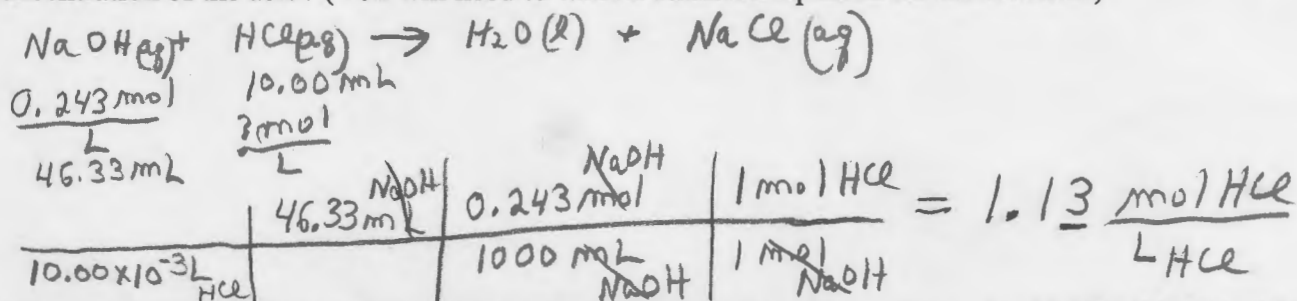
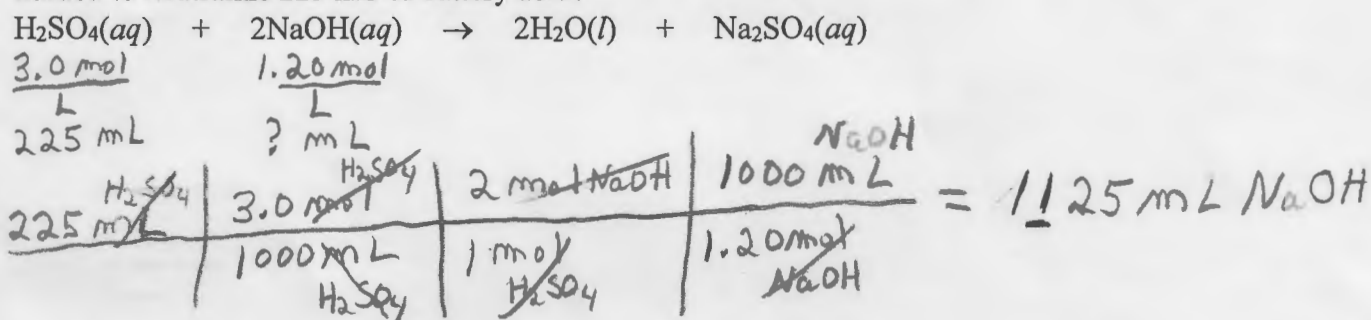


Show all work to receive credit.

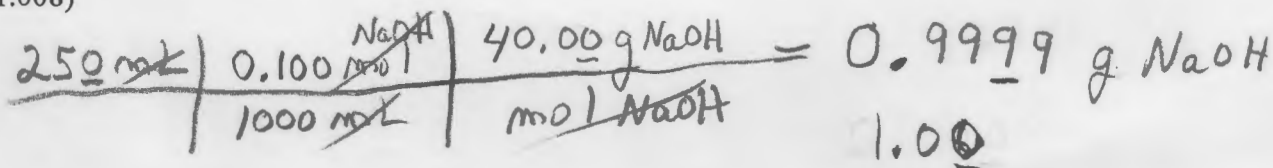
1. (7 Pts) A standard solution of 0.243 M NaOH was used to determine the concentration of a hydrochloric acid solution. If 46.33 mL of NaOH is needed to neutralize 10.00 mL of the acid, what is the molar (M) concentration of the acid? (You will need to write a balanced equation for the reaction.)



2. (6 Pts) Automobile batteries use 3.0 M H₂SO₄ as an electrolyte. How many mL of 1.20 M NaOH will be needed to neutralize 225 mL of battery acid?



3. (5 Pts) You are provided with a 250 mL volumetric flask, deionized water, and solid NaOH. How much NaOH should be weighed out in order to make 250. mL of 0.100 M solution? (Na 22.99, O 16.00, H 1.008)

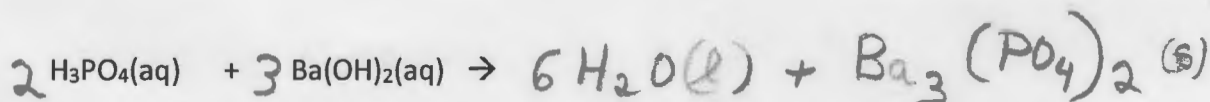


4. (5 Pts) What is the molarity (M) of a solution prepared by diluting 125 mL of 0.150 M HCl solution to a volume of 500.0 mL?

$$\text{Use } M_1V_1 = M_2V_2 \quad (0.150 \text{ M})(125 \text{ mL}) = M_2(500.0 \text{ mL})$$

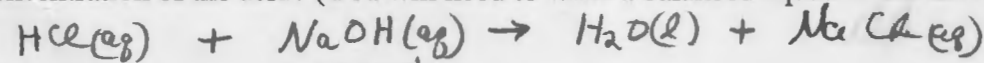
$$M_2 = 0.0375 \text{ M}$$

5. (2 Pts) Complete and balance the following equation:



Show all work to receive credit.

1. (7 Pts) A standard solution of 0.243 M NaOH was used to determine the concentration of a hydrochloric acid solution. If 46.33 mL of NaOH is needed to neutralize 20.00 mL of the acid, what is the molar (M) concentration of the acid? (You will need to write a balanced equation for the reaction.)



20.00 mL

 $\frac{? \text{ mol}}{\text{L}}$

0.243 mol/L

46.33 mL

$$\frac{20.00 \times 10^{-3} \text{ L HCl}}{46.33 \text{ mL NaOH}} \times \frac{0.243 \text{ mol NaOH}}{1000 \text{ mL NaOH}} \times \frac{1 \text{ mol HCl}}{1 \text{ mol NaOH}} = 0.563 \frac{\text{mol HCl}}{\text{L HCl}}$$

2. (6 Pts) Automobile batteries use 3.0 M H₂SO₄ as an electrolyte. How many mL of 1.40 M NaOH will be needed to neutralize 225 mL of battery acid?



3.0 mol/L

1.40 mol/L

225 mL

? mL

$$\frac{225 \text{ mL H}_2\text{SO}_4}{3.0 \text{ mol H}_2\text{SO}_4} \times \frac{2 \text{ mol NaOH}}{1 \text{ mol H}_2\text{SO}_4} \times \frac{1000 \text{ mL}}{1.40 \text{ mol NaOH}} = 964 \text{ mL NaOH}$$

3. (5 Pts) You are provided with a 250 mL volumetric flask, deionized water, and solid NaOH. How much NaOH should be weighed out in order to make 250. mL of 0.200 M solution? (Na 22.99, O 16.00, H 1.008)

$$\frac{250 \text{ mL}}{1000 \text{ mL}} \times 0.200 \text{ mol} = 0.050 \text{ mol} \times 40.0 \text{ g NaOH/mol} = 2.00 \text{ g NaOH}$$

4. (5 Pts) What is the molarity (M) of a solution prepared by diluting 145 mL of 0.150 M HCl solution to a volume of 500.0 mL?

use: $M_1 V_1 = M_2 V_2$

$$(0.150 \text{ M})(145 \text{ mL}) = M_2 (500.0 \text{ mL})$$

$$M_2 = 0.0435 \text{ M}$$

5. (2 Pts) Complete and balance the following equation:

