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**Student Activity- KMnO4 Redox Titrations**

**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.1** Balanced chemical equations for redox reactions can be constructed from half-reactions.

**Science Practice 5.C** Explain the relationship between variables within an equation when one variable changes.

 **3.A** Represent chemical phenomena using appropriate graphing techniques, including correct scale and units.

 **1.B** Describe the components of and quantitative information from models and representations that illustrate both particulate-level and macroscopic-level properties.

 **5.E** Determine a balanced chemical equation for a given chemical phenomena.

**QUESTION:** How can the concentration of Fe2+ be determined in a redox titration with KMnO4?

Instructions: You will be working with a computer simulation that covers redox titrations; please discuss each question with your lab partners and write down your best answer.

Web Site address for the computer simulation:

<https://pages.uoregon.edu/tgreenbo/redox.html>

**Procedure**:

1. Select the first reaction in the list of reactions. (KMnO4 and Fe 2+)

2. Record the concentration (molarity) of the KMnO4. \_\_\_\_\_\_\_\_\_\_\_M

3. Record the volume of Fe2+. \_\_\_\_\_\_\_\_\_\_\_mL

4. Titrate to a pink endpoint. Use a hit and miss method to narrow down how much KMnO4 will be needed and then titrate to a proper endpoint. Use the REPEAT button in the simulation to help in finding the approximate concentration needed.

5. Record the total volume of KMnO4 that was used. \_\_\_\_\_\_\_\_\_\_\_mL

6. Calculate the concentration (molarity) of Fe 2+ for this simulation. Based on the following

 **stoichiometric equation:** **5Fe+2 + MnO4- + 8H+ 🡪 5Fe+3 + Mn+2 + 4H2O**

 Show your work.

7. Enter your calculated value in the box on the simulation. \_\_\_\_\_\_\_\_\_\_\_M

8. Click OK to see if your calculation is correct or not.

**Discussion for Redox Titration:**

What was the ratio of Fe2+ to KMnO4 solution? Why is this important in your calculations?

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Could this experiment have been carried out if the concentration of the Fe2+ was known and the KMnO4 solution was the unknown? How would the calculation have changed?

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This simulation shows how to standardize a solution. Why is it important to standardize an unknown solution?

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