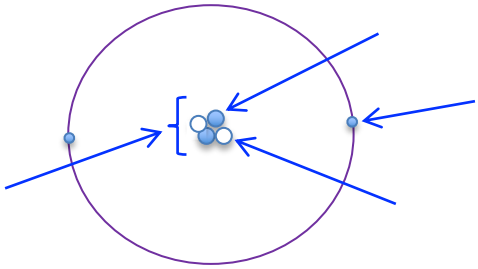
2.1 Constituents of the atom

The following diagram shows an atom of helium:



videos

(1) *Label the constituents of the atom, above.*

The atom shown is *helium-4* because it contains 4 nucleons (neutrons + protons) in the nucleus.

We label *helium-4* using the following notation:

$$^{4}_{2}He$$

The top number is called the 'nucleon number'. It is denoted by the symbol *A*.
(2) *What would this number be called in chemistry?*

The bottom number is called the 'proton number'.
(3) *Why do you think it is called this?*

(4) *What would this number be called in chemistry?*

The proton number is denoted by the symbol *Z*.

(5) *Write the symbol notation for helium-3.*

(6) *How is it different to helium-4?*

We call *helium-3* and *helium-4* isotopes.

(7) Carbon-14 is a radioactive isotope ('radioisotope') of carbon. Write the symbol notation for carbon-14.

(8) *Complete the following table for the properties of the constituents of the atom:*

constituent	*charge*		*mass*	
	(coulombs)	*relative to the charge on a proton*	*(kg)*	*relative to the mass of a proton*
proton				
neutron				
electron				

Specific Charge

The word 'specific' in science indicates 'per unit mass'. So 'specific charge' is the charge per kilogram. If we want to work out the specific charge of a particle, we take its total charge (in coulombs) and divide it by its total mass (in kg).

$$specific\ charge = \frac{total\ charge\ (C)}{total\ mass\ (kg)}$$

(9) *Looking at the formula, what is the unit for specific charge?*

Note that the neutral atom has zero charge and therefore zero specific charge.

(10) *Why does the neutral atom have zero charge?*

(11) *What is the specific charge of the following nuclei:*

1) *helium-3?*

2) *Carbon-12?*