

EXPERIMENT 32: PRIMARY CELLS

Equipment: 150mL beakers, salt bridges (U-tubes w/Agar & KNO₃), sensitive voltmeter.

Materials: 5mL Cu⁺²_(aq), 5mL Pb⁺²_(aq), 5mL Zn⁺²_(aq), Cu, Pb & Zn strips

In this experiment you will learn how electricity can be produced in a redox reaction.

- A. Place a strip of Cu in a beaker containing 1 M Cu (NO₃)₂. In another beaker place a strip of Zn and 1 M Zn (NO₃)₂ solution. Connect the Cu and Zn strips to a voltmeter using single strand electric wire.

1. Why is there no voltage registered on the voltmeter? _____

- B. Make a salt bridge by soaking a strip of paper towel with a saturated KNO₃ solution. Shake off the excess solution. Connect the two beakers using the salt bridge. Note which electrode is connected to the positive terminal of the voltmeter.

2. What voltage is registered on the voltmeter? _____

3. Using Reference Table N, determine which metal is oxidized, and which metal ion is reduced.

Write the half-reaction for each cell. _____

4. What is the theoretical voltage for a Cu/Cu (NO₃)₂ // Zn(NO₃)₂/Zn cell? _____

5. Define oxidation in terms of electron transfer. _____

6. The electrode at which oxidation takes place is called the _____.

7. Define reduction in terms of electron transfer. _____

8. The electrode at which reduction takes place is called the _____.

- C. Repeat parts A and B using a Cu/Cu (NO₃)₂ // Ni(NO₃)₂/Ni cell.

- D. If time permits, construct a Zn/Zn (NO₃)₂ // Ni(NO₃)₂/Ni cell. What voltage would such a cell produce?

Diagram of Electro-chemical Cell

SUMMARY QUESTIONS

9. What are practical applications of what you have learned in this experiment?

10. List the possible sources of error in this experiment.

11. For the above cell, electrons flow from the _____ electrode to the _____ electrode.

12. After equilibrium is reached, the voltmeter will read _____ volts.

13. Describe the function of the salt bridge.

CONCLUSIONS: For the Cu/Cu⁺² (1M), // Zn⁺² (1M), / Zn cell: as the cell continues to operate, the mass of the _____ electrode increases, and the mass of the _____ electrode decreases. The concentration of _____ ion increases, and the concentration of _____ ion decreases.