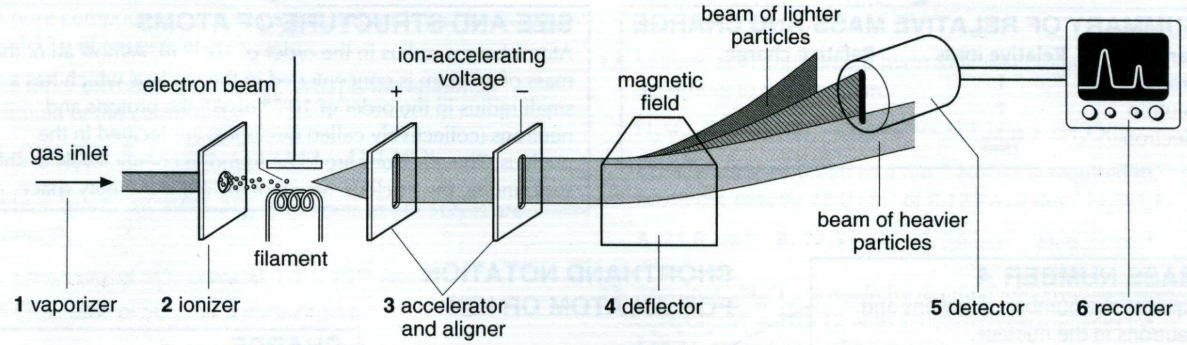
Mass spectrometer and relative atomic mass

MASS SPECTROMETER

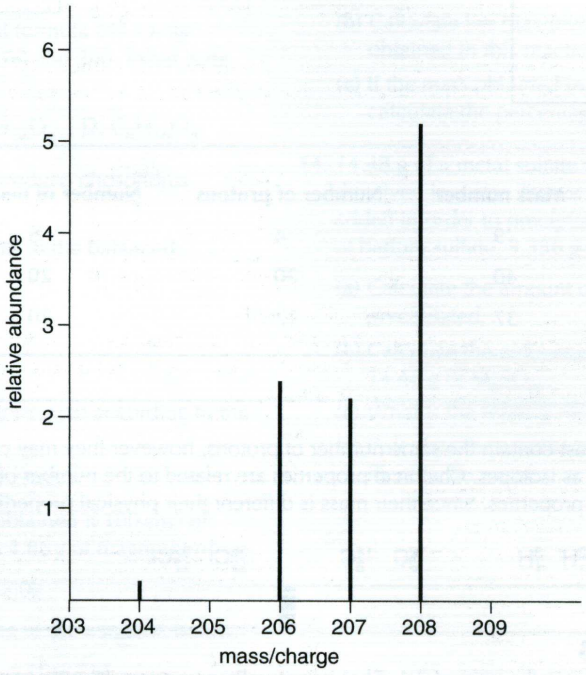
Relative atomic masses can be determined using a mass spectrometer. A *vaporized* sample is injected into the instrument. Atoms of the element are *ionized* by being bombarded with a stream of high energy electrons in the ionization chamber. In practice the instrument is set so that only ions with a single positive charge are formed. The resulting unipositive ions pass through holes in parallel plates under the influence of an electric field where they are *accelerated*. The ions are then *deflected* by an external magnetic field.

The amount of deflection depends both on the mass of the ion and its charge. The smaller the mass and the higher the charge the greater the deflection. Ions with a particular mass/charge ratio are then recorded on a *detector* which measures both the mass and the relative amounts of all the ions present.

DIAGRAM OF A MASS SPECTROMETER



THE MASS SPECTRUM OF NATURALLY OCCURRING LEAD



The relative atomic mass of lead can be calculated from the weighted average:

Isotopic mass	Relative abundance	% relative abundance
204	0.2	2
206	2.4	24
207	2.2	22
208	5.2	52

$$\text{relative atomic mass} = \frac{(2 \times 204) + (24 \times 206) + (22 \times 207) + (52 \times 208)}{100} = 207.2$$