

Worksheet 4.1: Atoms, Isotopes, and Ions

Atoms

- The number of protons in an atom determines the identity of the atom. $\text{Atomic \#} = \# \text{ Protons}$
- In a neutral atom, the number of positive protons equals the number of negative electrons. $\# \text{ Protons} = \# \text{ Electrons}$
- Protons and neutrons both have a mass of 1 amu. The mass of the electron is negligible compared to the mass of the proton and neutron. Thus the mass number, or the mass of the atom, is the sum of the number of protons and neutrons. $\text{Mass \#} = \# \text{ Protons} + \# \text{ Neutrons}$

Name	Symbol	Atomic #	Mass #	# Protons	# Neutrons	# Electrons
Selenium					46	
			222	86		
					118	79
		11			12	

Isotopes

- The number of neutrons in any specific type of atom can vary. Atoms of the same element with different numbers of neutrons are called isotopes.
- Isotopes are distinguished from each other by including the mass number with the name or symbol.

Name	Symbol	Atomic #	Mass #	# Protons	# Neutrons	# Electrons
	^{235}U					
	^{238}U					
Carbon-12						
Carbon-13						

Ions

- As we have seen, in a neutral atom, the number of protons and the number of electrons is equal.
- Atoms can gain or lose electrons to become ions. Ions are charged atoms resulting from the difference in number of positive protons and negative electrons.
- A cation is a positive ion. A cation results when an atom loses electrons. $\# \text{ Protons} > \# \text{ Electrons}$
- An anion is a negative ion. An anion results when an atom gains electrons. $\# \text{ Electrons} > \# \text{ Protons}$
- Ions are distinguished from atoms by including the ion charge as a superscript in the symbol.

Name	Symbol	Atomic #	Mass #	# Protons	# Neutrons	# Electrons	Cation or Anion?
	Al^{+3}				14		
Iron ion			56			24	
				15	15	18	
	F^{-1}		19				