Acid Base Titration Practice Name: KEY

1) Write the balanced equation for the reaction of hydrobromic acid and sodium hydroxide:

$HBr_{(aq)} + NaOH_{(aq)} \rightarrow H_2O_{(l)} + NaBr_{(aq)}$

Look at the data table below:

vol HBr	23.5 mL	0.0235 L
vol NaOH	10.7 mL	0.0107 L
M HBr	0.500 M	
M NaOH	? M	

2) Convert the mL of HBr and NaOH to L and fill them into the data table.

3) Calculate the moles of HBr that reacted.

$mol = 0.500 \frac{mol}{L} \cdot 0.0235 L$

0.0118 mol HBr

4) Use the mole ratio to find out how many moles of NaOH reacted.

$0.0118 \text{ mol } HBr \left(\frac{1 \text{ mol } NaOH}{1 \text{ mol } HBr} \right)$

0.0118 mol NaOH

5) Find the molarity of the NaOH. Show work and units!

$M = \frac{0.0118 \text{ mol } NaOH}{0.0107 \text{ L } NaOH} = 1.10 \frac{mol}{L}$

1.10 M NaOH

6) Write the balanced equation for the reaction of sulfuric acid and potassium hydroxide:

$H_2SO_{4(aq)} + 2\,KOH_{(aq)} \rightarrow 2\,HOH_{(l)} + K_2SO_{4(aq)}$

vol H_2SO_4	17.6 mL	0.0176 L
vol KOH	32.8 mL	0.0328 L
M H_2SO_4	? M	
M KOH	1.35 M	

7) Look at the data above. Which substance should you begin your calculations with? KOH

8) Convert the mL of acid and base above to L and fill them into the data table.

9) Calculate the **moles** of the KOH that reacted, using the data in the table.

$1.35 \frac{mol}{L} \cdot 0.0328 L$

0.0443 mol KOH

10) Use the mole ratio in the equation to find out how many moles of H_2SO_4 you reacted against the KOH.

$0.0443 \text{ mol } KOH \left(\frac{1 \text{ mol } H_2SO_4}{2 \text{ mol } KOH} \right)$

0.0221 mol H_2SO_4

11) Find the molarity of the H_2SO_4 by using the formula M = moles/L. Show work.

$M = \frac{0.0221 \text{ mol } H_2SO_4}{0.0176 \text{ L } H_2SO_4}$

1.26 M H_2SO_4

13) Write the balanced equation for the reaction of acetic acid (CH_3COOH) and potassium hydroxide (KOH).

$CH_3COOH_{(aq)} + KOH \rightarrow H_2O_{(l)} + KCH_3COO_{(aq)}$

vol CH_3COOH	10.5 mL	0.0105 L
vol KOH	9.7 mL	0.0097L
M CH_3COOH	? M	
M KOH	1.00 M	

Use the above information and combining all the previous steps into one large problem, find the molarity (M) of the acetic acid solution. Show all your work below.

① Mol KOH = $\frac{1.00\ mol}{L} \cdot 0.0097\ L = 0.0097\ mol\ KOH$

② mole ratio: $0.0097\ mol\ KOH \left(\frac{1\ mol\ CH_3COOH}{1\ mol\ KOH}\right) = 0.0097\ mol\ CH_3COOH$

③ $M_{CH_3COOH} = \frac{0.0097\ mol\ CH_3COOH}{0.0105\ L} = 0.92\ M$

0.92 M CH_3COOH

Review: Complete this naming chart:

Name	Formula
sulfuric acid	H_2SO_4
phosphoric acid	H_3PO_4
nitric acid	HNO_3
nitrous acid	HNO_2
acetic acid	CH_3COOH
methanoic acid	HCOOH
hydrofluoric acid	HF

(aka formic acid)

Complete and balance these neutralization reactions:

a) barium hydroxide + acetic acid:

$Ba(OH)_{2(aq)} + 2CH_3COOH_{(aq)} \rightarrow 2H_2O_{(l)} + Ba(CH_3COO)_{2(aq)}$

b) phosphoric acid + sodium hydroxide:

$H_3PO_{4(aq)} + 3NaOH \rightarrow 3H_2O_{(l)} + Na_3PO_{4(aq)}$