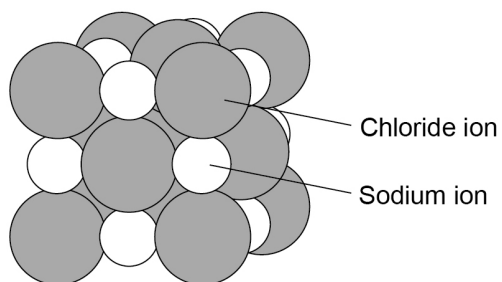


1.1

Figure 6 shows part of the structure and bonding in sodium chloride (NaCl).

Figure 6



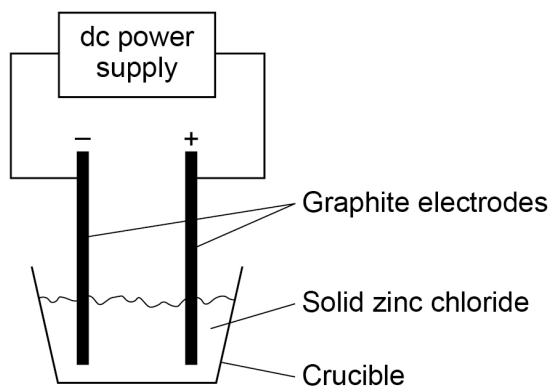
Explain the conditions needed for sodium chloride to conduct electricity.

[3 marks]

A student investigated the electrolysis of different substances.

Figure 6 shows the apparatus.

Figure 6



2.1

Explain why electrolysis would **not** take place in the apparatus shown in **Figure 6**.
[2 marks]

This question is about electrolysis.

ou

3.1

Some metals are extracted from molten compounds using electrolysis.

Why is electrolysis used to extract some metals?

[1 mark]

3.2

Aluminium is produced by electrolysis of a molten mixture.

What **two** substances does the molten mixture contain?

[2 marks]

1 _____

2 _____

3.3

Copper and chlorine are produced when molten copper chloride is electrolysed.

Complete the half equation for the reaction at each electrode.

[2 marks]

Half equation at negative electrode



Half equation at positive electrode



This question is about electrolysis.

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

ou

4.1

Explain why a mixture is used as the electrolyte instead of using only aluminium oxide.

[2 marks]

4.2

What happens at the negative electrode during the production of aluminium?

[1 mark]

Tick (✓) **one** box.

Aluminium atoms gain electrons.

☐

Aluminium atoms lose electrons.

☐

Aluminium ions gain electrons.

☐

Aluminium ions lose electrons.

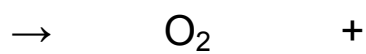
☐

4.3

Oxygen is produced at the positive electrode.

Complete the balanced half-equation for the process at the positive electrode.

[2 marks]



4.4

Explain why the positive electrode must be continually replaced.

[3 marks]

Sodium metal and chlorine gas are produced by the electrolysis of molten sodium chloride.

