

Seb Academy

Topics: Electrolysis Homework 3

Time allowed: 35 min

Date: _____

Name: _____

construct ionic equations for the reactions occurring at the electrodes during the electrolysis, given relevant information

(2015/S4NYGH/IPFE/11) Series circuits

- (2015/S4NYGH/IPFE/11) An electric current was passed into three cells containing different solutions for 10 minutes as shown below.

The decrease in mass of the anode in each cell was measured before and after the experiment. The table below shows the results of the experiment.

Cell	Decrease un mass of anode /g
X	0.80
Y	2.70
Z	0.00

- (a) Write the ionic equations for the reactions that occurred at the anode of cells **X**, **Y** and **Z**.

[3]

- (b) (i) Calculate and compare the number of moles of copper and silver lost at the respective anodes during the experiment.

[2]

- (ii) Give a reason for the difference in the number of moles of copper and silver lost when the same conditions are used.

[1]

- (c) When dilute sulfuric acid in cell **Z** is electrolysed using platinum electrodes, it was found that the ratio of the volume for the two gases liberated was 2:1. With the use of half-equations, explain why the gas volumes are in the ratio of 2:1.

[2]

- (d) The experiment was repeated by replacing the electrolyte in Cell **Z** with aqueous gold(II) nitrate. Calculate the mass of the product formed at the cathode in Cell **Z** using aqueous gold (II) nitrate as the electrolyte.

[2]

[Total: 10m]

- (2014/N/GCSE/10) In an electrolysis experiment, the same amount of charge deposited 16g of copper and 6g of titanium. The charge on the copper ion was 2+ [Ar: Ti, 48; Cu, 64] What was the charge on the titanium ion?
A 1+ **B** 2+ **C** 3+ **D** 4+
- (2017/SJI/P1/22) In the electrolysis of molten aluminium oxide, 4 moles of aluminium ions (Al^{3+}) were discharged at the cathode. Which one of the following would be discharged by the same amount of electricity?
A 4 moles copper(II) ions (Cu^{2+}) in the electrolysis of aqueous copper (II) sulfate
B 6 moles of lead ions (Pb^{2+}) in the electrolysis of molten lead(II) bromide
C 6 moles of silver ions (Ag^+) in the electrolysis of aqueous silver nitrate
D 12 moles of zinc ions (Zn^{2+}) in the electrolysis of molten zinc sulfate
- (2015/S4/RP/MYCT/7) Dilute silver nitrate solution was electrolysed using inert electrodes. What volume of oxygen would be produced at r.t.p. when 5.00 g of silver was deposited?
A 0.278 dm³
B 0.556 dm³
C 1.11 dm³

- D** 4.44 dm³
- (2010/O/GCSE/28) A coil of clean copper wire suspended in beaker of aqueous silver nitrate. Crystals of silver are deposited on the copper wire. Which statement is **not** correct?
 - A** The copper is oxidized
 - B** The solution turns blue
 - C** The total mass of the crystals of silver increases gradually
 - D** The total number of positive ions in the solution is unchanged
 - Two electrolytic cells were connected such that the same amount of current is passed through the two cells. Cell I contains aqueous XSO₄ and Cell II contains aqueous Y₂SO₄. Both metals **X** and **Y** can react with dilute sulfuric acid.

What is the ratio of the moles of X liberated to that of Y liberated for every 2 moles of electrons?

- | | moles of X liberated | moles of Y liberated |
|----------|----------------------|----------------------|
| A | 0 | 0 |
| B | 1 | 1 |
| C | 2 | 1 |
| D | 1 | 2 |
- Electrolysis is carried out using the two cells connected in series as shown in the diagram. One cell contains an aqueous solution of a titanium(II) salt, and the other cell contains an aqueous solution of a thallium(I) salt. When a quantity of electricity is passed through the two solutions, titanium is deposited on one cathode, and thallium on the other cathode.

Which statement about this experiment is correct?

- A** Equal number of moles of titanium and thallium is deposited
- B** Titanium and thallium are higher than hydrogen in the reactivity series

- C** The number of moles of titanium deposited is half the number of moles of thallium deposited
- D** The mass of titanium deposited is half of that of thallium deposited

[Total:
3
marks]

Study the effect of electrolysis on the electrolyte

- (2016/S4/RP/MYCT/8) Aqueous potassium sulfate is electrolysed using carbon electrodes. Which of the following gives the correct pH values of the solutions around the cathode and the anode after some time?

	pH of solution around the cathode	pH of solution around the anode
A	12	2
B	2	12
C	12	12
D	2	2

- (2014/S4RP/FE/18) Which of the following statements is true of the electrolyte during the electrolysis of aqueous copper(II) sulfate using inert electrodes?
 - A** The electrical conductivity increases
 - B** The pH increases
 - C** The solution becomes more acidic
 - D** The solution becomes more concentrated
- (2017/BB/P1/35) The following three solutions were electrolyzed using inert electrodes.
 - solution 1 concentrated sodium chloride
 - solution 2 dilute sulfuric acid
 - solution 3 silver nitrate

Which of the solution(s) produce oxygen gas at the anode?

- A** 1 only
- B** 1 and 2 only
- C** 1, 2 and 3
- D** 2 and 3

(2014/S4/RP/MYCT/3) Electroplate plastic toys

- (2014/S4/RP/MYCT/3) Plastic toys are often electroplated for decorative purposes. Copper-plated toys can be manufactured by coating them with a thin layer of graphite paste, before electroplating.

(a) Suggest a reason why the toy is first coated with graphite paste.

[1]

(b) Using a shaded circle, to represent a graphite-coated toy car, draw the set-up of the experiment used to electroplate the car with copper. Label the cathode, anode and the direction of electron flow. Name the electrolyte used.

Electrolyte used:

Diagram of the set up:

[2]

[Total: 3m]

- Table 3.1 shows information about some electrolysis experiments.

Table 3.1

Experiment	Negative electrode	Positive electrode	Electrolyte	Substance formed at negative electrode	Substance formed at positive electrode
•	carbon	carbon	dilute aqueous sodium chloride		
•	carbon	carbon	concentrated aqueous sodium chloride		
•	silver	silver	Dilute aqueous copper(II) sulfate	copper	oxygen
•	copper	copper	Dilute aqueous copper(II) sulfate		

- Complete Table 3.1 by filling in the missing information.

[2]

- Use examples from the table to explain the difference between an inert electrode and an electrode that is not inert.

[2]

- • **Describe the** change that would be **seen** at the negative electrode during experiment 3.

[1]

- Write an ionic equation for the reaction at the positive electrode in experiment 3.

[1]

- Describe and explain the colour change of the solution during experiment 3.

[2]

[Total: 8 Marks]