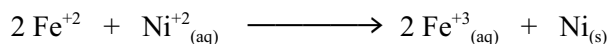


Electrochemical Cells: Assignment

1. If a piece of copper metal is dipped into a solution containing Cr^{+3} ions, what will happen? Explain, using E^0 values.
2. What will happen if an aluminium spoon is used to stir an $\text{Fe}(\text{NO}_3)_2$ (aq)? What will happen if an iron spoon is used to stir an AlCl_3 (aq)? Justify your answer using E^0 values.

3. Can a $1 \text{ mol dm}^{-3} \text{Fe}_2(\text{SO}_4)_3$ (aq) be stored in a container made of nickel metal? Explain your answer.

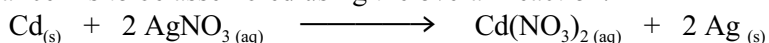
4. Will the reaction:



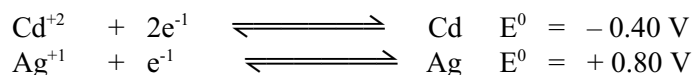
occur? What is the net voltage?

5. Predict what will happen if molecular bromine, Br_2 , is added to a solution containing NaCl (aq) and NaI (aq) at 25°C .

6. An electrochemical cell is to be assembled using the overall reaction:



Given :



- A) What is oxidized in this process?
- B) Write the equation for that half-reaction which is an *oxidation process*.
- C) Do the negative ions serve any useful purpose in the operation of the cell? Explain.
- D) Diagram the half-cell in which oxidation occurs. Label the electrode and the solution around it. (It will be convenient here to use the porous cup as a container for the half-cell).
- E) What is the electrode called which is undergoing oxidation?
- F) Write the equation for that half-reaction which is a *reduction process*. Diagram the half-cell for this process and identify the material used for the electrode and the compound dissolved in the solution.
- G) What is the name of the electrode in the half-cell where reduction is occurring?
- H) Combine the half-cells of parts D) and F) to give a complete cell; then indicate the *direction of electron flow* in the external circuit. Indicate the direction of *movement of positive ions* in the cell. Indicate the direction of *movement of negative ions* in the cell. Which half-cell electrode would be labelled negative?
- I) Suppose 2 moles of silver atoms were deposited. How many moles of cadmium atoms would dissolve? How many grams of Cd would dissolve if 2.0 g of silver metal plated out?
- J) Write the cell diagram (using standard cell notation) for this cell, including the net cell voltage.
- K) As the cell operates, what will happen to each of the electrodes?
- L) What is the function of the porous pot?
- M) Write the overall cell reaction.

7. A galvanic cell consists of a Mg electrode in a $1.0 \text{ mol dm}^{-3} \text{Mg}(\text{NO}_3)_2$ solution and a Ag electrode in a $1.0 \text{ mol dm}^{-3} \text{AgNO}_3$ solution. Calculate the overall cell voltage and diagram this cell — fully showing all relevant details. Write the cell notation for the cell.

8. Draw a schematic cell, clearly label the anode, the cathode, indicate the direction of electron flow, give the balanced equation for the cell; and calculate the E^0 for the following cell:

(i) $\text{Fe}^{+3} / \text{Fe}^{+2}$ and $\text{Br}_2 / \text{Br}^{-1}$ (with platinum electrodes)

(ii) $\text{Cu}^{+2} / \text{Cu}$ and $\text{H}^{+1} / \text{H}_2$