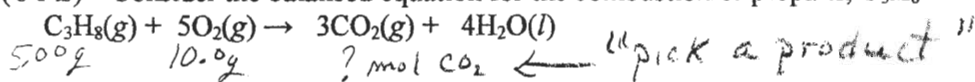


Quiz 4c 25 Pts TR Fall 2005 Name: Key

SHOW WORK TO RECEIVE CREDIT. Molar Masses: $H = 1.008$, $K = 39.10$, $C = 12.01$, $N = 14.01$, $Na = 22.99$, $O = 16.00$, $S = 32.07$

1. (6 Pts) Consider the balanced equation for the combustion of propane, C_3H_8



If propane reacts with oxygen as above. Which reactant and how much (in grams) remains in excess from a mixture containing 5.00 g of C_3H_8 and 10.0 g of O_2 ?

Based on C_3H_8 : $\frac{5.00g C_3H_8}{44.094g C_3H_8} \times \frac{1 mol C_3H_8}{1 mol C_3H_8} \times \frac{3 mol CO_2}{1 mol C_3H_8} = 0.3402 mol CO_2$

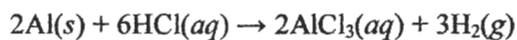
Based on O_2 : $\frac{10.00g O_2}{32.00g O_2} \times \frac{1 mol O_2}{1 mol O_2} \times \frac{3 mol CO_2}{5 mol O_2} = 0.1875 mol CO_2$

Difference is related to $X S C_3H_8$: $\frac{(0.3402 - 0.1875) mol CO_2}{3 mol CO_2} \times \frac{1 mol C_3H_8}{1 mol C_3H_8} \times \frac{44.094g C_3H_8}{1 mol C_3H_8} = 2.244g C_3H_8$

2. (5 Pts) A solution of methanol (CH_3OH) in water has a concentration of 0.200 M. What mass of methanol, in grams, is present in 0.150 liters of this solution?

$$0.150 L \times \frac{0.200 mol CH_3OH}{1 L} \times \frac{32.042g CH_3OH}{1 mol CH_3OH} = 0.9613g CH_3OH$$

3. (5 Pts) Aluminum metal dissolved in hydrochloric acid as follows



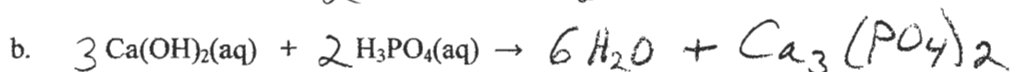
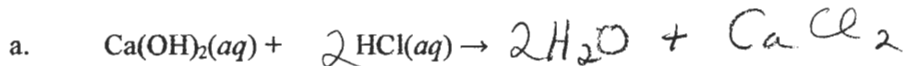
3.20g 6.0 mol

What is the minimum volume of 6.0 M $HCl(aq)$ needed to completely dissolve 3.20 g of aluminum in this reaction?

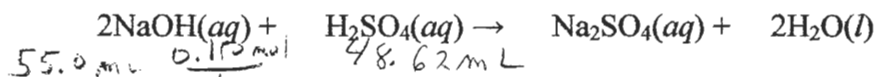
$$\frac{3.20g Al}{27.0g Al} \times \frac{1 mol Al}{1 mol Al} \times \frac{6 mol HCl}{2 mol Al} \times \frac{1 L HCl}{6.0 mol HCl} = 0.05926 L HCl$$

or 59.3 mL HCl

4. (4 Pts) Complete and balance the equation for the following acid-base reactions.



