SCH4U: 5-3H: Exploring Galvanic Cell

Knowledge/ Understanding (K/U)	Thinking/Inquiry (T/I)	Communication (C)	Application (A)	Total
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Part A: Proposing Possible Galvanic Cells

In this part, you will be required to build 3 different galvanic cells using the materials below and the table of **Standard Reduction Potentials**.

1. **Create** 3 different Galvanic Cells using any combination materials provided above. For each cell, select the materials that will result in a spontaneous oxidation - reduction reaction.
   Materials:
   - Silver
   - Copper
   - Zinc
   - Hydrogen electrode
   - Magnesium
   - 1 M $AgNO_{3\,(aq)}$
   - 1 M $Cu(NO_3)_{2\,(aq)}$
   - 1 M $Zn(NO_3)_{2\,(aq)}$
   - 1M HCl(aq)]
   - 1M $Mg(NO_3)_{2\,(aq)}$

   Complete a chart below for each cell with the answers to the following questions:

   a) **List** the materials required form the list above.
   b) **Write** the balanced spontaneous oxidation-reduction reaction.
   c) **Calculate** the Ecell of the galvanic cell. Show your work.
   d) **Verify** the spontaneity of the cell using Ecell and **justify**.
   e) **Identify** the anode of the cell.
   f) **Identify** the cathode of the cell. **(T/I : 3 x 5 marks)**

Galvanic Cell # 1

a) Materials required	
b) Reaction	
c) E cell	
d) Verification of Spontaneity with justification	
e) Anode	
f) Cathode	

Galvanic Cell # 2

a) Materials required	
b) Reaction	
c) E cell	
d) Verification of Spontaneity with justification	
e) Anode	
f) Cathode	

Galvanic Cell # 3

a) Materials required	
b) Reaction	
c) E cell	
d) Verification of Spontaneity with justification	
e) Anode	
f) Cathode	

2. **Explain** how you used the table of Standard Reduction Potential to the determine anode and cathode of each galvanic cell above**.** **(T/I : 2 marks)**

3. Of all the possible materials listed in question 1 , **determine** the strongest reducing agent and the strongest oxidizing agent. **Justify** your answer. **(T/I : 2 marks)**

4. **Predict** what will happen if the wrong salt solution is used in one of the half-cells. **(T/I :1 mark)**

5. **Predict** what will happen to the voltage values if the anode and cathode half-cells are switched. **(T/I: 1 mark)**

Part B: Building and Testing your Galvanic Cells

Now that you have predicted 3 possible galvanic cells, you will build and test them in the virtual lab using the simulation: Virtual Lab : Building Galvanic Cell

Procedure:

1. **Open** the Virtual Lab : Building Galvanic Cell
2. **Click** on 'Start' to open the galvanic cell simulator.
3. **Determine** which beaker (left or right) represents the anode and which one represents the cathode. HINT: Try building a cell! Reminder: The black wire is connected to the anode (-) and the red wire is connected to the cathode (+).
4. **Select** the appropriate metal and solution for the anode for the galvanic cell #1.
5. **Select** the appropriate metal and solution for the cathode for the galvanic cell #1.
6. **Click** the 'On/Off' switch to turn on the Voltmeter.
7. **Record** the voltage in Table 1.
8. **Repeat** this procedure for galvanic cell #2 and galvanic cell #3 from part A.

Results: **(A: 3 marks)**

Table 1: Voltage generated by different Galvanic Cells

Galvanic Cell #	Voltage (V)
1	
2	
3	

1. **State** whether the measured values in the table agree or disagree with the theoretical Ecell values calculated in Part A. Justify your statement. **(A: 1 mark)**