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Chapter 8 Practice Worksheet:
Formulas, Equations, and Moles

1) Balancing Equations

a. ___ N_2O_5 → ___ N_2O_4 + ___ O_2

b. ___ CO + ___ O_2 → ___ CO_2

c. ___ H_2 + ___ Br_2 → ___ HBr

d. ___ K + ___ H_2O → ___ KOH + ___ H_2

e. ___ Mg + ___ O_2 → ___ MgO

f. ___ O_3 → ___ O_2

g. ___ H_2O_2 → ___ H_2O + ___ O_2

h. ___ N_2 + ___ H_2 → ___ NH_3

i. ___ Zn + ___ AgCl → ___ $ZnCl_2$ + ___ Ag

j. ___ S_8 + ___ O_2 → ___ SO_2

k. ___ NaOH + ___ H_2SO_4 → ___ Na_2SO_4 + ___ H_2O

l. ___ Cl_2 + ___ NaI → ___ NaCl + ___ I_2

m. ___ KOH + ___ H_3PO_4 → ___ K_3PO_4 + ___ H_2O

n. ___ CH_4 + ___ Br_2 → ___ CBr_4 + ___ HBr

2) For the reaction on the right, which of the following equations **best** represents the reaction?

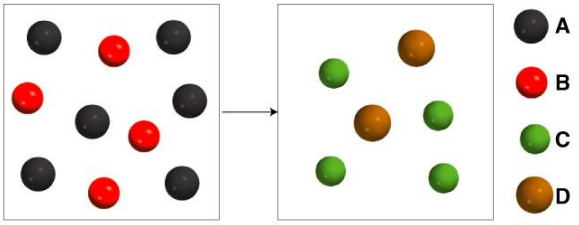
a. A + B → C + D

b. 6A + 4B → C + D

c. A + 2B → 2C + D

d. 3A + 2B → 2C + D

e. 3A + 2B → 4C + 2D



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3) Calculate the molar masses of the following substances:

a. NO_2

b. C_6H_6

c. NaI

d. CS_2

e. $Ca_3(PO_4)_2$

f. Li_2CO_3

g. $CHCl_3$

4) Stoichiometric Conversions: Complete the table below by converting between numbers of particles, moles, and grams.

Grams	**Moles**	**# Atoms, Molecules, Particles**
		6.02×10^{23} Hg atoms
	1.00 mol C atoms	
10.00 g H_2		
		2.95×10^{25} CH_4 molecules
2.00 g $Mg(NO_3)_2$		
	2.00 mol CO_2 molecules	

5) Avogadro's Number and the Mole

a. How many oxygen atoms are in one molecule of H_2O?

b. How many hydrogen atoms are in one molecule of H_2O?

c. How many molecules of H_2O are in 1.0 grams of H_2O?

d. How many H atoms are in 1.0 grams of H_2O?

e. How many atoms are in 3.14 g of copper (Cu)?

f. How many atoms are contained in 1.0 grams of CH_4?

g. How many ions are contained in 5.0612 grams of $MgCl_2$?

h. How many molecules of ethane (C_2H_6) are there in 0.334 g of ethane?

i. The density of water reaches a maximum of 1.00 g/mL at 4°C. How many water molecules are there in 2.56 mL of water at 4°C?

6) **Stoichiometry: Chemical Arithmetic**

For each equation, starting amount and substance shown, calculate the amount of product produced.

Equation	**Starting amount/substance**	**Product amount/substance**
$S\ (s) + O_2\ (g) \rightarrow SO_2\ (g)$	2.35 moles S	moles SO_2
$Si\ (s) + 2Cl_2\ (g) \rightarrow SiCl_4\ (l)$	4.1 moles Cl_2	grams $SiCl_4$
$3H_2\ (g) + N_2\ (g) \rightarrow 2NH_3\ (g)$	0.03445 grams H_2	grams NH_3
$KCN\ (aq) + HCl\ (aq) \rightarrow KCl\ (aq) + HCN\ (g)$	1.09 grams HCl	moles HCN
$2NH_3\ (g) + H_2SO_4\ (aq) \rightarrow (NH_4)_2SO_4\ (aq)$	0.00568 grams NH_3	grams $(NH_4)_2SO_4$
$2NO\ (g) + O_2\ (g) \rightarrow 2NO_2\ (g)$	6.50 moles O_2	moles NO_2

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7) **Yields of Chemical Reactions/Limiting Reactants**

a. MnO_2 reacts with HCl to produce $MnCl_2$, Cl_2, and H_2O. Write a balanced equation for this reaction. If 0.86 moles of MnO_2 and 48.2 grams of HCl react, which reagent will be used up first? How many grams of Cl_2 will be produced? How many moles of the excess reagent will be left over? If 19.8 grams of Cl_2 were obtained in lab, what is the percent yield?

b. ___ CaF_2 + ___ H_2SO_4 → ___ $CaSO_4$ + ___ HF

In the reaction above, you begin with 6.00 g of CaF_2 and 12.592 g H_2SO_4. You obtain 2.86 g of HF as a product. What is the percent yield of HF?

c. ___ K_3PO_4 (aq) + ___ $AgNO_3$ (aq) → ___ KNO_3 (aq) + ___ Ag_3PO_4 (s)

70.5 mg 15.0 mL of 0.050 M

Find the mass of precipitate formed in this reaction.

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Percent Composition and Empirical Formulas

8) What is the mass percent of each element in the following compounds?

a. $CaCl_2$

b. Fe_2O_3

c. $C_6H_{10}S_2O$

9) Calculate the empirical formulas of compounds containing the following percentages of elements. Use the molar mass to calculate the molecular formula for that compound as well.

a. 44.4% C, 6.21% H, 39.5% S, and 9.86% O; molar mass = 486.39 g/mol

b. 20.2% Al, 79.8% Cl; molar mass = 266.6 g/mol

c. 2.1% H, 65.2% O, 32.6% S; molar mass = 195.95 g/mol

d. 19.8% C, 2.50% H, 11.6% N, 66.1% O; molar mass = 360 g/mol