CHM151 Q3a 25 Pts Fall 2008 Name: Key

SHOW ALL WORK TO RECEIVE CREDIT.

Molar Masses you may need: H 1.01; C 12.01; N 14.01; O 16.00; S 32.07; Co 58.93; Cu 63.55

1. (4 Pts) Complete and balance each of the following reactions:

a. ___$H_3AsO_4(aq)$ + 3 $KOH(aq)$ → $3H_2O(\ell)$ + $K_3AsO_4(aq)$

b. 2 $H_3AsO_4(aq)$ + 3 $Ba(OH)_2(aq)$ → $6H_2O(\ell)$ + $Ba_3AsO_4(s)$

2. (4 Pts) Determine the molar mass of each of the following:

a. $Co(NO_3)_2$

1×58.93
2×14.01
$6 \times 16.00 = 96.00$
182.95

b. $CuSO_4 \cdot 5H_2O$

$1 \times 63.55 = 63.55$
$1 \times 32.07 = 32.07$
$10 \times 1.01 = 10.1$
$9 \times 16.00 = 96.00$
249.72

3. (2 Pts) Calculate the percent oxygen in $Co(NO_3)_2$.

$\frac{96.00}{182.95} \times 100 = 52.47\%$

4. Analysis of a compound gave the following percentages: C 26.7% H 2.2% O 71.1%

a. (4 Pts) Determine the compounds empirical formula.

Assume 100 g so 100% = 100g

C: $\frac{26.7\ g}{12.01\ g/mol} = 2.22 \div = 1$

H: $\frac{2.2\ g}{1.01\ g/mol} = 2.18 \div 2.18 = 1$

O: $\frac{71.1\ g}{16.00\ g/mol} = 4.44 \div = 2$

CHO_2

b. (2 Pts) Its molar mass was found to be 90 g/mole. What is the molecular formula?

molar $CHO_2 \cong 45$; so $90 \div 45 = 2$; so $C_2H_2O_4$

5a. (6 Pts) The Ostwald process can be used to manufacture nitric acid, HNO_3. Given the following equation, determine how many grams of nitric acid can be produced from 47.2 grams of nitrogen dioxide.

$3NO_2(g) + H_2O(l) \rightarrow 2HNO_3(aq) + NO(g)$

47.2 g ? g

$\frac{47.2\ g\ NO_2}{} \left| \frac{mol\ NO_2}{46.01\ g\ NO_2} \right| \frac{2\ mol\ HNO_3}{3\ mol\ NO_2} \left| \frac{63.02\ g\ HNO_3}{mol\ HNO_3} \right. = 43.1\ g\ HNO_3$

b. (3 Pts) If 8.2 moles of $NO_2(g)$ are used with and excess of water, how many moles of nitric acid can be formed?

$3NO_2 + H_2O \rightarrow 2HNO_3 + NO$

8.2 moles ? moles

$8.2\ mol\ NO_2 \left| \frac{2\ mol\ HNO_3}{} \right. = 5.5\ mol\ HNO_3$

CHM151 Q3b 25 Pts Fall 2008 Name: Key

SHOW ALL WORK TO RECEIVE CREDIT.

Molar Masses you may need: H 1.01; C 12.01; N 14.01; O 16.00; S 32.07; Co 58.93; Cu 63.55

1. (4 Pts) Complete and balance each of the following reactions:

a. ___ $H_3PO_4(aq)$ + 3 $LiOH(aq)$ → $3H_2O(\ell)$ + $Li_3PO_4(aq)$

b. 2 $H_3PO_4(aq)$ + 3 $Ca(OH)_2(aq)$ → $6H_2O(\ell)$ + $Ca_3(PO_4)_2$

2. (4 Pts) Determine the molar mass of each of the following:

a. $Cu(NO_3)_2$

6 x 16.00
2 x 14.01
1 x 63.55
187.57

b. $CoSO_4 \cdot 5H_2O$

9 x 16.00
10 x 1.01
1 x 32.07
1 x 58.93
245.1

3. (2 Pts) Calculate the percent oxygen in $Cu(NO_3)_2$.

$$\frac{96.00}{187.57} \times 100 = 51.18\%$$

4. Analysis of a compound gave the following percentages: C 26.7% H 2.2% O 71.1%

a. (4 Pts) Determine the compounds empirical formula

See Quiz 3a CHO_2

b. (2 Pts) Its molar mass was found to be 90 g/mole. What is the molecular formula?

See Quiz 3a $C_2H_2O_4$

5a. (6 Pts) The Ostwald process can be used to manufacture nitric acid, HNO_3. Given the following equation, determine how many grams of nitric acid can be produced from 67.2 grams of nitrogen dioxide.

$3NO_2(g) + H_2O(l) \rightarrow 2HNO_3(aq) + NO(g)$

67.2 g ? g

$$67.2\ g\ NO_2 \left| \frac{1\ mol\ NO_2}{46.01\ g\ NO_2} \right| \frac{2\ mol\ HNO_3}{3\ mol\ NO_2} \left| \frac{63.02\ g\ HNO_3}{1\ mol\ HNO_3} \right. = 61.4\ g\ HNO_3$$

b. (3 Pts) If 12.2 moles of $NO_2(g)$ are used with and excess of water, how many moles of nitric acid can be formed?

$3NO_2 + H_2O \rightarrow 2HNO_3 + NO$

12.2 mol ? mol

$$12.2\ mol\ NO_2 \left| \frac{2\ mol\ HNO_3}{3\ mol\ NO_2} \right. = 8.13\ mol\ HNO_3$$