Mole Ratios and Stoichiometry

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

Coefficients in a balanced equation represent relative numbers of particles and relative amounts in moles. Use the stated amounts of pure substances and assume complete reaction when asked for the theoretical amount.

1 For $N_2 + 3H_2 \rightarrow 2NH_3$, which ratio converts moles of H_2 consumed to moles of NH_3 formed?

(1) 3 mol NH_3 / 2 mol H_2

(2) 2 mol NH_3 / 3 mol H_2

(3) 2 mol H_2 / 3 mol NH_3

(4) 1 mol NH_3 / 3 mol H_2

2 For $2Mg + O_2 \rightarrow 2MgO$, calculate the moles of O_2 needed to react with 0.600 mol Mg. Show the mole ratio. [1]

Answer and work

_____

_____

3 For $H_2 + Cl_2 \rightarrow 2HCl$, a student says 1.0 mol H_2 consumes 2.0 mol Cl_2. Explain the error. [1]

Answer and work

_____

_____

4 For $CaCO_3 \rightarrow CaO + CO_2$, how much $CaCO_3$ decomposed if 0.45 mol CO_2 formed and this was the only reaction?

(1) 0.23 mol

(2) 0.30 mol

(3) 0.45 mol

(4) 0.90 mol

Hydrogen for a Fuel Cell

Use the information below to answer questions 5–8.

In a model hydrogen fuel cell, hydrogen and oxygen react to form water. Use $2H_2 + O_2 \rightarrow 2H_2O$. The table gives the amounts supplied in two independent trials. Assume each reaction runs until one reactant is used up.

Trial	**H_2 supplied (mol)**	**O_2 supplied (mol)**
A	0.80	0.60
B	0.80	0.30

5 Calculate the moles of O_2 needed to use all the hydrogen supplied in Trial A. Show your setup. [1]

Answer and work

6 Which reactant is in excess in Trial A? Use evidence from the table and the equation. [1]

Answer and work

7 What is the theoretical amount of water formed in Trial B?

(1) 0.30 mol

(2) 0.40 mol

(3) 0.60 mol

(4) 0.80 mol

8 A student predicts the two trials form equal amounts of water because they start with equal amounts of H_2. Explain why this prediction fails. [1]

Answer and work