

C6 Electrolysis Homework task 1

Q1.

This question is about electrolysis.

(a) Complete the sentence.

Choose the answer from the box.

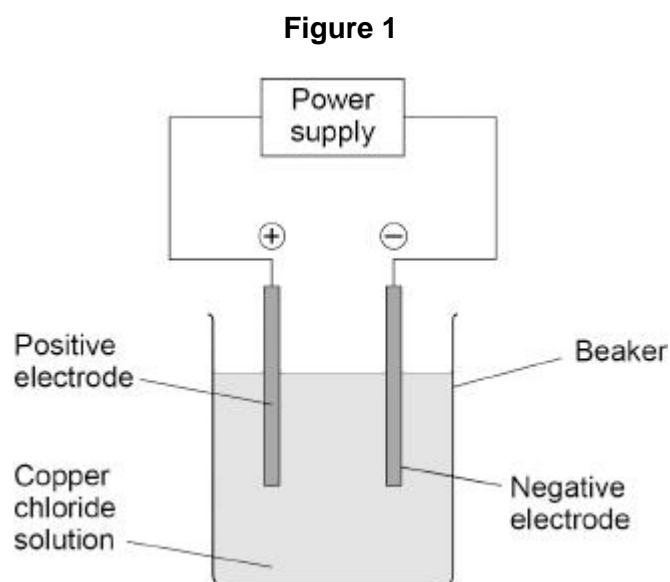
gaseous	molten	solid
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Copper chloride can conduct electricity when in solution or

when _____.

(1)

Figure 1 shows the apparatus used for the electrolysis of copper chloride solution.



There are four ions in copper chloride solution:

- Cu^{2+}
- Cl^-
- H^+
- OH^-

(b) Why do Cl^- ions and OH^- ions move to the positive electrode?

(1)

(c) Where do the H^+ and OH^- ions come from in the electrolysis of copper chloride solution?

Tick (✓) **one** box.

- Air
- Copper chloride
- Water

(1)

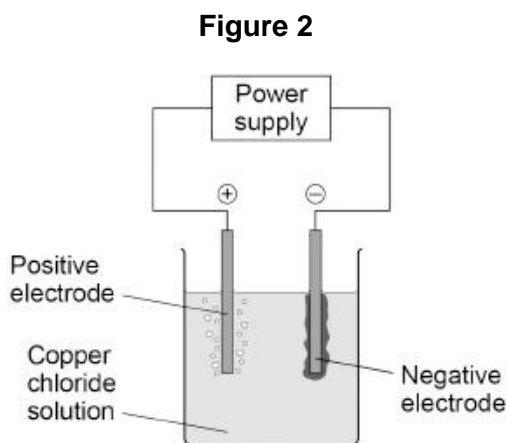
(d) Which ion produces a metal?

Tick (✓) **one** box.

- Cu^{2+}
- Cl^-
- H^+
- OH^-

(1)

(e) **Figure 2** shows the apparatus during the electrolysis of copper chloride solution.



Describe what is seen at each electrode during the electrolysis of copper chloride solution.

Positive electrode _____

Negative electrode _____

(2)

- (f) 500 cm³ of copper chloride solution contains 6.50 g of copper chloride.

Calculate the mass of copper chloride in 40.0 cm³ of this copper chloride solution.

Mass = _____ g

(2)

(Total 8 marks)

Q2.

This question is about the extraction of aluminium.

- (a) An aluminium atom is represented as:



Give the number of electrons and neutrons in the aluminium atom.

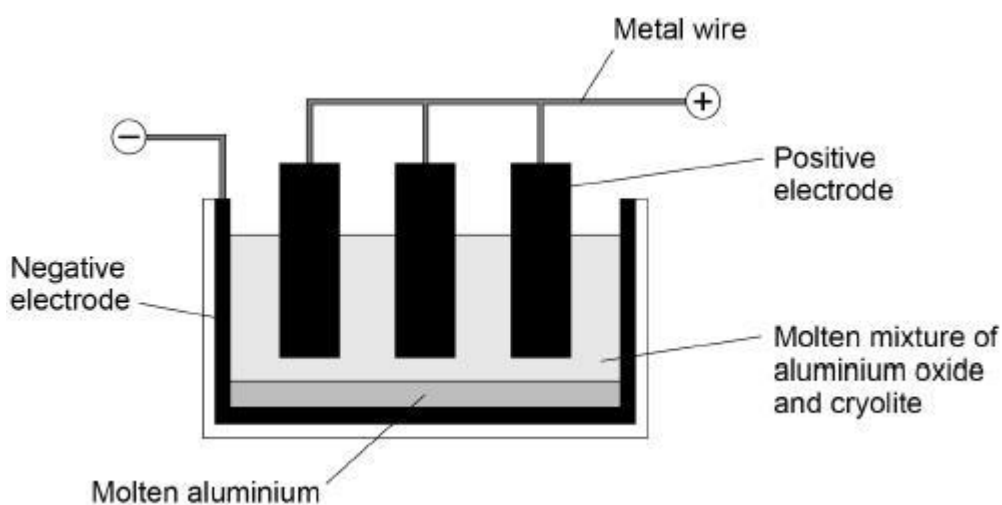
Number of electrons _____

Number of neutrons _____

(2)

Aluminium is extracted by the electrolysis of a molten mixture of aluminium oxide and cryolite.

