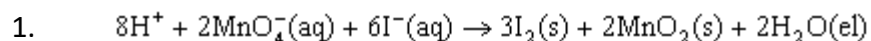


SCH4U Unit 5 - Practice Questions B**SECTION 1: Short Answer**

For each of the following questions:

- Identify the reducing agent (1 mark)
- Identify the oxidizing agent (1 mark)
- Write balanced oxidation and reduction half-reactions (2 marks; 1 mark per half-reaction)

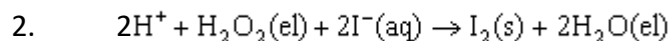


Oxidizing Agent: _____ Reducing Agent: _____

Balanced Half-Reactions

Oxidation Half-Reaction:

Reduction Half-Reaction:



Oxidizing Agent: _____ Reducing Agent: _____

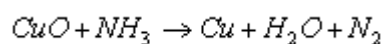
Balanced Half-Reactions

Oxidation Half-Reaction:

Reduction Half-Reaction:**SECTION 2: Short Answer**

Balance the following equation by the specific method. (T/I, 2 each) – 1 mark for correct method
Identify the oxidizing agent and reducing agent. (A, 1 each)

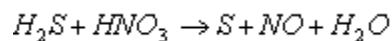
3. Balance the following equation using the **oxidation number** method:



Oxidizing Agent: _____ **Reducing Agent:** _____

Balanced Equation:

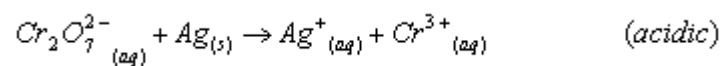
4. Balance the following equation using the **oxidation number** method:



Oxidizing Agent: _____ **Reducing Agent:** _____

Balanced Equation:

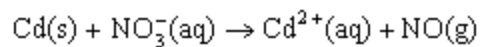
5. Balance the following equation using the **half-reactions** method in **acidic solution**:



Oxidizing Agent: _____ **Reducing Agent:** _____

Balanced Equation:

6. Balance the following equation using the half-reactions method in basic solution:



Oxidizing Agent: _____ Reducing Agent: _____

Balanced Equation:

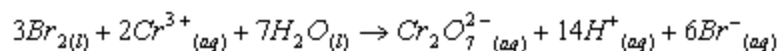
SECTION 3: Short Answer

Use the Standard Reduction Table at the end of the test to determine whether each reaction is spontaneous or not spontaneous.

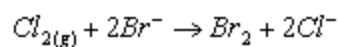
Calculations: 2 each [T/I]

Correct Spontaneity: 1 each [A]

7. Balance the equation and determine whether each reaction is spontaneous or not spontaneous.



8. Balance the equation and determine whether each reaction is spontaneous or not spontaneous.



SECTION 4: Short Answer

9. A galvanic cell is constructed using the following materials:

- Strip of zinc metal
- Strip of iron metal
- $\text{Fe}(\text{NO}_3)_2$ solution
- $\text{Zn}(\text{NO}_3)_2$ solution
- NaNO_3 (aq)
- 2 beakers
- U-shaped tube
- Connecting wires

- a) Explain the process of galvanizing. (A, 1)
- b) Identify the anode and the cathode. (A, 1)
- c) What direction will the electrons flow? (A, 0.5)
- d) Identify the oxidizing agent. (A, 0.25)
- e) Identify the reducing agent. (A, 0.25)
- f) Write the equations for the half-reactions in each cell. (A, 0.5)
- g) Write the net ionic equation for the cell reaction. (A, 0.5)

Oxidizing Agent: _____ **Reducing Agent:** _____

Oxidation Half-Reaction:

Reduction Half-Reaction:

Balanced Net Ionic Equation:

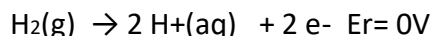
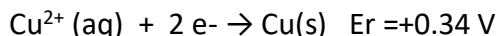
SECTION 5: Long Answer

The following questions will be graded according to the following rubric:

Criteria	Level 4	Level 3	Level 2	Level 1
APPLICATION Making connections between science, technology, society, and environment	makes connections between science, technology, society, and the environment with a high degree of effectiveness (3 marks)	makes connections between science, technology, society, and the environment with considerable effectiveness (2 marks)	makes connections between science, technology, society, and the environment with some effectiveness (1 mark)	makes connections between science, technology, society, and the environment with limited effectiveness (0 - 0.5 mark)
COMMUNICATION Information and ideas are communicated with complete and correct answers	Information and ideas are communicated clearly and precisely (2 mark)	Information and ideas are communicated with considerable clarity and precision (0.1 marks)	Information and ideas are communicated with some clarity and precision (0.5 marks)	Information and ideas are communicated with limited clarity and precision (0 marks)

10. In a copper-hydrogen fuel cell, the chemical energy of this compound is converted into electrical energy that can power a vehicle.

(a) Using only the following half-reactions and reduction potentials, write a net reaction equation and determine the approximate potential for the copper-hydrogen fuel cell.



(b) Discuss one advantages and one disadvantage of this technology for society.

11. How would you explain redox reactions to a chemistry student that has never studied the topic, but was interested in learning about them? Use vocabulary from the unit, but also be sure to give detailed explanations that would allow someone to understand what you are saying.