ou

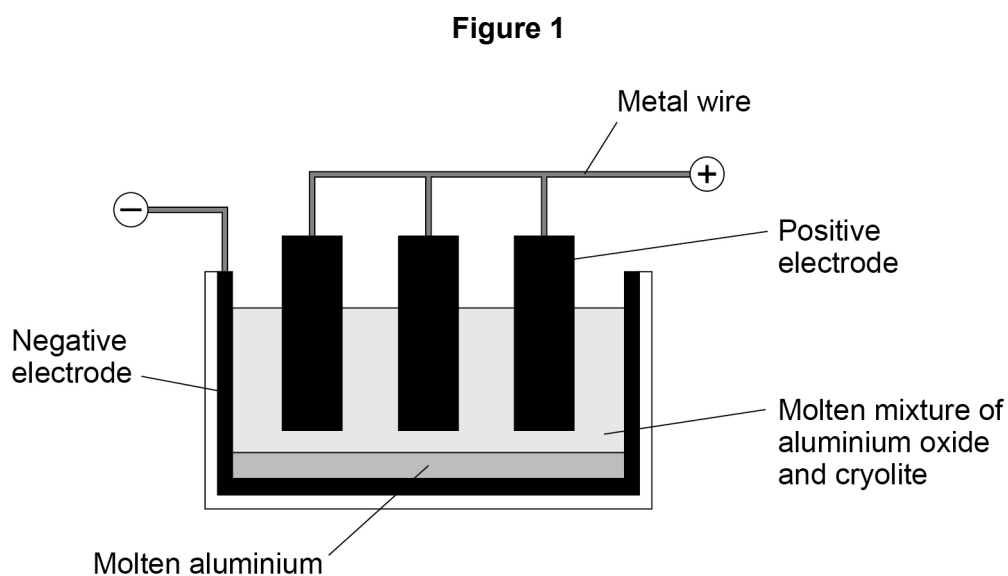
4.5

Explain why sodium chloride solution **cannot** be used as the electrolyte to produce sodium metal.

[2 marks]

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

Figure 1 shows the cell used for the electrolysis.



5.1

Oxygen is formed at the positive carbon electrodes.

Explain why the positive carbon electrodes must be continually replaced.

[3 marks]

5.2

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?

[3 marks]

Carbon electrode (made from graphite) _____

Molten mixture of aluminium oxide and cryolite _____

Metal wire _____

[
-
]

This question is about electrolysis.

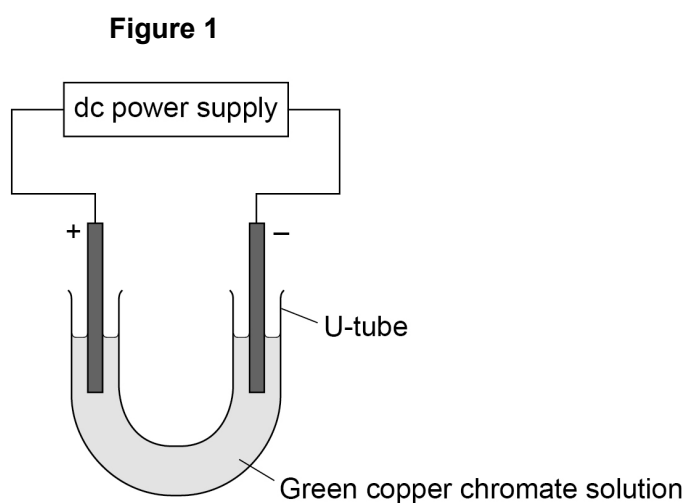
A student investigated the electrolysis of copper chromate solution.

Copper chromate solution is green.

Copper chromate contains:

- blue coloured Cu^{2+} ions
- yellow coloured CrO_4^{2-} ions.

Figure 1 shows the apparatus used.



The student switched the power supply on.

The student observed the changes at each electrode.

Table 4 shows the student's observations.

Table 4

Changes at positive electrode	Changes at negative electrode
Solution turned yellow	Solution turned blue
Bubbles formed at the electrode	Solid formed on the electrode

6.1

Explain why the colour changed at the positive electrode.

[2 marks]

*Do
out*

6.2

The gas produced at the positive electrode was oxygen.

The oxygen was produced from hydroxide ions.

Name the substance in the solution that provides the hydroxide ions.

[1 mark]

6.3

Describe how the solid forms at the negative electrode.

[3 marks]

6.4

The student repeated the investigation using potassium iodide solution instead of copper chromate solution.

Name the product at each electrode when potassium iodide solution is electrolysed.

[2 marks]

Negative electrode _____

Positive electrode _____

[
.
]

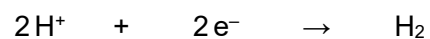
This question is about the electrolysis of aqueous solutions.

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

7.1

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.

[2 marks]

Type of reaction _____

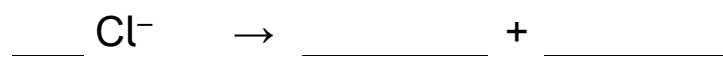
Reason _____

7.2

Chloride ions are attracted to the positive electrode.

Complete the half equation for the production of chlorine gas (Cl_2).

[2 marks]



7.3

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 marks]

[]

8.1

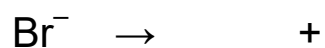
A teacher demonstrates the electrolysis of molten lead bromide.

Bromine is produced at the positive electrode.

Complete the half equation for the production of bromine.

