Set 9

1. (a) $M(KOH) = 39.10 + 16.00 + 1.008$
$= 56.1 \text{ g mol}^{-1}$

(b) $M(CuCl_2) = 63.55 + (2 \times 35.45)$
$= 134 \text{ g mol}^{-1}$

(c) $M(AlCl_3) = 26.98 + (3 \times 35.45)$
$= 133 \text{ g mol}^{-1}$

(d) $M(Ca(OH)_2) = 40.08 + (2 \times (16.00 + 1.008))$
$= 74.1 \text{ g mol}^{-1}$

(e) $M((NH_4)_2C_2O_4) = (2 \times 14.01) + (8 \times 1.008) + (2 \times 12.01) + (4 \times 16.00)$
$= 125 \text{ g mol}^{-1}$

(f) $M(Na_2CO_3.10H_2O) = (2 \times 22.99) + 12.01 + (3 \times 16.00) + (20 \times 1.008) + (10 \times 16.00)$
$= 286 \text{ g mol}^{-1}$

(g) $M(WC) = 183.9 + 12.01$
$= 196 \text{ g mol}^{-1}$

(h) $M(CH_4) = 12.01 + (4 \times 1.008)$
$= 16.0 \text{ g mol}^{-1}$

(i) $M(C_{12}H_{22}O_{11}) = (12 \times 12.01) + (22 \times 1.008) + (11 \times 16.00)$
$= 342 \text{ g mol}^{-1}$

(j) $M(AgCl) = 107.9 + 35.45$
$= 143 \text{ g mol}^{-1}$

(k) $M(ZnI_2) = 65.38 + (2 \times 126.9)$
$= 319 \text{ g mol}^{-1}$

(l) $M(Na_2SO_4) = (2 \times 22.99) + 32.06 + (4 \times 16.00)$
$= 142 \text{ g mol}^{-1}$

(m) $M(Fe_2(SO_4)_3) = (2 \times 55.85) + (3 \times 32.06) + (12 \times 16.00)$
$= 4.00 \times 102 \text{ g mol}^{-1}$

(n) $M(SO_2) = 32.06 + (2 \times 16.00)$
$= 64.1 \text{ g mol}^{-1}$

(o) $M(H_2SO_4) = (2 \times 1.008) + 32.06 + (4 \times 16.00)$
$= 98.1 \text{ g mol}^{-1}$

2. a) C-14 has two more neutrons in the nucleus than C-12
   b) C-13
   c) As the relative mass is very close to 12, most of a random sample of carbon must be C-12.
   d) During the life of a living thing the amount of C-14 remains relatively constant as it is always taking in new carbon. Once the living thing dies and no new carbon is taken in the amount of C-14 starts to drop as it decays (C-14 is radioactive). As a result the ratio of C-12 to C-14 changes. This ratio can be measured. The rate of decay of C-14 is known, so the time taken to reach the measured ratio can be calculated. As the half-life of C-14 is 5700 years objects of up to about 60 000 years can be dated with accuracy. (see www.howstuffworks.com for further details)

3. a) Normal hydrogen has 1 proton and 1 electron. Deuterium has 1 proton, 1 electron and 1 neutron. Tritium has 1 proton, 1 electron and 2 neutrons.

   b) Deuterium and tritium are used in the nuclear industry (mainly for fusion reactions) and can act as radioactive tracers. Tritium is also used in self-powered lighting.