Seb Academy
Topics: Electrolysis
Time allowed: 40 min

Date: _____

Name: _____

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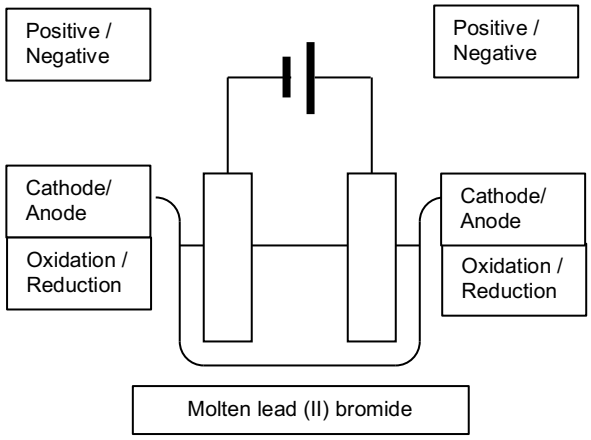
Homework 1

Skill 1 Define Electrolysis

(a) describe electrolysis as the conduction of electricity by an ionic compound (an electrolyte), when molten or dissolved in water, leading to the decomposition of the electrolyte

1. Fill in the blanks
   (a) Label the cathode & anode and strike out one of the options. [3]



Fill in the blanks, also for: [7]

(b) In an electrolysis, the cathode is connected to the _____ terminal.

(c) And the _____is connected to the _____ terminal.

(d) Electrons move from the _____ <write name of electrode> to _____ <write name of electrode>.

(e) Cations migrate towards the _____ and are <reduced / oxidised>.

(f) Anions migrate towards the _____ and are <reduced / oxidised>.

(g) When ions become discharged, they become _____. They do not conduct electricity anymore.

(h) All electrolysis experiments are <endothermic / exothermic>.

[Total: 10 marks]

Skill 2 Electrical Conductivity in Electrolysis

(a) describe electrolysis as evidence for the existence of ions which are held in a lattice when solid but which are free to move when molten or in solution
(b) describe, in terms of the mobility of ions present and the electrode products, the electrolysis of molten sodium chloride, using inert electrodes

2. (2013/S3RP/MYCT) Which particles are responsible for the electrical conductivity in copper and aqueous copper(II) sulfate?

	Copper	Aqueous Copper(II) Sulfate
A	electrons	electrons
B	electrons	ions
C	ions	electrons and ions
D	ions and electrons	ions

[Total: 1 mark]

Skill 3 Electrolysis of molten compounds

(a) predict the likely products of the electrolysis of a molten binary compound

3. (2013/N/GCSE/28) Which product is formed at the anode when molten lead (II) bromide is electrolysed?

A Lead(II) ions
B Lead atoms
C Bromide ions
D Bromine molecules

[Total: 1 mark]

Skill 4 Selective Discharge of Cations in Aqueous

(e) apply the idea of selective discharge based on
1. (i) cations: linked to the reactivity series (see also 9.2)

4. (2013/N/GCSE/12) Which ions are present in aqueous copper (II) chloride?
A Copper (II) ions and chloride ions only
B Copper (II) ions, chloride ions and hydrogen ions only
C Copper (II) ions, chloride ions and hydroxide ions only
D Copper (II) ions, chloride ions, hydrogen ions and hydroxide ions

[Total: 1 mark]

Skill 5 Selective discharge of Anions in Dilute

(ii) anions: halides, hydroxides and sulfates (e.g. aqueous copper(II) sulfate and dilute sodium chloride solution (as essentially the electrolysis of water))

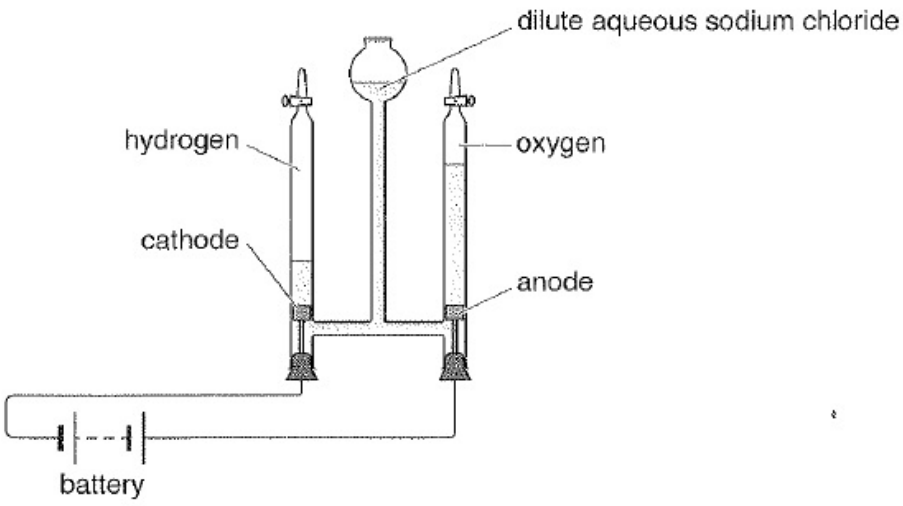
5. (2013/S4/RP/MYCT/9) Electrolysis of a dilute potassium nitrate solution was carried out. What are the products liberated at each electrode?