You should balance the half equation.

[2 marks]



8.2

Two aqueous salt solutions are electrolysed using inert electrodes.

Complete **Table 4** to show the product at each electrode.

[3 marks]

Table 4

Salt solution	Product at positive electrode	Product at negative electrode
Copper nitrate		copper
Potassium iodide		

8.3

Copper nitrate solution is blue.

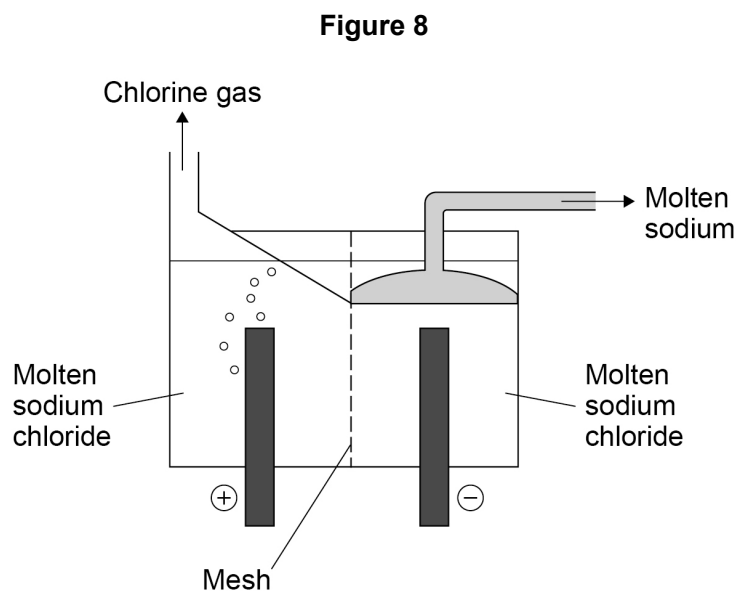
Suggest why the blue colour of the copper nitrate solution fades during the electrolysis.

[1 mark]

This question is about electrolysis.

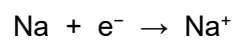
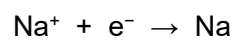
Molten sodium chloride is electrolysed in an industrial process to produce sodium.

Figure 8 shows a simplified version of the electrolysis cell used.



9.1

Which is the correct half equation for the production of sodium?

[1 mark]Tick (✓) **one** box.☐☐☐☐

A mesh is used to keep the products of the electrolysis apart.

out:

9.2

Suggest **one** reason why the products of the electrolysis must be kept apart.

[1 mark]

9.3

Which type of particle passes through the mesh in the electrolysis of molten sodium chloride?

[1 mark]

Tick (✓) **one** box.

Atom

☐

Electron

☐

Ion

☐

Molecule

☐

Aqueous sodium chloride solution is electrolysed in a different industrial process.

Two gases and an alkaline solution are produced.

out:

9.4

Which **two** ions are present in aqueous sodium chloride solution in addition to sodium ions and chloride ions?

[2 marks]

1 _____

2 _____

9.5

Name the alkaline solution produced.

[1 mark]

9.6

Explain how the alkaline solution is produced.

You should refer to the processes at the electrodes.

[3 marks]

[-]

During electrolysis ions are discharged at the electrodes to produce elements.

A student investigates the electrolysis of sodium chloride.

06

10.1

Why does solid sodium chloride **not** conduct electricity?

[1 mark]

10.2

Sodium chloride solution conducts electricity.

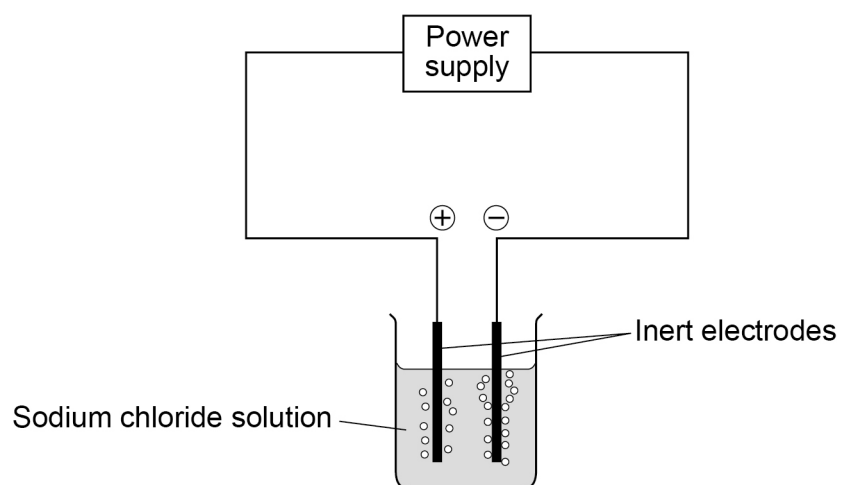
Complete the sentence.

