Oxidation States of Manganese Lab

My results are in BLUE

Procedure 1

1. Take 5 clean test tubes from the Glassware shelf and place them on the workbench.

2. Add 5 mL of water to the first test tube. This is your color standard against which the pale pink Mn⁺² ion can be compared.

3. Add 5 mL of KMnO₄ to the second test tube. This is your color standard for the purple permanganate ion.

4. Add 2 mL of KMnO₄ to test tubes 3, 4 and 5.

5. Add 1 mL of NaOH to test tube 3.

6. Add 1 mL of H₂SO₄ to test tube 5.

7. Take 3 pH meters from the Glassware shelf and place them into test tubes 3, 4 and 5. Record the pH in the test tubes. You will see that test tube 3 is the basic solution (13.82 pH), test tube 4 is neutral (7.0 pH), and test tube 5 is acidic(0.00 pH).

8. Add five 1 mL increments of NaHSO₃ to test tube 3. Observe and record the results of the reaction, color and precipitation, after each addition of 1 mL.

Starts as Pink, 13.82pH

Add 1mL – turns green, 13.65 pH

Add 2 mL – lighter green, 13.56pH

Add 3mL – stays light green, 13.48pH

Add 4mL – stays light green, 13.41pH

Add 5mL – stays light green, 13.35pH

9. Add five 1 mL increments of NaHSO₃ to test tube 4. Observe and record the results of the reaction, color and precipitation, after each addition of 1 mL.

Starts as Pink, 7.0pH

Add 1mL – Stays Pink, Gray Solid at bottom, 7.31pH

Add 2mL – Stays Pink, Gray solid at bottom, 7.38pH

Add 3mL – Turns Clear, Gray solid at bottom, 7.41pH

Add 4mL – Stays Clear, Gray solid at bottom, 7.31pH

Add 5mL - Stays Clear, Gray solid at bottom, 7.29pH

10. Add five 1 mL increments of NaHSO₃ to test tube 5. Observe and record the results of the reaction, color and precipitation, after each addition of 1 mL.

Starts Pink, 0.00pH

Add 1mL – No color change, 0.00pH

Add 2mL – No color change, 0.00pH

Add 3mL – No color change, 0.01pH

Add 4mL – No color change, 0.08pH

Add 5mL – Turns Clear, 0.14pH

\*\*They are asking for ‘precipitation’. Is this the solid at the bottom of Test Tube #5?\*\*

Assignment 1 of Procedure 1

1. For each test tube - #3, #4 and #5 - record the following results of the reactions:

1. Color of the solution

Test Tube #3

Starts as Pink, 13.82pH

Add 1mL – turns green, 13.65 pH

Add 2 mL – lighter green, 13.56pH

Add 3mL – stays light green, 13.48pH

Add 4mL – stays light green, 13.41pH

Add 5mL – stays light green, 13.35pH

Test Tube #4

Starts as Pink, 7.0pH

Add 1mL – Stays Pink, Gray Solid at bottom, 7.31pH

Add 2mL – Stays Pink, Gray solid at bottom, 7.38pH

Add 3mL – Turns Clear, Gray solid at bottom, 7.41pH

Add 4mL – Stays Clear, Gray solid at bottom, 7.31pH

Add 5mL - Stays Clear, Gray solid at bottom, 7.29pH

Test Tube #5

Starts Pink, 0.00pH

Add 1mL – No color change, 0.00pH

Add 2mL – No color change, 0.00pH

Add 3mL – No color change, 0.01pH

Add 4mL – No color change, 0.08pH

Add 5mL – Turns Clear, 0.14pH

1. Color of the precipitate, if any:

Only precipitate is Gray at the bottom of test tube #2 (Is this correct?)

This is where I need help. I’m not sure how to finish this up.

2. Based on these results, to what oxidation states did the MnO₄⁻ and HSO₃⁻ ions change in each test tube?

(a) Test tube 3:

(b) Test tube 4:

(c) Test tube 5:

3. Write the net ionic equations for the redox reactions in each test tube:

(a) Test tube 3:

(b) Test tube 4:

(c) Test tube 5: