Mass-to-mass Stoichiometry

Examples

1) $C_3H_8(l) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$

What mass of water is produced from the reaction of 45.00 g propane w/ excess oxygen?

(? — GIVEN)

45.00 g C_3H_8	1 mol C_3H_8 / 44.11 g C_3H_8	4 mol H_2O / 1 mol C_3H_8	18.02 g H_2O / 1 mol H_2O = 73.53 g H_2O

MM
3 C × 12.01 g = 36.03 g
8 H × 1.01 g = 8.08 g
44.11 g

MM
2 H × 1.01 g = 2.02 g
1 O × 16.00 g = 16.00 g
18.02 g

2) $8Fe(s) + S_8(s) \rightarrow 8FeS(s)$

What mass of sulfur (S_8) is needed to make 1000. g of iron (II) sulfide?

(? — GIVEN)

1000. g FeS	1 mol FeS / 87.92 g FeS	1 mol S_8 / 8 mol FeS	256.56 g S_8 / 1 mol S_8 = 364.76 g S_8

MM
Fe 55.85 g
S 32.07 g
+ 87.92 g

MM 8 S × 32.07 g = 256.56 g

$\frac{10 \cdot 5}{2}$

3.) $Cr_2(SO_4)_3(s) + 6\,LiNO_3(aq) \rightarrow 2\,Cr(NO_3)_3(aq) + 3\,Li_2SO_4(aq)$

?

what mass (theoretical yield) of chromium (III) nitrate made when 10.0 g of lithium nitrate reacts w/ excess chromium (III) sulfate? GIVEN

$$\frac{10.0\,g\ LiNO_3}{} \cdot \frac{1\,mol\ LiNO_3}{68.95\,g\ LiNO_3} \cdot \frac{2\,mol\ Cr(NO_3)_3}{6\,mol\ LiNO_3} \cdot \frac{238.03\,g\ Cr(NO_3)_3}{1\,mol\ Cr(NO_3)_3} = 11.51\,g\ Cr(NO_3)_3$$

1 Cr × 52.00 g = 52.00 g
3 N × 14.01 g = 42.03 g
9 O × 16.00 g = + 144.00 g
238.03 g

Step 1	Step 2	Step 3
converting g → moles	mole ratio	converting mole → g
$\frac{1\,mol\ given}{mm\ given}$	$\frac{mol\ ?}{mol\ given}$	$\frac{mm\ ?}{1\,mol\ ?}$
	↓ from balanced eqn	