Name: _____ Date: _____

Analysis of Hydrogen Peroxide

Abstract: The peroxide anion in hydrogen peroxide contains oxygen as a -1 charge. When reacted with a strong oxidizer such as potassium permanganate, the oxygen will be oxidized to the elemental gas. Simultaneously, the manganese in the dark purple colored permanganate ion, a +7 charge initially, will be reduced to the colorless +2 ion. When enough potassium permanganate has been added to the hydrogen peroxide solution so that no more oxygen can be oxidized, the purple color of the permanganate will color the solution a light pink indicating the endpoint of the reaction. The overall reaction is:

$2\ MnO_4^- + 6\ H^+ + 5\ H_2O_2 \rightarrow 5\ O_2 + 2\ Mn^{+2} + 8\ H_2O$

Objective: To use a standardized potassium permanganate solution to determine the concentration of hydrogen peroxide.

Materials:

distilled water	hydrogen peroxide	0.02584 *M* potassium permanganate
6 *M* sulfuric acid solution		

Equipment:

Erlenmeyer flask	buret	buret clamp
graduated cylinder	labels and/or markers	

Procedure :

1. Obtain a flask of potassium permanganate standard solution.
2. Rinse and clean two burets with distilled water.
3. Rinse one of the burets with a 5 mL portion of potassium permanganate and empty it into the sink.
4. Fill the buret with potassium permanganate solution until the liquid level is just above the zero mark.
5. Open the stopcock on the buret to allow any air bubbles to escape from the tip. Close the stopcock when the liquid level in the buret is between the 0- and 5-mL mark.
6. Record the precise level of the solution in the buret. This is the initial volume of the potassium permanganate solution. Note: Volumes are read from the top down in a buret. Always read from the bottom of the meniscus and remember to include the appropriate number of significant figures.
7. Fill a second buret to the 25 – 30 mL mark with hydrogen peroxide solution. Allow approximately 1.00 mL of the solution into an Erlenmeyer flask. Record the exact initial and final volumes.
8. Add about 25 mL of distilled water to the flask.
9. Measure 5 mL of 6M sulfuric acid into a graduated cylinder and carefully add the acid to the solution in the Erlenmeyer flask. Gently swirl the flask to mix the solution.
10. Position the flask under the potassium permanganate buret so that the tip of the buret is within the flask but at least 2 cm above the liquid surface. Place a piece of white paper under the flask to make it easier to detect the endpoint. Add a magnetic stir bar to the flask.
11. Open the buret stopcock and allow the potassium permanganate solution to flow into the flask.
12. Continue to add the potassium permanganate solution slowly, drop-by-drop, while stirring the flask.
13. When a light pink color persists in the titrated solution while swirling the flask, the endpoint has been reached.

Calculations :
For each trial:
1. Calculate the volume of potassium permanganate solution used.
2. Calculate the moles of permanganate ion used.
3. Calculate the number of moles hydrogen peroxide titrated.
4. Calculate the concentration of the hydrogen peroxide solution. Report your answer as a mass percentage (mass solute per mass solution). You may assume the density of the hydrogen peroxide solution is 1.01 g/mL.

After all trials have been calculated:
5. Perform a Q-test and calculate an average percentage of hydrogen peroxide solution.

Data:

Trial	$V_{initial}$ $KMnO_4$	V_{final} $KMnO_4$	$V_{initial}$ H_2O_2	V_{final} H_2O_2
1	0.52	14.75	35.65	36.55
2	14.75	29.12	36.55	37.68
3	29.12	43.75	37.68	38.80
4	0.85	15.55	38.80	39.71

Conclusion:
Consider the various titrations performed this year and describe potential places in the procedure that could introduce error. Include other errors that were unique to your lab experience.