[1 mark]

Sodium chloride **also** conducts electricity when _____ .

Figure 5 shows the apparatus for the electrolysis of sodium chloride solution.

Figure 5



06

10.3

Suggest an element that could be used to make the inert electrodes.

[1 mark]

10.4

Complete the half equation for the production of chlorine (Cl_2) at the positive electrode.

[2 marks]



10.5

Sodium chloride solution has a pH of 7

During the electrolysis of sodium chloride solution:

- hydrogen gas is produced at the negative electrode
- the pH of the solution increases.

Explain why.

[4 marks]

[-]

This question is about electrolysis.

out

Aluminium is manufactured by electrolysis of a molten mixture of aluminium oxide (Al_2O_3) and cryolite (Na_3AlF_6).

11.1

Complete the half equation for the reaction occurring at the negative electrode.

[1 mark]

11.2

Cryolite contains Na^+ ions as well as Al^{3+} ions.

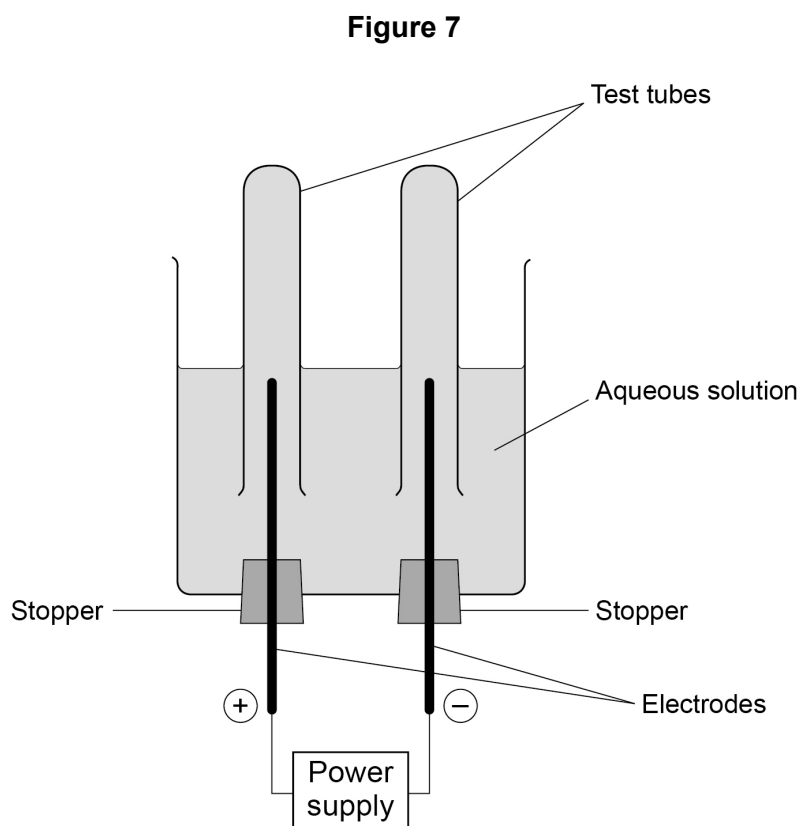
Suggest **one** reason why sodium is **not** a product of the electrolysis.

[1 mark]

A student investigated the electrolysis of an aqueous solution of a different compound.

out

Figure 7 shows the apparatus.



Hydrogen was produced at the negative electrode and oxygen was produced at the positive electrode.

out

11.3

Explain how oxygen was produced from water during the electrolysis of this aqueous solution.

[4 marks]
