23) Isotope mass abundance

^{12}C 12.0000amu 98.89%

^{13}C 13.034amu 1.11%

ave mass: $(0.9889)(12.0000) + (0.0111)(13.034)$

$= 12.01$

* there would be 9889 atoms of ^{12}C and 111 atoms of ^{13}C in 10,000 atom sample

* the average mass of carbon is independent of size, it will always be 12.01

total mass: $10{,}000 \text{ atoms} \times \frac{12.01 \text{amu}}{1 \text{atm}} =$

$1.201 \times 10^5 \text{amu}$

For 1 mole of carbon (6.02×10^{23} atoms) the average mass is 12.01 amu

of ^{12}C atoms $= (0.9889)(6.02 \times 10^{23}\ \text{atoms})$

$= 5.955 \times 10^{23}\ \text{atoms}\ ^{12}C$

of ^{13}C atoms $= (0.0111)(6.02 \times 10^{23}\ \text{atoms})$

$= 6.68 \times 10^{21}\ \text{atoms}\ ^{13}C$

total mass $= 6.02 \times 10^{23}\ \text{atoms} \dfrac{12.01\ \text{amu}}{1\ \text{atom}} =$

$= 7.233 \times 10^{24}\ \text{amu}$

total mass in g =

$6.02 \times 10^{23}\ \text{atoms} \dfrac{12.01\ \text{amu}}{1\ \text{atom}} \Big| \dfrac{1\ \text{g}}{6.02 \times 10^{23}\ \text{amu}} =$

$= 12.01\ \dfrac{\text{g}}{\text{mol}}$

33) $A = (0.0140)(203.973) = 2.86$

$(0.2410)(205.9745) = 49.64$

$(0.2210)(206.9759) = 45.74$

$(0.5240)(207.9766) = 109.0$

207.2 amu

Pb

35) let x = mass of ^{185}Re

$(0.6260)(186.956) + (0.3740)(x) = 186.207$

$\frac{186.207 - 117.0}{0.3740} = \frac{0.3740\,x}{0.3740}$

$x = 185$

41) $\frac{500.\text{ atoms Fe} \,/\, 55.85\text{ g Fe}}{6.02\times10^{23}\text{ atoms Fe}} =$

$= 4.64 \times 10^{-20}$ g Fe

45) Al_2O_3

$2(26.98) + 3(16.00) = 101.96 \frac{g}{mol}$

Na_3AlF_6

$3(22.99) + 1(26.98) + 6(19.00) = 209.95 \frac{g}{mol}$

46) a) NH_3

$1(14.01) + 3(1.01) = 17.03 \frac{g}{mol}$

b) N_2H_4

$2(14.01) + 4(1.01) = 32.05 \frac{g}{mol}$

c) $(NH_4)_2Cr_2O_7$

$2(14.01) + 8(1.01) + 2(52.00) + 7(16.00)$

$= 252.08 \frac{g}{mol}$

4a) $1.00\text{g } NH_3 \left| \frac{1\text{mole } NH_3}{17.03\text{g } NH_3} \right. = 0.0587\text{ mole } NH_3$

b) $1.00\text{g } N_2H_4 \left| \frac{1\text{mole } N_2H_4}{32.05\text{g } N_2H_4} \right. = 0.0312\text{ mole } N_2H_4$

c) $1.00\text{g } (NH_4)_2Cr_2O_7 \left| \frac{1\text{mole } (NH_4)_2Cr_2O_7}{252.08\text{g } (NH_4)_2Cr_2O_7} \right. =$

$3.97 \times 10^{-3}\text{ mol } (NH_4)_2Cr_2O_7$

5) a) $5.00\text{ mole } NH_3 \left| \frac{17.03\text{g } NH_3}{1\text{ mole } NH_3} \right. = 85.2\text{g } NH_3$

b) $5.00\text{ mole } N_2H_4 \left| \frac{32.05\text{g } N_2H_4}{1\text{ mole } N_2H_4} \right. = 160.\text{g } N_2H_4$

c) $5.00\text{mole } (NH_4)_2Cr_2O_7 \left| \frac{252.08\text{g } (NH_4)_2Cr_2O_7}{1\text{ mole } (NH_4)_2Cr_2O_7} \right.$

$= 1260\text{g } (NH_4)_2Cr_2O_7$

53) a) $5.00 \text{ mole } NH_3 \left| \frac{1 \text{ mole } N}{1 \text{ mole } NH_3} \right| \frac{14.01 \text{ g}}{1 \text{ mole } N} =$

$70.1 \text{ g } N$

b) $5.00 \text{ mole } N_2H_4 \left| \frac{2 \text{ mole } N}{1 \text{ mole } N_2H_4} \right| \frac{14.01 \text{ g } N}{1 \text{ mole } N} =$

$140. \text{ g } N$

c)

$5.00 \text{ mole } (NH_4)_2Cr_2O_7 \left| \frac{2 \text{ mole } N}{1 \text{ mole } (NH_4)_2Cr_2O_7} \right| \frac{14.01 \text{ g } N}{1 \text{ mole } N} =$

$140. \text{ g } N$

55a) $1.00\text{g } NH_3 \left| \frac{6.02\times10^{23} \text{ part } NH_3}{17.03\text{g } NH_3} \right. =$

3.54×10^{22} part NH_3

b) $1.00\text{g } N_2H_4 \left| \frac{6.02\times10^{23} \text{ part } N_2H_4}{32.05\text{g } N_2H_4} \right. =$

1.88×10^{22} part N_2H_4

c) $1.00\text{g } (NH_4)_2Cr_2O_7 \left| \frac{6.02\times10^{23} \text{ part } (NH_4)_2Cr_2O_7}{252.08\text{g } (NH_4)_2Cr_2O_7} \right. =$

2.39×10^{21} part $(NH_4)_2Cr_2O_7$

57 a) 3.54×10^{22} part NH_3 / 1 atom N = 1 part NH_3

3.54×10^{22} atoms N

b) 1.88×10^{22} part N_2H_4 / 2 atoms N = 1 part N_2H_4

3.76×10^{22} atoms N

c) 2.39×10^{21} part $(NH_4)_2Cr_2O_7$ / 2 atoms N = 1 part $(NH_4)_2Cr_2O_7$

4.78×10^{21} atoms N