

Practice Task 6

Achievement Standard Chemistry 91393

Demonstrate understanding of oxidation-reduction processes

Electrochemistry

Level 3

Credits: 3

Recommended time to complete: 1 hour

Assessment conditions: Closed book

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of oxidation-reduction processes.	Demonstrate in-depth understanding of oxidation-reduction processes.	Demonstrate comprehensive understanding of oxidation-reduction processes

Student instructions

Introduction

This activity requires you to write a report demonstrating your understanding of oxidation-reduction in the context of electrolytic and electrochemical cells.

You are required to answer **both** questions.

You will be assessed on how comprehensive your understanding of the oxidation-reduction processes is demonstrated in this report.

Throughout your report, use correct chemical vocabulary, symbols and conventions.

You will be provided with a chart of redox species and their appearance.

The following standard reduction potentials may be useful: NOT ALL WILL BE USED.

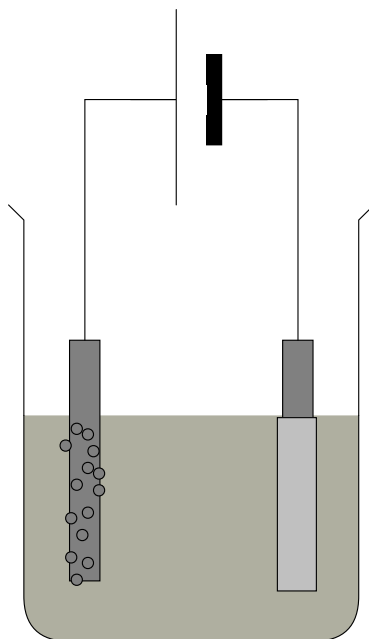
O ₂ / H ₂ O	1.23 V	Ag ⁺ /Ag	+0.80V
H ⁺ / H ₂	0.00 V	Mg ²⁺ / Mg	-2.37 V
H ₂ O / H ₂	-0.83 V	Pb ²⁺ /Pb	-0.36V

Part One **Electrolysis**

This diagram shows an electrolytic cell.

Electrolysis of lead nitrate solution, $\text{Pb}(\text{NO}_3)_2(\text{aq})$ is carried out using 2 carbon electrodes.

Bubbles of a colourless gas and a grey metal deposit are seen.

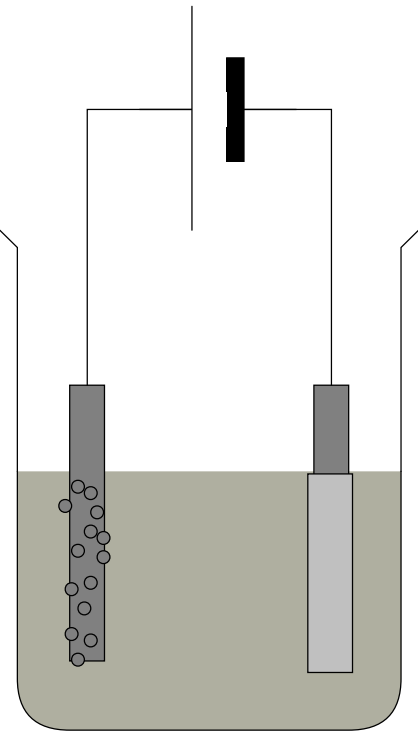


Write a report on the oxidation-reduction processes occurring in this electrolytic cell.

Include in your report:

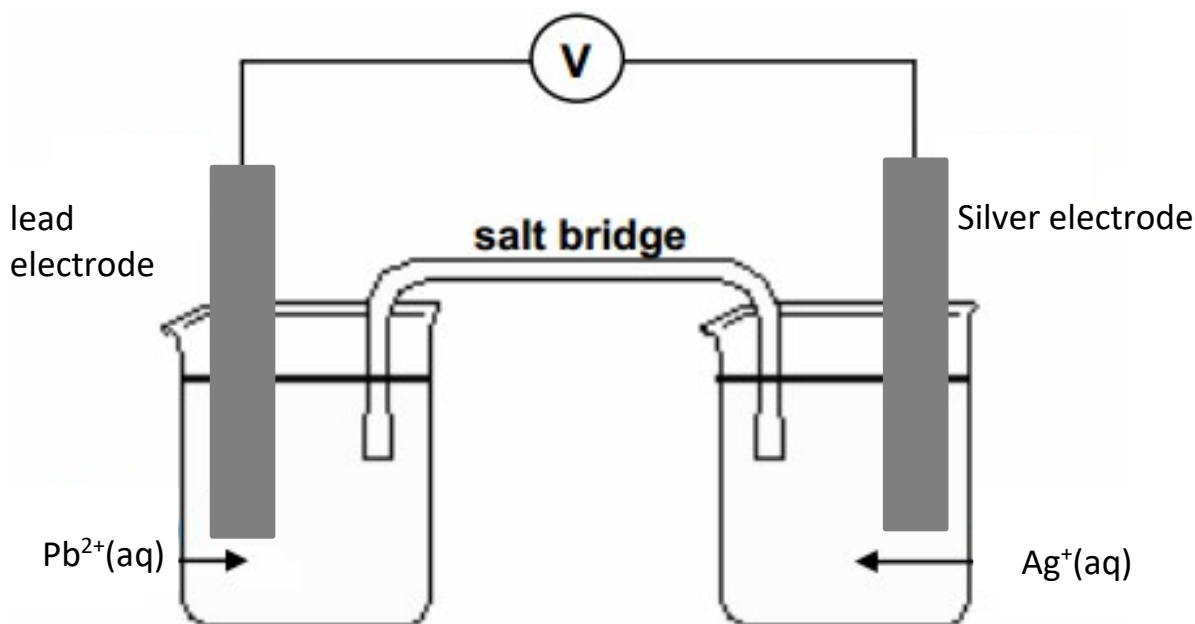
- Identify the anode and cathode electrodes
- Explain the observations at each electrode, clearly linked to the species involved.
- Describe the redox process that occurs at each electrode, identifying the species oxidised and reduced by name or formula.
- Write balanced half equations for the both oxidation and reduction processes.
- Write a fully balanced redox equation.
- Justify both redox processes occurring using oxidation numbers **and/or** the loss or gain of electrons. (You must state how many electrons are lost or gained).
- Use standard reduction potentials to work out the cell potential in order to determine/predict spontaneity and the requirements to bring about electrolysis of lead nitrate solution.

You may annotate this diagram to assist you in your answer.



Part Two **Electrochemical cells**

An electrochemical cell was set up.



Write a report on the oxidation-reduction processes occurring in this electrochemical cell.

Include in your report:

- Identify the anode and cathode electrodes
- Describe the expected observations at each electrode and in each beaker, clearly linked to the all the species involved – if there is no observable change, explain why.
- Describe the redox process that occurs at each electrode, identifying the species oxidised and reduced by name or formula.
- Write balanced half equations for the both oxidation and reduction processes.
- Write a fully balanced redox equation.
- Justify both redox processes occurring using oxidation numbers **and/or** the loss or gain of electrons. (You must state how many electrons are lost or gained).
- Use standard reduction potentials to work out the cell potential.
- Explain the spontaneity of the cell with reference to the standard reduction potentials.
