EST-4
Practice

Name:

The Mole and Molar Mass #2

1. How many molecules are in 2.0 moles of KCl?

$2 \text{ mol KCl} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol KCl}} = 1.205 \times 10^{24} \rightarrow \boxed{1.2 \times 10^{24} \text{ molecules}}$

2. How many atoms are in 2.0 moles of KCl?

$2 \text{ mol KCl} \times \frac{6.02 \times 10^{23} \text{ molecules KCl}}{1 \text{ mol KCl}} \times \frac{2 \text{ atoms KCl}}{1 \text{ molecule KCl}} = 2.4092 \times 10^{24} \rightarrow \boxed{2.4 \times 10^{24} \text{ atoms}}$

3. How many molecules are in 4.0 moles of NaF?

$4 \text{ mol NaF} \times \frac{6.02 \times 10^{23} \text{ molecules NaF}}{1 \text{ mol NaF}} = \boxed{2.4 \times 10^{24} \text{ molecules}}$

4. How many atoms are in 4.0 moles of NaF?

$4 \text{ mol NaF} \times \frac{6.02 \times 10^{23} \text{ molecules NaF}}{1 \text{ mol NaF}} \times \frac{2 \text{ atoms NaF}}{1 \text{ molecule NaF}} = \boxed{4.8 \times 10^{27} \text{ atoms}}$

5. Calculate the mass of the following:

a) 0.50 mol of H_2

$H_2 \rightarrow 2(1.01)$

$0.50 \text{ mol } H_2 \times \frac{2.02 \text{ g } H_2}{1 \text{ mol } H_2} = 1.01 \rightarrow \boxed{1.0 \text{ g}}$

b) 5.0 mol of Al

$Al \rightarrow 26.98$

$5.0 \text{ mol Al} \times \frac{26.98 \text{ g Al}}{1 \text{ mol Al}} = 134.90 \rightarrow \boxed{1.3 \times 10^{2} \text{ g}} \quad \boxed{130 \text{ g}}$

c) 0.20 mol of NaCl

NaCl
22.99 35.45

$0.20 \text{ mol NaCl} \times \frac{58.44 \text{ g NaCl}}{1 \text{ mol NaCl}} = 11.688 \rightarrow \boxed{12 \text{ g}}$

d) 2.0 mol of $C_6H_{12}O_6$

$C_6H_{12}O_6$
6(12.00) 12(1.01) 6(16.00)

$2.0 \text{ mol } C_6H_{12}O_6 \times \frac{180.18 \text{ g } C_6H_{12}O_6}{1 \text{ mol } C_6H_{12}O_6} = 360.360 \rightarrow \boxed{360 \text{ g}}$

e) 0.10 mol of Na_2O

Na_2O
2(22.99) 16.00

$0.1 \text{ mol } Na_2O \times \frac{61.98 \text{ g } Na_2O}{1 \text{ mol } Na_2O} = 6.198 \rightarrow \boxed{6.2 \text{ g}}$

f) 3.0 mol of $(NH_2)_2CO$

$(NH_2)_2CO$
2(22.99) 4(1.01) 12.00 16.00

$3.0 \text{ mol } (NH_2)_2CO \times \frac{60.07 \text{ g } (NH_2)_2CO}{1 \text{ mol } (NH_2)_2CO} = 180.210 \rightarrow \boxed{180 \text{ g}}$

g) 1.50 mol of $Pb(NO_3)_2$

$1.50 \text{ mol } Pb(NO_3)_2 \times \frac{331.22 \text{ g } Pb(NO_3)_2}{1 \text{ mol } Pb(NO_3)_2} = 496.83 \rightarrow \boxed{497 \text{ g}}$

h) 10.0 mol of NaOH

$10.0 \text{ mol NaOH} \times \frac{40.00 \text{ g NaOH}}{1 \text{ mol NaOH}} = 400.00 \rightarrow \boxed{400 \text{ g}}$ or $\boxed{4.00 \times 10^{2} \text{ g}}$

i) 12.0 mol of K_2S

$12.0 \text{ mol } K_2S \times \frac{110.27 \text{ g } K_2S}{1 \text{ mol } K_2S} = 1323.24 \rightarrow \boxed{1.32 \times 10^{3} \text{ g}}$

j) 0.50 mol of MgF_2 $0{,}50\ \text{mol}\ MgF_2 \times \frac{62.31\ \text{g}\ MgF_2}{1\ \text{mol}\ MgF_2} = 31.155 \rightarrow \boxed{31\ \text{g}}$

k) 3.0 mol of CCl_4 $3{,}0\ \text{mol}\ CCl_4 \times \frac{153.81\ \text{g}\ CCl_4}{1\ \text{mol}\ CCl_4} = 461.43 \rightarrow \boxed{4.6 \times 10^2\ \text{g}}$ or $\boxed{460\ \text{g}}$

6. Calculate the number of moles in

a) 60.0 g of C $60.0\ \text{g}\ C \times \frac{1\ \text{mol}\ C}{12.01\ \text{g}\ C} = 4.996 \rightarrow \boxed{5{,}00\ \text{mol}}$

b) 4.0 g of HF $4.0\ \text{g}\ HF \times \frac{1\ \text{mol}\ HF}{20{,}01\ \text{g}\ HF} = 0{,}200 \rightarrow \boxed{0{,}20\ \text{mol}}$

c) 250g of $CaCO_3$ $250\ \text{g}\ CaCO_3 \times \frac{1\ \text{mol}\ CaCO_3}{100.09\ \text{g}\ CaCO_3} = 2.498 \rightarrow \boxed{2{,}5\ \text{mol}}$

d) 1.0 L of water $1000\ \text{g}\ H_2O \times \frac{1\ \text{mol}\ H_2O}{18.02\ \text{g}\ H_2O} = 55.49 \rightarrow \boxed{55\ \text{mol}}$

1000 ml = 1000g

* density $H_2O = 1\ \text{g/ml}$

e) 11.7g of NaCl $11.7\ \text{g}\ NaCl \times \frac{1\ \text{mol}\ NaCl}{58{,}44\ \text{g}\ NaCl} = 0{,}200 \rightarrow \boxed{0{,}200\ \text{mol}}$

f) 24.5g of $Ca(OH)_2$ $24{,}5\ \text{g}\ Ca(OH)_2 \times \frac{1\ \text{mol}\ Ca(OH)_2}{74.10\ \text{g}\ Ca(OH)_2} = 0{,}331 \rightarrow \boxed{0{,}331\ \text{mol}}$

g) 78.7g of HNO_3 $78.7\ \text{g}\ HNO_3 \times \frac{1\ \text{mol}\ HNO_3}{63.02\ \text{g}\ HNO_3} = 1.249 \rightarrow \boxed{1.25\ \text{mol}}$

h) 74.0g of HCl $74.0\ \text{g}\ HCl \times \frac{1\ \text{mol}\ HCl}{36{,}46\ \text{g}\ HCl} = 2.0296 \rightarrow \boxed{2.03\ \text{mol}}$