

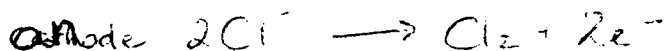
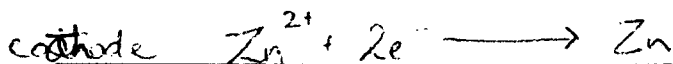
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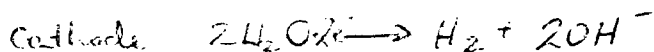
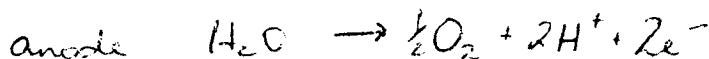
Part I

If the following electrolytes were electrolyzed, predict what half reactions would occur at the anode and cathode. (Remember, 1.0M NaCl implies an aqueous solution of NaCl.)

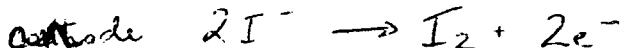
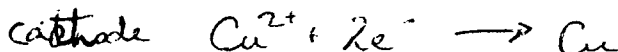
1. Molten ZnCl_2 ; inert electrodes.



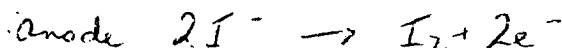
2. 1.0M Na_2SO_4 ; inert electrodes.



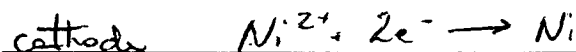
3. Molten CuI_2 ; inert electrodes.



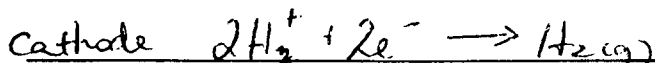
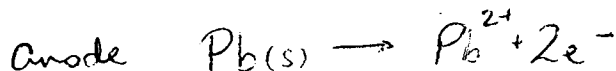
4. 1.0M KI; inert electrodes.



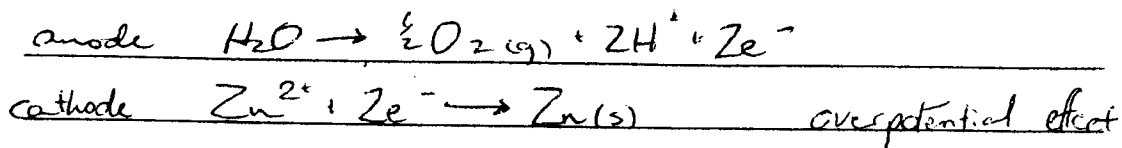
5. 1.0M NiSO_4 ; nickel electrodes.



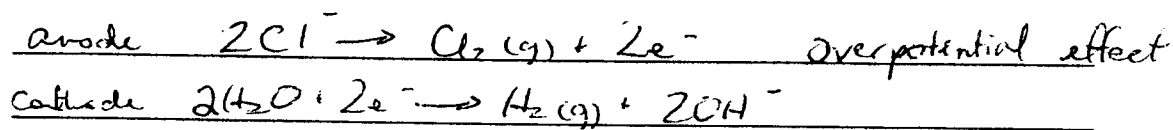
6. 1.0M HI; lead electrodes.



7. 1.0M ZnSO₄; inert electrodes.

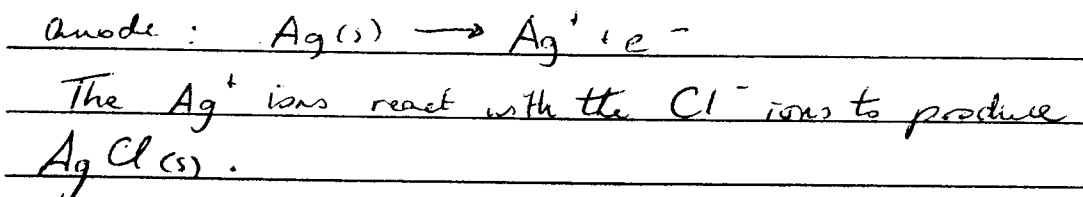


8. 1.0M NaCl; inert electrodes.

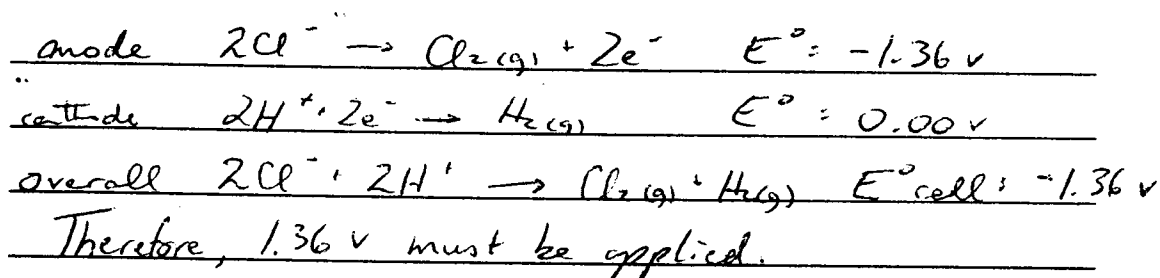


Part II

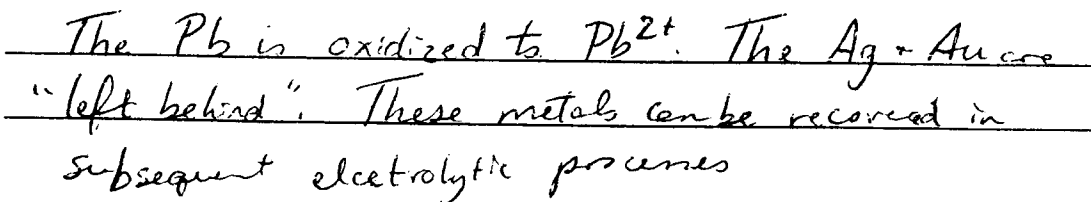
9. When a 1.0M KCl solution is electrolyzed using silver electrodes, a precipitate forms at the anode. Explain this result.



10. If a 1.0M HCl solution is electrolyzed using platinum electrodes (inert), what minimum voltage must be applied? Predict the anode and cathode half-reactions, as well as the overall cell reaction.



11. a. In the electrorefining of lead, lead bullion is used as the anode and pure lead is used as the cathode in an electrolytic solution containing Pb^{2+} ions. Lead bullion is primarily lead, but it does contain impurities such as silver and gold. What happens to these three metals at the anode during electrolysis?



11. b. Lead bullion may also contain trace amounts of impurities such as zinc metal. Describe what happens to this zinc during electrolysis, and explain why the pure lead cathode does not become contaminated with zinc.

Although both the $Zn(s)$ and the $Pb(s)$ are oxidized at the anode, the Zn^{2+} ions are "trapped" in solution. Since, at the cathode the Pb^{2+} ions have a higher reduction potential than the Zn^{2+} , only the Pb^{2+} ions are reduced to $Pb(s)$.

12. Why can aluminum metal not be produced by electrowinning $Al(s)$ from an aqueous solution containing Al^{3+} ions? Write the cathode half-reaction that would occur.

Even with hydrogen's high overpotential, H_2O is reduced before Al^{3+} .