	Cathode	***Anode***
A	hydrogen	oxygen
B	hydrogen	nitrogen
C	potassium	oxygen
D	potassium	nitrogen

6. (2006/HC/S4/IP) When dilute sulfuric acid is electrolysed using platinum electrodes, 40 cm^3 of oxygen gas is produced. What volume of hydrogen gas is produced in the same experiment?

A 120 cm^3
B 40 cm^3
C 80 cm^3
D 0 cm^3

7. (2015/O/GCSE/5) Dilute aqueous sodium chloride forms hydrogen and oxygen during electrolysis.



(a) Write ionic equations for the reactions at the cathode and anode. [2]

At the cathode _____

At the anode _____

(b) The gases are collected and their volumes are measured. In theory, the ratio of hydrogen to oxygen should be 2:1. Oxygen is more soluble than hydrogen in water. This changes the ratio of gases that are collected.

i. Why is the theoretical ratio of hydrogen to oxygen 2:1? [2]

_____

_____

_____

ii. **Explain how** and **why** the solubility of oxygen affects the ratio of hydrogen to oxygen that is collected. [2]

_____

_____

iii. The difference from the expected ratio is greater when the electrolysis starts but less noticeable after the electrolysis has been running for some time. Suggest why this happens. [1]

(c) What happens to the concentration of sodium chloride during the electrolysis? Explain your reasoning. [1]

(d) The same apparatus can be used to electrolyse concentrated aqueous sodium chloride. Give one similarity and one difference between the products of the electrolysis of dilute and concentrated aqueous sodium chloride. [2]

(e) Platinum metal electrodes are used. Why is platinum a suitable material for use as an electrode? [1]

8. (2008/HC/S4/IP) Aqueous copper(II) sulphate is electrolysed using graphite electrodes. Which observations will be made?

	At anode (+ve)	**At cathode (-ve)**	**The electrolyte**
A	Anode dissolves	Pink solid forms	No change
B	Anode dissolves	Pink solid forms	Blue colour fades
C	Colourless gas forms	Colourless gas forms	No change
D	Colourless gas forms	Pink solid forms	Blue colour fades

9. (2010/HC/S4/IP) What would be observed when aqueous copper(II) sulfate is electrolysed using platinum electrodes?

I The anode decreases in size.
II A pink solid is deposited at the cathode.
III Bubbles of gas are observed at the anode.
IV The pH of the electrolyte decreases.

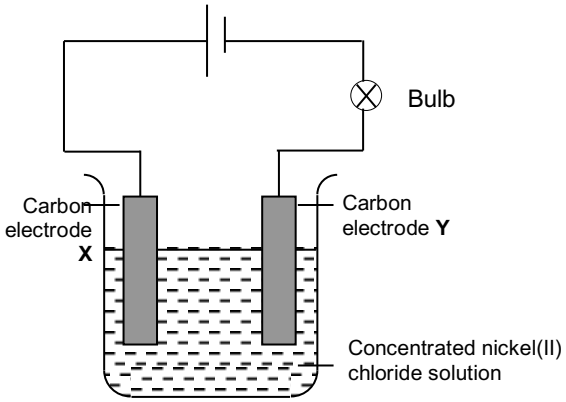
A I, II and III
B II, III and IV
C I, II and IV
D II and III

[Total: 15 marks]

Skill 6 Selective discharge of Anions due to Concentration

1. (iii) concentration effects (as in the electrolysis of concentrated and dilute aqueous sodium chloride) (In all cases above, inert electrodes are used.)

10. An electrolysis experiment was set up:



What occurs at electrons X?

A Chloride ions are oxidized
B Chloride ions are reduced
C Nickel ions are oxidized
D Nickel ions are reduced

11. In the electrolysis of concentrated potassium iodide solution using inert electrode, the products formed are

	Cathode Product	Solution produced
A	silvery metal	violet solution
B	silvery metal	Colourless solution
C	colourless gas	Colourless solution
D	colourless gas	Brown solution

[Total: 2 marks]