EXPERIMENT 25: NEUTRALIZATION AND TITRATION

Equipment: 2 burets (marked acid and base), 2 small funnels (marked A and B), one 100mL or 150 mL
                    beaker, glass stirring rod, iron ring, ring stand, buret holder, wire gauze, Bunsen burner

Materials: 20 mL 0.20M NaOH, phenolphthalein, 20mL HCl of unknown concentration, matches

In a titration a solution of known concentration is used to determine the concentration of an unknown solution.

A.   1.   Fill a buret (labelled BASE; with a pinch clamp) with approximately 20 mL of
            a solution of NaOH of known molarity (approx. 0.20 M).
      2.   Fill another buret (labelled ACID; with a glass stopcock) with 20 mL of a
            solution of HCl of unknown molarity. **Be sure the tips of the burets are
            filled.**
      3.   Record the initial volumes in the table below. The meniscus (curved surface of the liquid)
            should always be read at eye level, and the readings should always be made at the bottom of
            the meniscus.

B.   4.   Run 10mL of the acid into a 150 mL beaker.
      5.   Add 1 drop of phenolphthalein indicator, and stir.
      6.   Add the base drop-wise, and stir after each drop, until the solution remains pink.
      7.   Read the meniscus on each buret and record the final volumes in the table below.

C.   8.   Repeat the entire procedure in A and B at least once in order to test the precision of the
            method. Save the final solution from step B6 for part "D".

D.   9.   Place the beaker containing a few mL of the neutralized solution on a wire gauze over a
            burner.
      10.   Boil until all but a few drops of liquid have evaporated. Then shut off the burner, and allow
            the remainder to evaporate to dryness. **Caution:** Overheating may crack the beaker.

      11.   What do you observe? Explain. _____

            _____

      12.   Write an equation for the reaction between the acid and the base.

            _____

	TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4
Base: final reading				
Base: initial reading				
mL of base used				
Acid: final reading				
Acid: initial reading				
mL of acid used				

3. Calculate the molarity of the acid for each trial (to the correct number of significant figures).

$M_{base} \times V_{base\ used} = M_{acid} \times V_{acid\ used}$

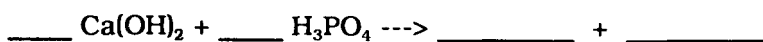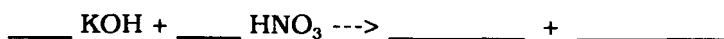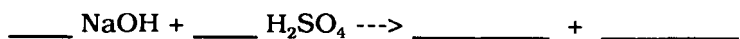Trial 1   Trial 2   Trial 3   Trial 4

Average acid Molarity: _____

4. Compare results obtained in the different titration trials.

5. List possible sources of experimental error.

6. Complete and balance the following equations:

_____ NaOH + _____ H_2SO_4 ---> _____ + _____

_____ KOH + _____ HNO_3 ---> _____ + _____

_____ $Ca(OH)_2$ + _____ H_3PO_4 ---> _____ + _____

7. How many milliliters of 0.50M HNO_3 would be needed to neutralize 15.0 mL of 1.00M KOH?

_____

CONCLUSIONS

In a neutralization reaction an _____ and a _____ react to form a _____

and _____. Phenolphthalein, litmus, methyl orange, and methyl red are often used in

titrations as acid-base _____.