ORGANIC ELEMENTAL ANALYSIS

C, H and O
- the organic compound is burned in **excess** oxygen
- any... **carbon** reacts with the oxygen to form **carbon dioxide**
    hydrogen reacts with the oxygen to form **water**
    oxygen in the compound **doesn't combine with the added oxygen**

Carbon
carbon dioxide has a relative molecular mass of... $12 + 16 + 16 = 44$
carbon has a relative atomic mass of 12
the fraction of carbon in carbon dioxide $=$ $12/44$

e.g. the mass of carbon in 0.11g of CO_2 $=$ 0.11 x 12/44 $=$ 0.03g

Hydrogen
water has a relative molecular mass of... $1 + 1 + 16 = 18$
hydrogen has a relative atomic mass of 1
there are two hydrogen atoms in water molecules
the fraction of hydrogen in water $=$ $2/18$

e.g. the mass of carbon in 0.54g of H_2O $=$ 0.54 x 2/18 $=$ 0.06g

Oxygen
because oxygen doesn't react with the added oxygen, it is assumed that the difference in mass between the original compound and the calculated masses of carbon and hydrogen is oxygen.

EXAMPLE CALCULATION

Compound X contains C, H and O. When 0.86g of X is burnt in excess oxygen, 1.10g of carbon dioxide and 0.45g of water are formed. Calculate the mass of C,H and O in the sample of X

mass of C $=$ 1.10 x 12/44 $=$ 0.3g
mass of H $=$ 0.45 x 2/18 $=$ 0.05g
mass of O $=$ 0.86 - (0.3 + 0.05) $=$ 0.51g

These values can be used to calculate the EMPIRICAL FORMULA

Cl
- the organic (or inorganic) compound is treated with silver nitrate solution
- any **chloride** is converted to **silver chloride (AgCl)** $Ag^+ + Cl^- \longrightarrow AgCl$
- the insoluble silver chloride is filtered, dried and weighed

silver chloride has a relative molecular mass of... $108 + 35.5 = 143.5$
chlorine has a relative atomic mass of 35.5
the fraction of chlorine in silver chloride $=$ $35.5/143.5$

Other elements
Calculations are carried out in the same way as those above.