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CHEMISTRY HONORS LAB 5.7

ELECTROLYSIS

Introduction

Molten ionic compounds conduct electricity and can therefore be electrolysed.
Aqueous solutions of ionic compounds conduct electricity and can also be electrolysed.
All aqueous solutions contain H^+ and OH^- ions in addition to the ions from the ionic compound.
It is possible to predict the products of the electrolysis of a molten or aqueous electrolyte.

Procedure

Watch the videos and answer the questions
You do not need to watch the entire length of the video; just enough to answer the questions.

1) the electrolysis of molten $PbBr_2$ https://www.youtube.com/watch?v=cpf9oNRZy-w

(a)	Why does no current flow when the $PbBr_2$ is solid?	Ions cannot move so cannot conduct electricity
(b)	Write an equation for the half-reaction occurring at the cathode.	$Pb^{2+} + 2e^- \rightarrow Pb$
(c)	Write an equation for the half-reaction occurring at the anode	$2Br^- \rightarrow Br_2 + 2e^-$
(d)	Write the net ionic equation for the reaction	$Pb^{2+} + 2Br^- \rightarrow Br_2 + Pb$
(e)	Electrolysis is used commercially to prepare sodium from NaCl and aluminium from Al_2O_3, but it is rarely used to prepare lead. Why is this?	Because lead is below C in the reactivity series so can be extracted by heating its ore with carbon

2) the electrolysis of NaOH(aq)   www.youtube.com/watch?v=vFR9zUGt2C4

(a)	Write an equation for the half-reaction occurring at the cathode	$2H_2O + 2e^- \rightarrow H_2 + 2OH^-$
(b)	Write an equation for the half-reaction occurring at the anode	$2H_2O \rightarrow O_2 + 4e^- + 4H^+$
(c)	Write the net ionic equation for the reaction	$2(2H_2O + 2e^- \rightarrow H_2 + 2OH^-)$ $2H_2O \rightarrow O_2 + 4e^- + 4H^+$ $6H_2O \rightarrow 2H_2 + O_2 + 4OH^- + 4H^+$ $6H_2O \rightarrow 2H_2 + O_2 + 4H_2O$ $2H_2O \rightarrow 2H_2 + O_2$
(d)	What substance is being electrolysed in this reaction?	water
(e)	Explain why different volumes of gas were produced at the two electrodes	water breaks down to give 2 moles of hydrogen per mole of oxygen

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3) The electrolysis of KI(aq)   www.youtube.com/watch?v=cV35DHVeNm8

(a)	Write an equation for the half-reaction occurring at the cathode	$2H_2O + 2e^- \rightarrow H_2 + 2OH^-$
(b)	Write an equation for the half-reaction occurring at the anode	$2I^- \rightarrow I_2 + 2e^-$
(c)	Write the net ionic equation for the reaction	$2H_2O + 2I^- \rightarrow H_2 + I_2 + 2OH^-$
(d)	Explain what you saw at the cathode	Bubbles, solution turned pink
(e)	Explain what you saw at the anode	Purple/brown liquid
(f)	Why did the solution gradually turn pink?	OH^- ions were turning phenolphthalein pink

4) The electrolysis of $CuCl_2$(aq)   www.youtube.com/watch?v=mIT-_nghOB4

(a)	Write an equation for the half-reaction occurring at the cathode	$Cu^{2+} + 2e^- \rightarrow Cu$
(b)	Write an equation for the half-reaction occurring at the anode	$2Cl^- \rightarrow Cl_2 + 2e^-$
(c)	Write the net ionic equation for the reaction	$Cu^{2+} + 2Cl^- \rightarrow Cu + Cl_2$
(d)	How did the demonstrator identify the product at the cathode?	Scraped a red/brown solid off the cathode
(e)	How did the demonstrator identify the product at the anode?	Gas turned blue litmus paper red then white
(f)	What does the result of this experiment tell you about the molarity of the $CuCl_2$(aq) solution used, and why?	Must be high, or you would have got oxygen and not chlorine

5) Electroplating a metal with copper   https://www.youtube.com/watch?v=gTjWkeSpRqk

(a)	Write an equation for the half-reaction occurring at the cathode	$Cu^{2+} + 2e^- \rightarrow Cu$
(b)	Write an equation for the half-reaction occurring at the anode	$Cu \rightarrow Cu^{2+} + 2e^-$
(c)	How would you change this apparatus to coat an iron nail with a layer of silver?	Place the iron nail at the cathode Dissolve any soluble compound containing silver ions into the water