



Additional Assessment Materials
Summer 2021

Pearson Edexcel GCSE in Chemistry (1CH0)
Foundation

Resource Set Topic F: Electrolytic processes

Questions

(Public release version)

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General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource is to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

Q5ei-ii-iii

(e) Solid sodium chloride is dissolved in water.

The sodium chloride solution is electrolysed in the apparatus shown in Figure 8.

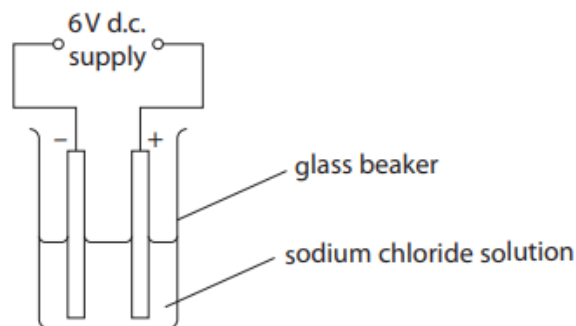


Figure 8

(i) State why sodium chloride solution, rather than solid sodium chloride, must be used in this experiment.

(1)

Sodium chloride is an ionic compound and can only conduct electricity when molten or in a solution.

(ii) The formulae of the ions present in the sodium chloride solution are

Na^+

Cl^-

H^+

OH^-

Circle the ions that would be attracted to the anode.

(1)

(iii) Molten lead bromide can be electrolysed to form molten lead and bromine gas.

Explain how a student could modify the apparatus shown in Figure 8 to carry out this electrolysis.

(2)

Replace sodium chloride solution with molten lead bromide. Use a crucible instead of a glass beaker and place it on a tripod. Use a bunsen burner to heat.

- 9 (a) Water, acidified with sulfuric acid, is decomposed by electrolysis.
The water is decomposed to produce hydrogen and oxygen.

- (ii) Throughout the experiment the volume of hydrogen and the volume of oxygen are measured at two-minute intervals.

The results are shown in Figure 9.

time in minutes	volume of hydrogen in cm^3	volume of oxygen in cm^3
0	0	0
2	4	2
4	8	4
6	12	6
8	16	8

Figure 9

Describe, using the data in Figure 9, what the results show about the volumes of hydrogen and of oxygen produced in this experiment.

(2)

4cm^3 of hydrogen and 2cm^3 of oxygen are produced in each 2 minutes interval. The rate of production remains constant throughout the 8 minutes for both gases. The volume of hydrogen produced is twice of volume of oxygen produced.

- (b) Molten lead bromide is electrolysed.

The products of this electrolysis are

(1)

- A hydrogen and bromine
 B hydrogen and oxygen
 C lead and bromine
 D lead and oxygen

(c) Calcium nitrate and calcium carbonate are both ionic compounds.

Calcium nitrate mixed with water behaves as an electrolyte.

Calcium carbonate mixed with water does not behave as an electrolyte.

Explain, in terms of solubility and movement of ions, this difference in behaviour.

(2)

Calcium nitrate is soluble in water so ions carrying charge are free to move around. Calcium carbonate is insoluble and so the ions are held together in place.

* (d) Impure copper can be purified using electrolysis.

In this electrolysis

- the anode is made of impure copper
- the cathode is made from pure copper
- the electrolyte is copper sulfate solution.

The apparatus at the start of the experiment is shown in Figure 10.

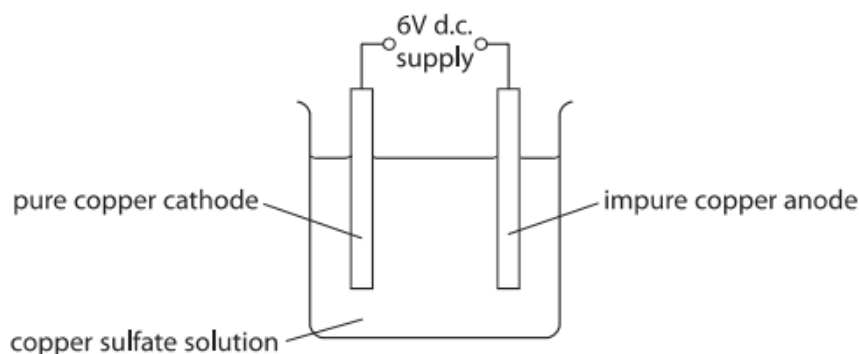


Figure 10

During the electrolysis three observations are made

- the sizes of both the anode and the cathode change
- a solid appears directly beneath the anode
- the colour of the copper sulfate solution does not change.

Explain all three observations.

(6)

Copper ions from the anode are oxidised. ($\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$). The copper ions move into the solution so anode size decreases. Cu^{2+} is positively charged so it moves to the cathode where it is reduced. ($\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$). Size of cathode increase as more copper deposits. The solid appearing beneath the anode is the anode sludge which

contains impurities from the anode. The colour of copper sulfate does not change because as copper ions are reduced at the cathode, they are replaced by copper ions from the anode.

- 8 Figure 11 shows the apparatus that can be used to electrolyse sodium sulfate solution using inert electrodes.

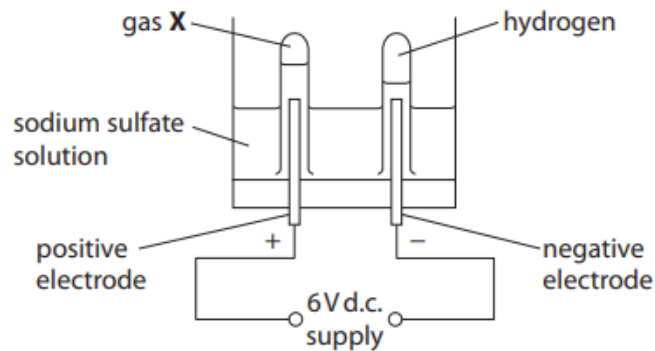


Figure 11

(a) Hydrogen is produced at the negative electrode during electrolysis.

- (i) Describe the test to show the gas is hydrogen.

(2)

Lighted splint goes off with a pop sound when hydrogen gas is present.

- (ii) What is the name of gas X that forms at the positive electrode?

(1)

- A ammonia
 B oxygen
 C nitrogen
 D sulfur dioxide

- (iii) State what is meant by the term **electrolysis**.

(2)

Electrolysis is the process of breaking down electrolytes into their elements, using electricity.

- (d) (i) In Figure 11, the gases given off at the electrodes are collected in test-tubes. However, the actual volume of gases cannot be measured using these test-tubes.

Suggest what apparatus could be used in place of the test-tubes in Figure 11 to measure the volume of gases given off.

(1)

gas syringe

- (ii) State what could be added into the circuit to show a current is flowing during electrolysis.

(1)

ammeter

TOTAL FOR PAPER IS 22 MARKS