CHM 151 Quiz 4 25 Pts Fall 2019 Review of Solutions. Name: Key

This is a "Bring Back Quiz". It is due Wednesday Oct. 3rd. Show all work to receive credit.

1. (3 Pts) What is the resulting concentration when 455.8 mL of a 0.0786 M Na_2SO_4 solution is evaporated to a volume of 50.00 mL?

$M_1V_1 = M_2V_2$

$(0.0786\ M)(455.8\ mL) = M_2(50.00\ mL)$

$M_2 = 0.717$

2. (3 Pts) What concentration H_3PO_4 results when 50.00 mL of 0.355 M H_3PO_4 solution is diluted to 400.0 mL?

$M_1V_1 = M_2V_2$

$(0.355\ M)(50.00\ mL) = M_2(400.0\ mL)$

$M_2 = 0.0444$

3. (4 Pts) How many grams of HNO_3 are present in 450.0 mL of 0.0550 M HNO_3 solution?

$$\frac{450.0\ mL}{1}\left|\frac{0.0550\ mol\ HNO_3}{1000\ mL}\right|\frac{63.018\ g}{mol} = 1.56\ g\ HNO_3$$

4. 25.00 mL of 0.505 M hydrochloric acid solution is reacted with 20.50 mL of 0.303 M barium hydroxide solution. You must write a balanced equation.

a. (4 Pts) Determine how many moles of the excess reactant is present when the reaction is done.

$2HCl(aq) + Ba(OH)_2(aq) \rightarrow 2H_2O(l) + BaCl_2(aq)$

25.00 mL, 0.505 mol/L | 20.50 mL, 0.303 mol/L | ? mol (pick a reactant and do two calculations)

Based on HCl:

$$\frac{25.00\ mL}{1}\left|\frac{0.505\ mol\ HCl}{1000\ mL}\right|\frac{2\ mol\ H_2O}{2\ mol\ HCl} = 0.0126\ mol\ H_2O$$ (HCl will be in excess)

Based on $Ba(OH)_2$:

$$\frac{20.50\ mL}{1}\left|\frac{0.303\ mol\ Ba(OH)_2}{1000\ mL}\right|\frac{2\ mol\ H_2O}{1\ mol\ Ba(OH)_2} = 0.012423\ mol\ H_2O$$

Subtracting gives $2.02 \times 10^{-4}\ mol\ H_2O$

b. (4 Pts) Determine the concentration (in moles per liter) of the remaining (excess) reactant.

$$\frac{2.02\times10^{-4}\ mol\ H_2O}{1}\left|\frac{2\ mol\ HCl}{2\ mol\ H_2O}\right. = 2.02\times10^{-4}\ mol\ XS\ HCl$$

$$\frac{2.02\times10^{-4}\ moles}{(0.02500 + 0.02050)\ L} = 0.0044\ \frac{mol}{L}\ HCl$$

Key

5. (4 Pts) A barium hydroxide solution is being standardized with potassium hydrogen phthalate (KHP). If it took 33.25 mL of the barium hydroxide solution to neutralize 0.5728 grams KHP, what was the molarity of the barium hydroxide solution? You must write a balanced equation.

$Ba(OH)_2(aq) + 2KHC_8H_4O_4(s) \rightarrow 2H_2O(l) + BaC_8H_4O_4 + K_2C_8H_4O_4$

33.25 mL 0.5728 g

These would mixed

204.22 g / mol (molar mass)

$$\frac{0.5728\ g\ KHP \mid 1\ mol\ KHP \mid 1\ mol\ Ba(OH)_2}{33.25 \times 10^{-3}\ L\ Ba(OH)_2 \mid 204.22\ g\ KHP \mid 2\ mol\ KHP} = 0.04218\ \frac{mol\ Ba(OH)_2}{L_{Ba(OH)_2}}$$

6 (3 Pts) Determine the number of moles of water produced by the reaction of 155 g of ammonia and 356 g of oxygen.

$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

155 g 356 g

Based on: NH_3

$$\frac{155\ g\ NH_3 \mid 1\ mol\ NH_3 \mid 6\ moles\ H_2O}{17.034\ g\ NH_3 \mid 4\ mol\ NH_3} = 13.6\ mole\ H_2O$$

Based on: O_2

$$\frac{356\ g\ O_2 \mid 1\ mol\ O_2 \mid 6\ mol\ H_2O}{32.00\ g\ O_2 \mid 5\ mol\ O_2} = 13.35\ mol\ H_2O$$

Since O_2 is the Limiting Reactant.