1. a) $\frac{46.6\%\ Fe}{55.85}$ $\frac{53.44\%\ S}{32.07}$

$\frac{0.83}{0.83}$ $\frac{1.67}{0.83}$

1 2

FeS_2

b) $\frac{63.35\%\ Fe}{55.85}$ $\frac{36.47\%\ S}{32.07}$

1.13 1.14

FeS

c) $\frac{26.67\%\ K}{39.10}$ $\frac{35.47\%\ Cr}{52.00}$ $\frac{38.00\%\ O}{16.00}$

$\frac{0.68}{0.68}$ $\frac{0.68}{0.68}$ $\frac{2.38}{0.68}$

1(2) 1(2) 3.5(2)

$K_2Cr_2O_7$

d) $\frac{21.8\%\ Mg}{24.31}$ $\frac{27.9\%\ P}{30.97}$ $\frac{50.3\%\ O}{16.00}$

$\frac{0.9}{0.9}$ $\frac{0.9}{0.9}$ $\frac{3.14}{0.9}$

1(2) 1(2) 3.5(2)

$Mg_2P_2O_7$

1. e) $\frac{65.7\%\,Sr}{87.62}$ $\frac{10.4\%\,Si}{28.09}$ $\frac{23.9\%\,O}{16.00}$

$\frac{0.75}{0.37}$ $\frac{0.37}{0.37}$ $\frac{1.49}{0.37}$

2 1 4

Sr_2SiO_4

2. a) $\frac{8.87g\,P}{30.97}$ $\frac{11.43g\,O}{16.00}$

$\frac{0.286}{0.286}$ $\frac{0.714}{0.286}$

1 (2) 2.5 (2)

P_2O_5

b) $\frac{1.03g\,K}{39.01}$ $\frac{1.18g\,Cr}{52.00}$ $\frac{1.27g\,O}{16.00}$

$\frac{0.0210}{0.023}$ $\frac{0.025}{0.023}$ $\frac{0.079}{0.023}$

1 (2) 1 (2) 3.5 (2)

$K_2Cr_2O_7$

c) $\frac{21.52g\,K}{39.10}$ $\frac{8.82g\,S}{32.07}$ $\frac{17.62g\,O}{16.00}$

$\frac{.55}{.28}$ $\frac{.28}{.28}$ $\frac{1.10}{.28}$

2 1 4

K_2SO_4

Stoichiometry

1. Write a balanced equation
2. Determine given + needed
3. Determine type of problem
4. Line-up given and required conversions – this includes the molar ratio.

   The molar ratio comes from the coefficients of a balanced equation

   Coefficients → $\frac{\#\text{ mol of needed}}{\#\text{ mol of given}}$
5. Complete math – check your labels.

Stoichiometry

Steps:

1. Write a balanced chemical reaction.
2. Determine given + needed
3. Determine the molar ratio – created from the coefficients of a balanced equation.

   coefficients → $\frac{\#\text{ mol need}}{\#\text{ mol given}}$

4. Determine the type of problem.
5. Set up conversions + complete math

Types

mole → mole (1 conv. = molar ratio)

mass → mole (2 conv. = molar mass$_A$, molar ratio)

mole → mass (2 conv. = molar ratio, molar mass$_B$)

*mass → mass (3 conv = molar mass$_{given}$, molar ratio, molar mass$_{need}$)

Vol → mol

mol → vol

*vol → vol * exchange 22.4L where is volume is used

*mass → vol

* vol → mass

master equation

$$\text{Amt. given} \times \frac{1\text{ mol given}}{\text{molar mass (-or- 22.4L)}_{\text{given}}} \times \underbrace{\frac{\#\text{ mol needed}}{\#\text{ mol given}}}_{\text{molar ratio}} \times \frac{\text{molar mass (-or- 22.4L)}_{\text{needed}}}{1\text{ mol needed}} = \text{theoretical yield}$$

$$\%\text{ yield} = \frac{\text{your lab result}}{\text{theoretical yield}} \times 100$$

Practice 1.a)

$3\ CuSO_4 + 2\ Al \rightarrow \_\_\ Al_2(SO_4)_3 + 3\ Cu$

(Al^{3+}, SO_4^{2-})

given: 0.5 mol Al need: ? moles $CuSO_4$ Type: mol → mol

$$0.5\text{ mol Al} \times \frac{3\text{ mol } CuSO_4}{2\text{ mol Al}} = (0.5 \times 3) \div 2 = .75 \rightarrow \boxed{0.8\text{ mol } CuSO_4}$$

1 sf

molar ratio

2a) $3\ Ca + 2\ AlCl_3 \rightarrow 3\ CaCl_2 + 2\ Al$

(Ca^{2+}, Cl^-)

given: 2.5 mol Ca needed: ? mol $AlCl_3$ Type: mol → mol

$$2.5\text{ mol Ca} \times \frac{2\text{ mol } AlCl_3}{3\text{ mol Ca}} = \boxed{1.7\text{ mol } AlCl_3}$$

2 sf

mass → mole

1.a. $3\,CuSO_4 + 2\,Al \rightarrow Al_2(SO_4)_3 + 3\,Cu$

given: 13.5g Al needed: ? mol $CuSO_4$ Type: mass → mol

$$13.5\,g\,Al \times \frac{1\,mol\,Al}{26.98\,g\,Al} \times \frac{3\,mol\,CuSO_4}{2\,mol\,Al} = 0.751\,mol\,CuSO_4$$

3sf

26.98 g Al: molar mass

2c. given: 8.5g Al need: ? g Cu Type: mass → mass

$$8.5\,g\,Al \times \frac{1\,mol\,Al}{26.98\,g\,Al} \times \frac{3\,mol\,Cu}{2\,mol\,Al} \times \frac{63.55\,g\,Cu}{1\,mol\,Cu} = 30.\,g\,Cu$$