Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Student Activity- Decomposition of H2O2**

**Learning Objective SPQ-4.B** Identify the equivalence point in a titration based on the amounts of the titrant/analyte, if the titration reaction goes to completion.

 **SPQ-4.A** Explain changes in the amounts of reactants and products based on the balanced reaction equation for a chemical process.

 **TRA-2.C** Represent a redox reaction equation using half-reactions.

**Science Practice 5.A** Identify quantities needed to solve a problem from given information.

 **5.F** Calculate, estimate, or predict an unknown quantity from known quantities

 by selecting and following a logical computational pathway and attending

 to precision.

**QUESTION:** How can we determine the percentage of H2O2 in a drugstore bottle of

 Hydrogen Peroxide?

**Materials**

Bottle of drugstore Peroxide Well plate 1-mL pipette

disposable pipettes 0.010 M KMnO4 solution 6M sulfuric acid

10-mL volumetric flask (or graduated cylinder

1. Measure 1.0 mL of a drugstore bottle of hydrogen peroxide and dilute it with 9.0 mL of distilled water.

2. Pipette out 0.5 mL of your freshly made dilute solution of hydrogen peroxide into a

 well plate.

3. Add 2 drops of 6.0 M sulfuric acid solution to the well plate.

4. Now titrate the solution in your well plate with your 0.010 M KMnO4 solution until the solution turns a light pink color. Count the drops of KMnO4 (aq) that you used.

5. Each person in your group must perform at least one titration.

6. Record your results in your data table below.

**Data Table: Titration of hydrogen peroxide**

|  |  |  |
| --- | --- | --- |
| **Trial #** | **Diluted/Acidified** **Hydrogen Peroxide** | **Drops of KMnO4** |
| **1** | **0.5 mL** |  |
| **2** | **0.5 mL** |  |
| **3** | **0.5 mL** |  |
| **4** | **0.5 mL** |  |

We will assume that every 1 drop of KMnO4 solution is equal to 0.05 mL. Using the molarity of the KMnO4 solution given to you by your instructor, calculate the moles of KMnO4 solution added to the hydrogen peroxide for each trial. Then take an average.

Given the two 1/2 reactions below, figure out the net ionic equation for the reaction that occurred during this activity.

H2O2(aq) O2(g) + 2H+(aq) + 2e–

MnO4–(aq) + 8H+(aq) + 5e– Mn2+(aq) + 4H2O(l)

 What is the ratio of moles of peroxide to moles of permanganate in this reaction?

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Using the ratio above, calculate the moles of peroxide that were titrated in this activity.

Calculate the Molarity of the H2O2 solution that was titrated using your 0.5 mL sample.

Calculate the moles of H2O2 is your 10 mL sample that you made at the beginning of this activity.

Calculate the mass of H2O2 from your above calculation.

If we assume the density of the drugstore bottle of peroxide is about 1.00 g/mL, then calculate the mass% of the H2O2 in the 10 .0 mL sample that we started with in this activity.

Multiply the mass % of the H2O2 solution that you just calculated by 10. (Remember we diluted the original sample). This is the % of H2O2 in the original bottle of peroxide.