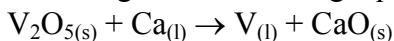
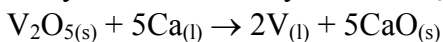


Honors Chemistry
Chapter 3 Exam - Pretest

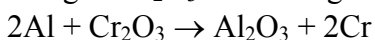
1. When 10.0mol of V_2O_5 are mixed with 10.0mol of Ca, which is the limiting reactant according to the following equation when balanced?



Ca because Ca reacts in a 5/1 mole ratio with V_2O_5 , meaning you always need 5 times as many moles of Ca as you do V_2O_5 .



2. What is the theoretical yield of chromium that can be produced by the reaction of 40.0g of Cr_2O_3 with 8.00g of aluminum according to the following equation?



$$40.0g Cr_2O_3 (1mol Cr_2O_3 / 151.99g Cr_2O_3) = .263mol Cr_2O_3$$

$$8.00g Al (1mol Al / 26.98g Al) = .297mol Al$$

Al limits because you need twice as many moles of Al as Cr_2O_3 therefore using the limiting reagent to calculate products

$$.297mol Al (2mol Cr / 2mol Al) = .297 mol Cr$$

$$.297mol Cr (52.00g Cr / 1mol Cr) = \mathbf{15.44g Cr}$$

3. The mass of 1.21×10^{20} atoms of sulfur is:

$$1.21 \times 10^{20} \text{ atoms } (1mol S / 6.022 \times 10^{23} \text{ atoms S})(32.07g S / 1mol S) = \mathbf{6.44 \times 10^{-3} g S}$$

4. What is the mass of 0.0250mol P_2O_5 ?

$$0.0250mol P_2O_5 (141.94g P_2O_5 / 1mol P_2O_5) = \mathbf{3.55g P_2O_5}$$

5. Balance the following: $SF_4 + H_2O \rightarrow H_2SO_3 + HF$

1,3,1,4

6. A chemistry student performs a laboratory experiment to determine the empirical formula for tungsten oxide (W_xO_y). The data that is gathered is shown below:

Weight of crucible: 11.120g

Weight of tungsten: 8.820g

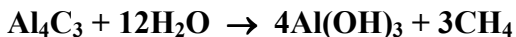
Weight of crucible and oxide of tungsten: 23.012g

What is the mass percent of tungsten in the compound?

What is the empirical formula for Tungsten oxide?

Moles of tungsten (W) = $8.820\text{g} (1\text{mol W} / 183.84\text{g W}) = .0480\text{mol W}$
Moles of oxygen (O) = $23.012\text{g} - 11.120\text{g} - 8.820\text{g} = 3.072\text{g O} (1\text{mol O} / 16.00\text{g O}) = .192\text{mol O}$
 $\text{W}_{.0480/.0480}\text{O}_{.192/.0480} = \text{WO}_4$
Mass % of W = $8.820\text{gW} / (23.012\text{g} - 11.120\text{g}) = \mathbf{74.2\%}$

7. Aluminum carbide (carbide is C^{4-}) reacts with water to produce aluminum hydroxide and methane (carbon tetrahydride). Write a balanced chemical equation for this reaction.



8. How many grams of water can be produced from 48.0g of oxygen and 2.00mol of hydrogen according to $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

$48.0\text{g O}_2 (1\text{mol O}_2 / 32.0\text{g O}_2) = 1.50\text{mol O}_2$
The 2.00mol of H_2 is limiting because you would need 2.00mol H_2 to react completely with the 1.50mol of O_2 according to the coefficients of the balanced equation.
 $2.00\text{mol H}_2 (2\text{mol H}_2\text{O} / 2\text{mol H}_2) = 2.00\text{mol H}_2\text{O}$
 $2.00\text{mol H}_2\text{O} (18.016\text{g H}_2\text{O} / 1\text{mol H}_2\text{O}) =$
36.0g H_2O

9. An atom of carbon has a mass about three times greater than the mass of a helium atom. How many grams of helium will contain the same number of atoms as 600.g of carbon?

For a given number of particles
Mass of particles of C = 3 times the mass of the same particles of He
or 1 He particle has a mass that is 1/3 the mass of a C atom. Therefore
Grams of He = $1/3 (600.\text{g C}) =$
200.g He

10. What is the percent yield of a reaction in which 29.50g of ammonia (NH_3) are formed in the lab (as an exclusive product) when 28.02g of nitrogen gas are reacted with 8.064g of hydrogen gas?

$\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$
 $28.02\text{g N}_2 / 28.02\text{g/mol} = 1\text{mol N}_2$
 $1\text{mol N}_2 (3\text{mol H}_2 / 1\text{mol N}_2) = 3\text{mol H}_2$ required

$8.064\text{g H}_2 / 2.016\text{g/mol H}_2 = 4\text{mol H}_2$ available nitrogen limits
 $1\text{mol N}_2 (2\text{mol NH}_3 / 1\text{mol N}_2) = 2\text{mol NH}_3$
 $2\text{mol NH}_3 (17.034\text{g/mol}) = 34.068\text{g NH}_3$
 $29.50\text{g act} / 34.07\text{g theor.} = \mathbf{86.6\%}$