Reaction stoichiometry — Practice Worksheet

Six multistep problems · built to pair with the IntoChemistry Problem-Solving Studio

Name: _____ Date: _____

Instructions: Show your dimensional-analysis setup and units. Round your final result to an appropriate number of significant figures. For particles, use 6.022×10^{23} mol^{-1}.

1. Water from oxygen

Assume all other reactants are in excess. Given 0.75 mol O_2, calculate the theoretical amount and mass of H_2O.

Balanced equation: $2\ H_2 + O_2 \rightarrow 2\ H_2O$. Product molar mass: 18.02 g/mol.

a. What is mol H_2O per mol O_2 in the balanced equation?

b. How many moles of H_2O can form from 0.75 mol O_2?

c. What is the theoretical mass of H_2O in grams? (M = 18.02 g/mol)

2. Ammonia from nitrogen

Assume all other reactants are in excess. Given 1.2 mol N_2, calculate the theoretical amount and mass of NH_3.

Balanced equation: $N_2 + 3\ H_2 \rightarrow 2\ NH_3$. Product molar mass: 17.04 g/mol.

a. What is mol NH_3 per mol N_2 in the balanced equation?

b. How many moles of NH_3 can form from 1.2 mol N_2?

c. What is the theoretical mass of NH_3 in grams? (M = 17.04 g/mol)

3. Magnesium oxide

Assume all other reactants are in excess. Given 0.8 mol Mg, calculate the theoretical amount and mass of MgO.

Balanced equation: $2\ Mg + O_2 \rightarrow 2\ MgO$. Product molar mass: 40.31 g/mol.

a. What is mol MgO per mol Mg in the balanced equation?

b. How many moles of MgO can form from 0.8 mol Mg?

c. What is the theoretical mass of MgO in grams? (M = 40.31 g/mol)

4. Oxygen from potassium chlorate

Assume all other reactants are in excess. Given 0.6 mol $KClO_3$, calculate the theoretical amount and mass of O_2.

Balanced equation: $2\ KClO_3 \rightarrow 2\ KCl + 3\ O_2$. Product molar mass: 32.00 g/mol.

a. What is mol O_2 per mol $KClO_3$ in the balanced equation?

b. How many moles of O_2 can form from 0.6 mol $KClO_3$?

c. What is the theoretical mass of O_2 in grams? (M = 32.00 g/mol)

5. Carbon dioxide from carbonate

Assume all other reactants are in excess. Given 0.25 mol $CaCO_3$, calculate the theoretical amount and mass of CO_2.

Balanced equation: $CaCO_3 \rightarrow CaO + CO_2$. Product molar mass: 44.01 g/mol.

a. What is mol CO_2 per mol $CaCO_3$ in the balanced equation?

b. How many moles of CO_2 can form from 0.25 mol $CaCO_3$?

c. What is the theoretical mass of CO_2 in grams? (M = 44.01 g/mol)

6. Iron(III) oxide

Assume all other reactants are in excess. Given 0.8 mol Fe, calculate the theoretical amount and mass of Fe_2O_3.

Balanced equation: $4\ Fe + 3\ O_2 \rightarrow 2\ Fe_2O_3$. Product molar mass: 159.70 g/mol.

a. What is mol Fe_2O_3 per mol Fe in the balanced equation?

b. How many moles of Fe_2O_3 can form from 0.8 mol Fe?

c. What is the theoretical mass of Fe_2O_3 in grams? (M = 159.70 g/mol)