass of iron (element) is $M_{Fe} = 0.05845 * 53.9396105 + 0.91754 * 55.9349375 + 0.02119 * 56.9353940 + 0.00282 * 57.9332756 = 55.84515 \text{ u}$

