Mole Conversion and Stoichiometry WS

(periodic table)

molar mass (g) = 1 mol = 6.022×10^{23} atoms

*The only way to go from one substance to another is through the **mole ratio** of the balanced chemical equation.*

You must show all unit cancellation in order to get credit.
No work shown means no credit is given.
Write the units in the conversion.
Label everything including the answer. Give the answer using the proper # of sig. figs.

Part A:

1. 5.48×10^{10} atoms of C to mol of C

$$5.48 \times 10^{10}\ \text{atoms C} \times \frac{1\ \text{mol C}}{6.022 \times 10^{23}\ \text{atoms C}} = 9.0999 \times 10^{-14} = 9.10 \times 10^{-14}\ \text{mol of C}$$

2. 5.23×10^{24} g of Al to mol of Al

$$5.23 \times 10^{24}\ \text{g of Al} \times \frac{1\ \text{mol Al}}{26.98\ \text{g of Al}} = 1.9384 \times 10^{23} = 1.94 \times 10^{23}\ \text{mol of Al}$$

Cu^{2+} NO_3^- K^+ SO_4^{2-} $K^+ NO_3^-$ $Cu^{2+} SO_4^{2-}$

3. Copper (II) nitrate reacts with potassium sulfate. What are the products?

$$Cu(NO_3)_2(aq) + K_2SO_4(aq) \rightarrow 2KNO_3(aq) + CuSO_4(aq)$$

4. What is the solid? - Pg. 245 - Solubility chart

No Solid Forms

5. If 2 moles of potassium sulfate react, how many moles of each of the other substances react or are produced?

$$2Cu(NO_3)_2 + 2K_2SO_4 \rightarrow 4KNO_3 + 2CuSO_4$$

$$2\ \text{Mol}\ K_2SO_4 \times \frac{2\ \text{mol}\ Cu(NO_3)_2}{2\ \text{mol}\ K_2SO_4} = 2\ \text{mol of}\ Cu(NO_3)_2$$

$$2\ \text{mol}\ K_2SO_4 \times \frac{4\ \text{mol}\ KNO_3}{2\ \text{mol}\ K_2SO_4} = 4\ \text{mol of}\ KNO_3$$

$$2\ \text{mol}\ K_2SO_4 \times \frac{2\ \text{mol}\ CuSO_4}{2\ \text{mol}\ K_2SO_4} = 2\ \text{mol of}\ CuSO_4$$

Part B:

1. 1.25 moles V to atoms of V

$$1.25 \text{ mol V} \times \frac{6.022 \times 10^{23} \text{ Atoms V}}{1 \text{ mol V}} = 7.5275 \times 10^{23} = 7.53 \times 10^{23} \text{ atoms V}$$

2. 2.0×10^{12} g Si to atoms of Si

$$2.0 \times 10^{12} \text{ g Si} \times \frac{1 \text{ mol Si}}{28.09 \text{ g Si}} \times \frac{6.022 \times 10^{23} \text{ atoms Si}}{1 \text{ mol Si}} = 4.287 \times 10^{34} = 4.3 \times 10^{34} \text{ atoms of Si}$$

3. If 29.6 g of potassium sulfate (K_2SO_4) react, how many moles of each of the other substances react or are produced?

$$29.6 \text{ g of } K_2SO_4 \times \frac{1 \text{ mol } K_2SO_4}{174.27 \text{ g } K_2SO_4} \times \frac{1 \text{ mol } Cu(NO_3)_2}{1 \text{ mol } K_2SO_4} = 1 \text{ mol of } Cu(NO_3)_2$$

(29.6 / 174.27 = .170)

$$29.6 \text{ g of } K_2SO_4 \times \frac{1 \text{ mol } K_2SO_4}{174.27 \text{ g } K_2SO_4} \times \frac{2 \text{ mol } KNO_3}{1 \text{ mol } K_2SO_4} = 2 \text{ mol of } KNO_3$$

(.340)

$$29.6 \text{ g of } K_2SO_4 \times \frac{1 \text{ mol } K_2SO_4}{174.27 \text{ g } K_2SO_4} \times \frac{1 \text{ mol } CuSO_4}{1 \text{ mol } K_2SO_4} = 1 \text{ mol of } CuSO_4$$

(.170)

Part C:

1. 4.86×10^{18} atoms of Cu to g of Cu (molar mass)

$$4.86 \times 10^{18} \times \frac{1 \text{ mol Cu}}{6.022 \times 10^{23} \text{ atoms Cu}} \times \frac{63.55 \text{ g Cu}}{1 \text{ Mol Cu}} = 5.1287 \times 10^{-4} = 5.13 \times 10^{-4} \text{ g of Cu}$$

2. 3.98×10^{22} mol Mn to g of Mn

$$3.98 \times 10^{22} \text{ mol Mn} \times \frac{54.94 \text{ g Mn}}{1 \text{ mol Mn}} = 2.1866 \times 10^{24} = 2.19 \times 10^{24} \text{ g of Mn}$$

3. If 29.6 g of potassium sulfate (K_2SO_4) react, how many g of each of the other substances react or are produced?

39.10×2, 32.07, $16(4)$

$$29.6 \text{ g of } K_2SO_4 \times \frac{1 \text{ mol } K_2SO_4}{174.27 \text{ g } K_2SO_4} \times \frac{1 \text{ mol } Cu(NO_3)_2}{1 \text{ mol } K_2SO_4} \times \frac{187.57 \text{ g of } Cu(NO_3)_2}{1 \text{ mol } Cu(NO_3)_2} =$$

63.55, $14.01(2)$, $16(6)$

$31.859 =$

39.10, 14.01, $16(3)$

$$29.6 \text{ g of } K_2SO_4 \times \frac{1 \text{ mol } K_2SO_4}{174.27 \text{ g } K_2SO_4} \times \frac{2 \text{ mol } KNO_3}{1 \text{ mol } K_2SO_4} \times \frac{101.11 \text{ g } KNO_3}{1 \text{ mol } KNO_3} = 31.9 \text{ g of } Cu(NO_3)_2$$

63.55, 32.07, $16(4)$

$$29.6 \text{ g of } K_2SO_4 \times \frac{1 \text{ mol } K_2SO_4}{174.27 \text{ g } K_2} \times \frac{1 \text{ mol } CuSO_4}{1 \text{ mol } K_2SO_4} \times \frac{159.62 \text{ g } CuSO_4}{1 \text{ mol } CuSO_4} =$$

$34.347 =$ 34.3 g of KNO_3

$27.1116 =$ 27.1 g of $CuSO_4$