CHM151 Quiz 3a 25 Pts Fall 2007 Name: Key

SHOW ALL WORK TO RECEIVE CREDIT.

MOLAR MASSES: H 1.008, C 12.01, O 16.00, Na 22.99, P 30.97, S 32.06, Cl 35.45, Ca 40.08, Ba 137.3
Avogadro's number: 6.02 x 10^{23}/mol

1. (6 Pts) Determine the molar mass of each of the following:

a. $Ca_3(PO_4)_2$

8 × 16.00 =
2 × 30.97 =
3 × 40.08 =

310.18

b. Na_2SO_4

4 × 16.00 =
1 × 32.06 =
2 × 22.99 =

142.04

2. (4 Pts) How many moles are there in 25.45 g of water?

H_2O
1 × 16.00
2 × 1.008
18.016

$$25.45\ g\ H_2O \left| \frac{1\ mol\ H_2O}{18.016\ g\ H_2O} \right. = 1.413\ mol\ H_2O$$

3. (4 Pts) A chemical reaction calls for 3.00 moles of calcium chloride. How many grams of calcium chloride should be used?

$CaCl_2$
2 × 35.45 = 110.90
1 × 40.08

$$3.00\ mol\ CaCl_2 \left| \frac{110.90\ g}{mol} \right. = 333\ g\ CaCl_2$$

4. (5 Pts) A compound consists of 31.1% sulfur and 68.9% chlorine by mass. Determine its empirical formula. Use 100 g so,

$$S: 31.1\ g \left| \frac{mol}{32.06\ g} \right. = 0.970 \div 0.970 = 1$$

$$Cl: 68.9\ g \left| \frac{mol}{35.45\ g} \right. = 1.944 \div 0.970 = 2$$

SCl_2

5. $2H_3PO_4(aq) + 3Ba(OH)_2 \rightarrow 6H_2O(l) + Ba_3(PO_4)_2(aq)$

a) ? moles 3.45 mol

b) 3.45 mol → ? mol

a. (3 Pts) How many moles of phosphoric acid would be required to neutralize 3.45 moles of barium hydroxide?

$$3.45\ mol\ Ba(OH)_2 \left| \frac{2\ mol\ H_3PO_4}{3\ mol\ Ba(OH)_2} \right. = 2.30\ mol\ H_3PO_4$$

b. (3 Pts) How many moles of water are produced by the amounts used in 5a?

$$3.45\ mol\ Ba(OH)_2 \left| \frac{6\ mol\ H_2O}{3\ mol\ Ba(OH)_2} \right. = 6.90\ mol\ H_2O$$

CHM151 Quiz 3b 25 Pts Fall 2007 Name: Key

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MOLAR MASSES: H 1.008, C 12.01, O 16.00, Na 22.99, P 30.97, S 32.06, Cl 35.45, Ca 40.08, Ba 137.3
Avogadro's number: 6.02×10^{23}/mol

1. (6 Pts) Determine the molar mass of each of the following:

a. $Ba_3(PO_4)_2$

8 × 16.00 = 128.00
2 × 30.97 = 61.94
3 × 137.3 = 411.9
601.84

b. $CaSO_4$

4 × 16.00 = 64.00
1 × 32.06 = 32.06
1 × 40.08 = 40.08
136.14

2. (4 Pts) How many moles are there in 45.45 g of water?

H_2O: 1 × 16.00 = 16.00, 2 × 1.008 = 2.016, 18.016

$$45.45\ g\ H_2O \left| \frac{mol\ H_2O}{18.016\ g\ H_2O} \right. = 2.523\ mol$$

3. (4 Pts) A chemical reaction calls for 5.00 moles of calcium chloride. How many grams of calcium chloride should be used?

$CaCl_2$: 1 × 40.08, 2 × 35.41 → 110.90

$$5.00\ mol\ CaCl_2 \left| \frac{110.90\ g\ CaCl_2}{mol\ CaCl_2} \right. = 555\ g\ CaCl_2$$

4. (5 Pts) A compound consists of 31.1% sulfur and 68.9% chlorine by mass. Determine its empirical formula. Use 100g

$$S: 31.1\ g \left| \frac{mol}{32.06\ g} \right. = 0.970 \div 0.970 = 1$$

$$Cl: 68.9\ g \left| \frac{mol}{35.45\ g} \right. = 1.944 \div 0.970 = 2$$

SCl_2

5. $2H_3PO_4(aq) + 3Ba(OH)_2 \rightarrow 6H_2O(l) + Ba_3(PO_4)_2(aq)$

a) ? mol 6.85 mol

b) 6.85 mol → ? mol

a. (3 Pts) How many moles of phosphoric acid would be required to neutralize 6.85 moles of barium hydroxide?

$$6.85\ mol\ Ba(OH)_2 \left| \frac{2\ mol\ H_3PO_4}{3\ mol\ Ba(OH)_2} \right. = 4.57\ mol\ H_3PO_4$$

b. (3 Pts) How many moles of water are produced by the amounts used in 5a?

$$6.85\ mol\ Ba(OH)_2 \left| \frac{6\ mol\ H_2O}{3\ mol\ Ba(OH)_2} \right. = 13.7\ mol\ H_2O$$