5. (5 Pts) 55.0 mL of the 0.150 M aqueous NaOH is titrated against sulfuric acid, H_2SO_4 , according to the equation



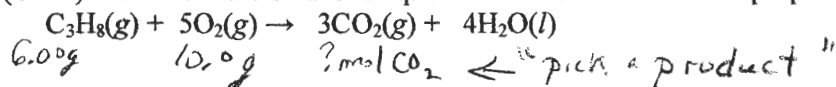
If the volume of sulfuric acid solution required to neutralize the NaOH is 48.62 mL, what is its concentration?

$$\frac{55.0 mL NaOH}{1000 mL NaOH} \times \frac{0.150 mol NaOH}{1 mol NaOH} \times \frac{1 mol H_2SO_4}{2 mol NaOH} = 0.004125 mol H_2SO_4$$

$\frac{0.004125 mol H_2SO_4}{48.62 \times 10^{-3} L H_2SO_4} = 0.08484 M H_2SO_4$

SHOW WORK TO RECEIVE CREDIT. Molar Masses: $H = 1.008$, $K = 39.10$, $C = 12.01$, $N = 14.01$, $Na = 22.99$, $O = 16.00$, $S = 32.07$

1. (6 Pts) Consider the balanced equation for the combustion of propane, C_3H_8



If propane reacts with oxygen as above. Which reactant and how much (in grams) remains in excess from a mixture containing 6.00 g of C_3H_8 and 10.0 g of O_2 ?

Based on: $6.00g C_3H_8$ | $\frac{1 mol C_3H_8}{44.094g C_3H_8}$ | $\frac{3 mol CO_2}{1 mol C_3H_8}$ = $0.4082 mol CO_2$

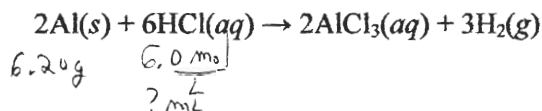
Based on: $10.0g O_2$ | $\frac{1 mol O_2}{32.00g O_2}$ | $\frac{3 mol CO_2}{5 mol O_2}$ = $0.1875 mol CO_2$

Difference is related to XS C_3H_8 : $(0.4082 - 0.1875) mol CO_2$ | $\frac{1 mol C_3H_8}{3 mol CO_2}$ | $\frac{44.094g C_3H_8}{1 mol C_3H_8}$ = $3.244g C_3H_8$ IN XS

2. (5 Pts) A solution of methanol (CH_3OH) in water has a concentration of 0.200 M. What mass of methanol, in grams, is present in 0.250 liters of this solution?

$$0.250L \times 0.200 \frac{mol CH_3OH}{L} \times 32.042 \frac{g CH_3OH}{mol CH_3OH} = 1.60 g CH_3OH$$

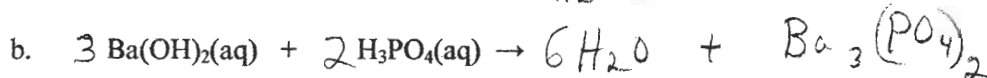
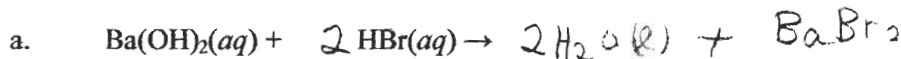
3. (5 Pts) Aluminum metal dissolved in hydrochloric acid as follows



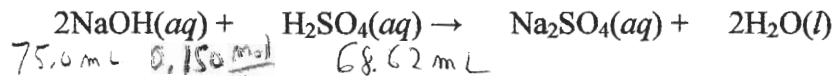
What is the minimum volume of 6.0 M $HCl(aq)$ needed to completely dissolve 6.20 g of aluminum in this reaction?

$$6.20g Al \times \frac{1 mol Al}{27.0g Al} \times \frac{6 mol HCl}{2 mol Al} \times \frac{1000 mL HCl}{6.0 mol HCl} = 114.8 mL$$

4. (4 Pts) Complete and balance the equation for the following acid-base reactions.



5. (5 Pts) 75.0 mL of the 0.150 M aqueous $NaOH$ is titrated against sulfuric acid, H_2SO_4 , according to the equation



If the volume of sulfuric acid solution required to neutralize the $NaOH$ is 68.62 mL, what is its concentration?

$$75.0 mL \times \frac{0.150 mol NaOH}{L NaOH} \times \frac{1 mol H_2SO_4}{2 mol NaOH} = 0.08197 mol H_2SO_4$$

$\frac{0.08197 mol H_2SO_4}{68.62 \times 10^{-3} L H_2SO_4}$