The diagram below shows the cell used for the electrolysis.



(b) Aluminium is produced by the reduction of aluminium oxide (Al_2O_3).

What is meant by the term reduction?

(1)

(c) Oxygen is formed at the positive carbon electrodes.

Explain why the positive carbon electrodes must be continually replaced.

(3)

(d) A substance conducts electricity because of free moving, charged particles.

What are the free moving, charged particles in a:

- carbon electrode (made from graphite)
- molten mixture of aluminium oxide and cryolite
- metal wire?

Carbon electrode (made from graphite) _____

Molten mixture of aluminium oxide and cryolite _____

Metal wire _____

(3)

(Total 9 marks)

HIGHER TIER QUESTIONS

Q3.

A student investigates a potassium salt, **X**.

She finds that salt **X**:

- has a high melting point
- does not conduct electricity when it is solid
- dissolves in water and the solution does conduct electricity.

(a) What is the type of bonding in salt **X**?

Tick **one** box.

Covalent

Giant molecular

Ionic

Metallic

(1)

(b) What is the name given to solutions that conduct electricity?

(1)

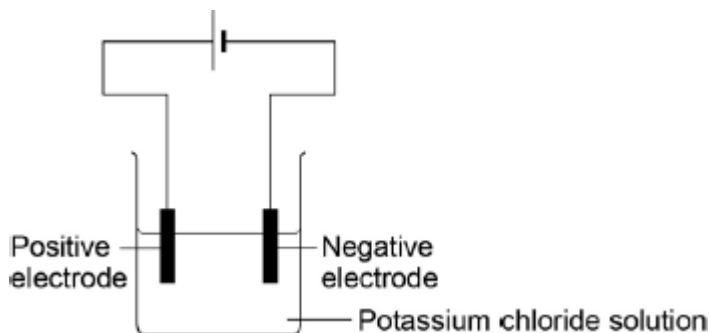
(c) Why does a solution of salt **X** in water conduct electricity?

(1)

(d) The student electrolyses a solution of potassium chloride.

Figure 1 shows the apparatus she uses.

Figure 1



When the current is switched on, bubbles of hydrogen gas are given off at the negative electrode.

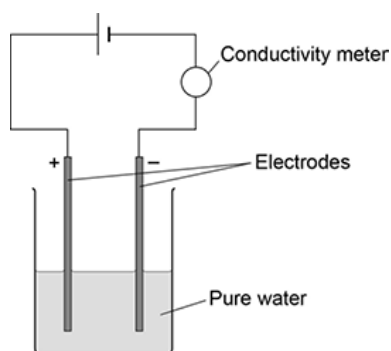
Explain why hydrogen is produced and **not** potassium.

(2)

- (e) The student then compares the relative conductivity of different concentrations of potassium chloride.

Figure 2 shows the apparatus she uses.

Figure 2



This is the method used.

1. Add potassium chloride solution to the water one drop at a time.
2. Stir the mixture.
3. Record the reading on the conductivity meter.

The table below shows the student's results.

Number of drops of potassium chloride solution	Relative conductivity of solution
0	0
1	90
2	180
3	270
4	360
5	450
6	540

When there is no potassium chloride in the beaker no electrical charge flows.

Suggest why pure water does **not** conduct electricity.

(2)

(f) Describe the relationship shown in the table above.

(2)
(Total 9 marks)

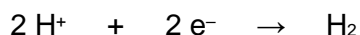
Q4.

This question is about the electrolysis of aqueous solutions.

Hydrogen gas and chlorine gas are produced when sodium chloride solution is electrolysed.

(a) Hydrogen ions (H⁺) are attracted to the negative electrode.

The half equation for the reaction at the negative electrode is:



What type of reaction happens at the negative electrode?

Give the reason for your answer.

Type of reaction _____

Reason _____

(2)

(b) Chloride ions are attracted to the positive electrode.

Complete the half equation for the production of chlorine gas (Cl₂).



(2)

(c) Hydrogen gas and oxygen gas are produced when sodium sulfate solution is electrolysed.

Explain how oxygen gas is produced in the electrolysis of sodium sulfate solution.

(4)
(Total 8 marks)