1. g) $n = 0.11\,mol$ $\quad m = n \times M$

$M = 32.1u$ $\quad = 32.1\,g/mol \times 0.11\,mol$

(molecmass = 32.1u) $\quad = 3.5$ grams

$M = 32.1\,g/mol$

i) $n = 4.8\,mol$

CH_4 $\quad 2C = 2 \times 12u$

$4 \times 1.008 = 4u$

molecmass = 16u

$M = 16.0\,g/mol$

$m = n \times M$

$= 4.8\,mol \times 16.0\,g/mol$

$= 76.8\,g. = 77\,g$

j) $n = 2.0\,mol$,

M		
	$2 \times C$	28
	$4 \times H$	4
	$2 \times O$	32
		64 g/mol

$m = 1.2 \times 10^2\,g.$

k) $n = 2.0\,mol$

$(NH_4)_2SO_4$

$2N = 2 \times 14u = 28u$

$8H \quad 8 \times 1 = 8u$

$1S \quad 1 \times 32 = 32u$

$4O \quad 4 \times 16 = 64u$

molecmass = 132.0u

$M = 132.0\,g/mol$

$m = n \times M$

$m = 2.0\,mol \times 132\,g/mol$

$m = 264\,g$

$= 2.6 \times 10^2\,g$

l) $n = 3.0\,mol$

$BeSO_4 \cdot 4H_2O$

$1Be = 1 \times 9u = 9u$

$1S = 1 \times 32u = 32u$

$8H = 8 \times 1u = 8u$

$8O \quad 8 \times 16u = 128u$

$177u$

$M = 177\,g/mol$

$m = n \cdot M$

$m = 3.0\,mol \times 177\,g/mol$

$m = 531$ grams.

5.3×10^2 grams

m) $n = 0.12\,mol$

C_6H_6

$6C = 6 \times 12.0 = 72.0u$

$6H = 6 \times 1.0 = 6.0u$

$78u$

$M = 78.0\,g/mol$

$m = n\,M$

$= 0.12 \times 78.0$

$= 9.36$ grams

(9.4 g)

2) e) $m = 23g$

$N_2 \Rightarrow 2N = 2 \times 14.01$

$= 28u$

$M = 28 g/mol$

$n = \frac{m}{M}$

$= \frac{23g}{28 g/mol}$

$= 0.82 mol$

j) $m = 2.15g$

$Cu(C_2H_3O_2)_2$

$1Cu = 1 \times 63.5 = 63.5u$

$4C = 4 \times 12.0 = 48.0u$

$6H = 6 \times 1.00 = 6.00u$

$4O = 4 \times 16.0 = 64.0u$

$181.5u$

$M = 181.5 g/mol$

$n = \frac{m}{M} = \frac{2.15g}{181.5 g/mol} = .0118 mol$

$(1.18 \times 10^{-2} mol)$

h) $m = 2.698g$

$M of Al = 27.0 g/mol$

$n = \frac{m}{M}$

$= \frac{2.698g}{27.0 g/mol}$

$= .0999 mol$ or 0.10

$(9.99 \times 10^{-2} mol)$

3c) $n = 1.0 mol$ $n = \frac{\#part}{N}$

$\#particles = n \times N$

$= 1.0 mol \times 6.02 \times 10^{23} \frac{atoms}{mol}$

$= 6.02 \times 10^{23} atoms$

d) $\#molecules = n \times N$

$= 1.0 mol \times 6.02 \times 10^{23}$

$= 6.02 \times 10^{23} molecules$

Since there are 2 oxygen atoms of O per molecule

$2 \times 6.02 \times 10^{23} =$

$12.04 \times 10^{24} atoms$

e) $\#molecules = n \times N$

$= 2.0 mol \times 6.02 \times 10^{23} \frac{molec}{mol}$

$= 12.04 \times 10^{23} molecules$

$= 1.204 \times 10^{24} molecules of CuSO_4.$

f) ∴ There are 1.204×10^{24} atoms of Cu.

g) There are 1.204×10^{24} atoms of I

h) 4 atoms of Oxygen.

$= 4 \times 1.204 \times 10^{24}$

$= 4.816 \times 10^{24}$ atoms of Oxygen.

i) 2 moles.

