

Name: \_\_\_\_\_

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# Chemistry 12

## Electrochemistry Sections 10, 11, 12 and 13 - Worksheet #4

Directions: Answer in the space provided. Make sure you fully answer the questions.

1. Predict the overall reaction which will be favoured in the following mixtures.
  - (a) A mixture of powdered Aluminum and Iron is added to a beaker of  $\text{Cr}^{3+}$  solution.
  - (b) A Tin strip is immersed in  $\text{HNO}_{3(\text{aq})}$ .
  - (c) A Copper strip is immersed in  $\text{HNO}_{3(\text{aq})}$ .
  - (d) A Copper rod is immersed in  $\text{HCl}_{(\text{aq})}$ , through which is bubbled  $\text{O}_{2(\text{g})}$ .
  - (e)  $\text{Hg}(\text{l})$  is dropped into a solution which contains  $\text{H}_2\text{SO}_{4(\text{aq})}$  and  $\text{KMnO}_{4(\text{aq})}$ .

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2. "Native copper" is the term used by geologists for copper which is found in elemental form; that is, as natural deposits of copper metal. Suggest why native gold is found in nature, but native iron is extremely rare, compared to gold.
3. Aluminum corrodes quickly in salt water. Suggest three ways in which you could slow down or stop the corrosion of an aluminum boat in the ocean.
4. An iron can has a coating of tin. When tin oxidizes, it forms  $\text{SnO}$ , which adheres strongly to the surface of the tin and prevents further oxidation of the underlying metals. If the tin coating is scratched and the iron is exposed, will the tin provide cathodic protection for the iron? If so, why? If not, what will happen?

### Section B: The Breathalyzer Test

1. Balance the redox equation for the oxidation of ethanol by acidic potassium dichromate:



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2. What makes a fuel cell so 'great'?

3. What makes Simms so great? ☺

4. Why are Pepsi slurpee's so great? Why are banana slurpee's so bad?

### Section A: Electrolysis of a Molten Binary Salt Using Inert Electrodes

1. For each of the following molten ionic compounds show the half-cell reactions which occur at the cathode and the anode, the overall reaction and the minimum voltage which must be applied to make the electrolysis reaction occur.

(a)  $\text{KBr}_{(l)}$

(b)  $\text{CaI}_{2(l)}$

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Section B: Electrolysis of an Aqueous Salt Using Inert Electrodes

1. What products are formed when the following aqueous solutions are electrolyzed? What is the minimum voltage which would have to be applied in each case?



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2. An aqueous solution of  $\text{Na}_2\text{SO}_4$  is electrolyzed. If litmus paper is dipped into the solution around the anode during the reaction, what colour will the litmus turn? What colour will the litmus turn when dipped into the solution around the cathode? If the electric current is turned off and the anode and cathode solutions are stirred together, what is the pH of the resulting solution?

### Section C: Electrolysis of an Aqueous Salt Using Reactive Electrodes

1. You have a piece of iron which you wish to electroplate with chromium metal. Should the iron be the anode or the cathode? Explain.
2. Design a cell to silver plate an iron spoon. Include in your design: the ions in solution, the direction of the ion flow, the substances used for the anode and the cathode, and the direction of electron flow when the cell is connected to a DC power source.

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3. Design a cell which can be used to electroplate copper onto a strip of tin. Include in your design: the ions in solution, the direction of ion flow, the substances used for the anode and the cathode, and the direction of electron flow when the cell is connected to a DC power source.
  
  
  
  
  
  
  
  
  
  
4. What would make chemistry 12 better?
  
  
  
  
  
  
  
  
  
  
5. What is one suggestion you would give to future chemistry 12 student's in my (Simms's) class?
  
  
  
  
  
  
  
  
  
  
6. What is your favorite memory of chemistry 12?
  
  
  
  
  
  
  
  
  
  
7. Will you come back and visit CHS?