Standard Reduction Potentials:

	E° (V)
$F_2(g) + 2e^- \rightleftharpoons 2F^-(aq)$	+2.87
$PbO_{2(s)} + SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \rightleftharpoons PbSO_{4(s)} + 2H_2O(l)$	+1.69
$MnO_4^-(aq) + 8H^+(aq) + 5e^- \rightleftharpoons Mn^{2+}(aq) + 4H_2O(l)$	+1.51
$Au^3+(aq) + 3e^- \rightleftharpoons Au(s)$	+1.50
$ClO_4^-(aq) + 8H^+(aq) + 8e^- \rightleftharpoons Cl^-(aq) + 4H_2O(l)$	+1.39
$Cl_2(g) + 2e^- \rightleftharpoons 2Cl^-(aq)$	+1.36
$2HNO_2(aq) + 4H^+(aq) + 4e^- \rightleftharpoons N_2O(g) + 3H_2O(l)$	+1.30
$Cr_2O_7^{2-}(aq) + 14H^+(aq) + 6e^- \rightleftharpoons 2Cr^{3+}(aq) + 7H_2O(l)$	+1.23
$O_2(g) + 4H^+(aq) + 4e^- \rightleftharpoons 2H_2O(l)$	+1.23
$MnO_2(s) + 4H^+(aq) + 2e^- \rightleftharpoons Mn^{2+}(aq) + 2H_2O(l)$	+1.22
$2IO_3^-(aq) + 12H^+(aq) + 10e^- \rightleftharpoons I_2(s) + 6H_2O(l)$	+1.20
$Br_2(l) + 2e^- \rightleftharpoons 2Br^-(aq)$	+1.07
$Hg_2^{2+}(aq) + 2e^- \rightleftharpoons Hg(l)$	+0.85
$ClO^-(aq) + H_2O(l) + 2e^- \rightleftharpoons Cl^-(aq) + 2OH^-(aq)$	+0.84
$Ag^+(aq) + e^- \rightleftharpoons Ag(s)$	+0.80
$NO_3^-(aq) + 2H^+(aq) + e^- \rightleftharpoons NO_2(g) + H_2O(l)$	+0.80
$Fe^{3+}(aq) + e^- \rightleftharpoons Fe^{2+}(aq)$	+0.77
$O_2(g) + 2H^+(aq) + 2e^- \rightleftharpoons H_2O_2(l)$	+0.70
$MnO_4^-(aq) + 2H_2O(l) + 3e^- \rightleftharpoons MnO_2(s) + 4OH^-(aq)$	+0.60
$I_2(s) + 2e^- \rightleftharpoons 2I^-(aq)$	+0.54
$Cu^+(aq) + e^- \rightleftharpoons Cu(s)$	+0.52
$O_2(g) + 2H_2O(l) + 4e^- \rightleftharpoons 4OH^-(aq)$	+0.40
$Cu^{2+}(aq) + 2e^- \rightleftharpoons Cu(s)$	+0.34
$SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \rightleftharpoons H_2SO_3(aq) + H_2O(l)$	+0.17
$Sn^{4+}(aq) + 2e^- \rightleftharpoons Sn^{2+}(aq)$	+0.15
$Cu^{2+}(aq) + e^- \rightleftharpoons Cu^+(aq)$	+0.15
$S(s) + 2H^+(aq) + 2e^- \rightleftharpoons H_2S(aq)$	+0.14
$AgBr(s) + e^- \rightleftharpoons Ag(s) + Br^-(aq)$	+0.07
$2H^+(aq) + 2e^- \rightleftharpoons H_2(g)$	0.00
$Pb^{2+}(aq) + 2e^- \rightleftharpoons Pb(s)$	-0.13
$Sn^{2+}(aq) + 2e^- \rightleftharpoons Sn(s)$	-0.14
$AgI(s) + e^- \rightleftharpoons Ag(s) + I^-(aq)$	-0.15
$Ni^{2+}(aq) + 2e^- \rightleftharpoons Ni(s)$	-0.26
$Co^{2+}(aq) + 2e^- \rightleftharpoons Co(s)$	-0.28
$H_3PO_4(aq) + 2H^+(l) + 2e^- \rightleftharpoons H_3PO_3(aq) + H_2O(l)$	-0.28
$PbSO_4(s) + 2e^- \rightleftharpoons Pb(s) + SO_4^{2-}(aq)$	-0.36
$Se(s) + 2H^+(aq) + 2e^- \rightleftharpoons H_2Se(aq)$	-0.40
$Cd^{2+}(aq) + 2e^- \rightleftharpoons Cd(s)$	-0.40
$Cr^{3+}(aq) + e^- \rightleftharpoons Cr^{2+}(aq)$	-0.41
$Fe^{2+}(aq) + 2e^- \rightleftharpoons Fe(s)$	-0.44
$Ag_2S(s) + 2e^- \rightleftharpoons 2Ag(s) + S^{2-}(aq)$	-0.69
$Zn^{2+}(aq) + 2e^- \rightleftharpoons Zn(s)$	-0.76
$Te(s) + 2H^+(aq) + 2e^- \rightleftharpoons H_2Te(aq)$	-0.79
$2H_2O(l) + 2e^- \rightleftharpoons H_2(g) + 2OH^-(aq)$	-0.83
$Cr^{2+}(aq) + 2e^- \rightleftharpoons Cr(s)$	-0.91
$SO_4^{2-}(aq) + H_2O(l) + 2e^- \rightleftharpoons SO_3^{2-}(aq) + 2OH^-(aq)$	-0.93
$Al^{3+}(aq) + 3e^- \rightleftharpoons Al(s)$	-1.66
$Mg^{2+}(aq) + 2e^- \rightleftharpoons Mg(s)$	-2.37
$Na^+(aq) + e^- \rightleftharpoons Na(s)$	-2.71
$Ca^{2+}(aq) + 2e^- \rightleftharpoons Ca(s)$	-2.87
$Ba^{2+}(aq) + 2e^- \rightleftharpoons Ba(s)$	-2.91
$K^+(aq) + e^- \rightleftharpoons K(s)$	-2.93
$Li^+(aq) + e^- \rightleftharpoons Li(s)$	-3.04