4. a) # atoms = 12.04×10^{23}

$n = \frac{\#\text{atoms}}{N}$

$n = \frac{12.04 \times 10^{23} \text{ atoms}}{6.02 \times 10^{23} \text{ atoms/mol}}$

$n = 2.00 \text{ mol}$

b) # atoms of Cu = 3.02×10^{20}

$n = \#\text{atoms}/N$

$= \frac{3.02 \times 10^{20} \text{ atoms}}{6.02 \times 10^{23} \frac{\text{atoms}}{\text{mol}}} = .487 \times 10^{-3} \text{ mol}$

$= 4.87 \times 10^{-4} \text{ mol}$

c) # atoms of Pb = 2.01×10^{24}

$n = \frac{\#\text{atoms}}{N}$

$n = \frac{2.01 \times 10^{24} \text{ atoms}}{6.02 \times 10^{23} \text{ atoms/mol}}$

$n = .334 \times 10$

$n = 3.34 \text{ mol}$

d) 1.80×10^{25} chemistry teachers

$n = \#\text{teachers}/N$

$n = \frac{1.80 \times 10^{25} \text{ teachers}}{6.02 \times 10^{23} \frac{\text{teachers}}{\text{mol}}}$

$n = .299 \times 10^{2} \text{ mol}$

$n = 2.99 \times 10 \text{ mol}$

5. c) # atoms of Al = 2.5×10^{26}

$n = \frac{\#\text{atoms}}{N}$

$n = \frac{2.5 \times 10^{26} \text{ atoms}}{6.02 \times 10^{23} \text{ atom/mol}}$

$n = .415 \times 10^{3}$

M of Al = 27.0 g/mol

$\text{mass} = n \times M$

$= .415 \times 10^{3} \text{ mol} \times 27.0 \text{ g/mol}$

$= 11.205 \text{ g}$ 1.12×10^{4} g

∴ The mass of Al is ~~11.2 kg~~ g.

e) # molecules of CO_2 = 12.04×10^{23}

$n = \frac{\#\text{molec}}{N}$

$n = \frac{12.04 \times 10^{23} \text{ molec}}{6.02 \times 10^{23} \text{ molec/mol}}$

$n = 2.00 \text{ mol}$

1C = 12.0 u

M of CO_2 = 2O = 2×16 = 32 u

M = 44 g/mol

$\text{mass} = n \times M$

$m = 2.00 \text{mol} \times 44.0 \text{ g/mol}$

$m = 88.0 \text{ g}$

∴ The mass of CO_2 is 88.0 g.

f) # molec of H_2O = 50

$n = \frac{50 \text{ molec}}{6.02 \times 10^{23} \text{ molec/mol}}$

$n = 8.31 \times 10^{-23} \text{ mol}$

M of H_2O → 2H = 2 u/molec

1O = 16.0 u/molec

M = 18 g/mol

$m = n \times M$

$m = 8.31 \times 10^{-23} \text{ mol} \times 18 \text{ g/mol}$

$m = 149.58 \times 10^{-23}$

$m = 1.50 \times 10^{-21}$ grams.

∴ The mass of 50 H_2O molecules is 1.50×10^{-21}

g) # molecules = 3.01×10^{22}

Mol $Al_2(SO_4)_3$

$2Al - 2 \times 27.0 = 54.0u$

$3S \cdot 3 \times 32.1 = 96.3u$

$120 - 12 \times 16 = 192u$

$M = 342.3\ g/mol$

$n = \frac{\#molec}{N}$

$n = \frac{3.01 \times 10^{22}\ molec}{6.02 \times 10^{23}\ molec/mol}$

$n = .5 \times 10^{-1}$

$= 5.0 \times 10^{-2}\ mol$

$mass = n \cdot M$

$= 5.0 \times 10^{-2}\ mol \times 342.3 \frac{g}{mol}$

$m = 17.1\ grams$

∴ The mass of $Al_2(SO_4)_3$ is 17.1 g.

6 a) $m = 31.0g$

Mof P = 31.0 g/mol

$n = m/M$

$n = 31.0g / 31.0g/mol$

$n = 1.0\ mol$

# of atoms = $n \times N$

$= 1.0mol \times 6.02 \times 10^{23} \frac{atoms}{mol}$

$= 6.02 \times 10^{23}$ atoms

∴ There are 6.02×10^{23} atoms in 31.0g of P.

b) $m = 72.0g$

Mof C = 12.0 g/mol

#moles = m/M

$n = \frac{72.0g}{12.0g/mol}$

$= 6.00\ mol$

# of atoms = $6.00mol \times 6.02 \times 10^{23} \frac{atoms}{mol}$

$= 3.61 \times 10^{24}$ atoms

c) $m = 18.0g$

Mof H_2O = 18 g/mol

#moles = m/M

$n = 18.0g / 18.0g/mol$

$n = 1.00\ mol$

# of molec. = $n \times N$

$= 1.00mol \times 6.02 \times 10^{23} \frac{molec}{mol}$

$= 6.02 \times 10^{23}$ molecules of H_2O

d) $m = 9.8g$

Mof H_2SO_4 → 2H ⇒ 2

1S ⇒ 32.1

4O = 4×16 = 64

98.1 g/mol

$n = m/M$

$= 9.8g / 98.1g/mol$

$= .0999\ mol$

$(9.99 \times 10^{-2}\ mol)$

molec = .0999 × 6.02×10^{23}

$= .601 \times 10^{23}$ molec

Since 4O atoms per molec

$4 \times .601 \times 10^{23} = 2.41 \times 10^{23}$