Stochiometry

Stoichiometry - calculations based on quantitative relationships in a balanced chemical equation
★ Assumptions of stoichiometry
  ☆ Reaction has no side reactions
  ☆ Reaction goes to completion
  ☆ The reactants are completely consumed
★ Mole problems

Sample Problem

How many moles of oxygen are liberated when 0.4 moles of potassium chlorate decomposes?

Step 1: Write a balanced equation and determine the mole ratios from the equation
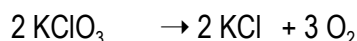
$2\ KClO_3$	$\rightarrow 2\ KCl$	$+\ 3\ O_2$
mole ratio 2	2	3
moles $\frac{known}{0.4}$		$\frac{unknown}{x}$

Step 2: Identify the known and the unknown

Step 3: Set up a proportion and solve for the unknown

- $\dfrac{2}{0.4mol} = \dfrac{3}{x}$
- $2x = 1.2mol$
- $x = 0.6mol$

Answer the questions below by circling the number of the correct response

1. Given the reaction: $N_2 + 3H_2 \rightarrow 2NH_3$, how many moles of nitrogen are needed to produce 8 moles of ammonia?
   (1) 1   (3) 3
   (2) 2   (4) 4

2. Given the reaction: $2CO + O_2 \rightarrow 2CO_2$
   What is the minimum number of moles of O_2 required to produce one mole of CO_2?
   (1) 1.0   (3) 0.25
   (2) 2.0   (4) 0.50

3. Given the reaction;
   $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$
   What is the total number of moles of NaOH needed to react completely with 2 moles of H_2SO_4?
   (1) 1   (3) 0.5
   (2) 2   (4) 4

4. Given the reaction: $2Na + 2H_2O \rightarrow 2NaOH + H_2$
   What is the total number of moles of hydrogen produced when 4 moles of sodium react completely?
   (1) 1   (3) 3
   (2) 2   (4) 4

5. Given the reaction: $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
   What is the ratio of moles of $H_2(g)$ consumed to moles of $NH_3(g)$ produced?
   (1) 1:2   (3) 3:2
   (2) 2:3   (4) 6:6

6. Given the reaction: $(NH_4)_2CO_3 \rightarrow 2NH_3 + CO_2 + H_2O$
   What is the minimum amount of ammonium carbonate that reacts to produce 1.0 mole of ammonia?
   (1) 0.25 mole   (3) 17 moles
   (2) 0.50 mole   (4) 34 moles