

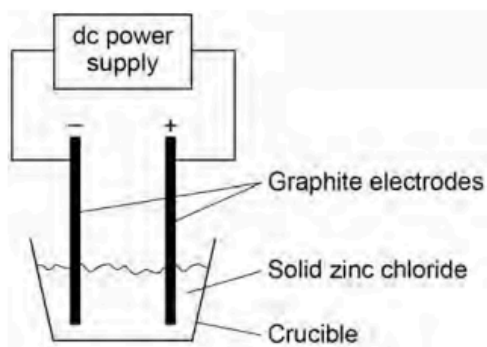
(Electrolysis (including of aqueous solutions, half-equations))

Q1. (2018)

A student investigated the electrolysis of different substances.

Figure 6 shows the apparatus.

Figure 6



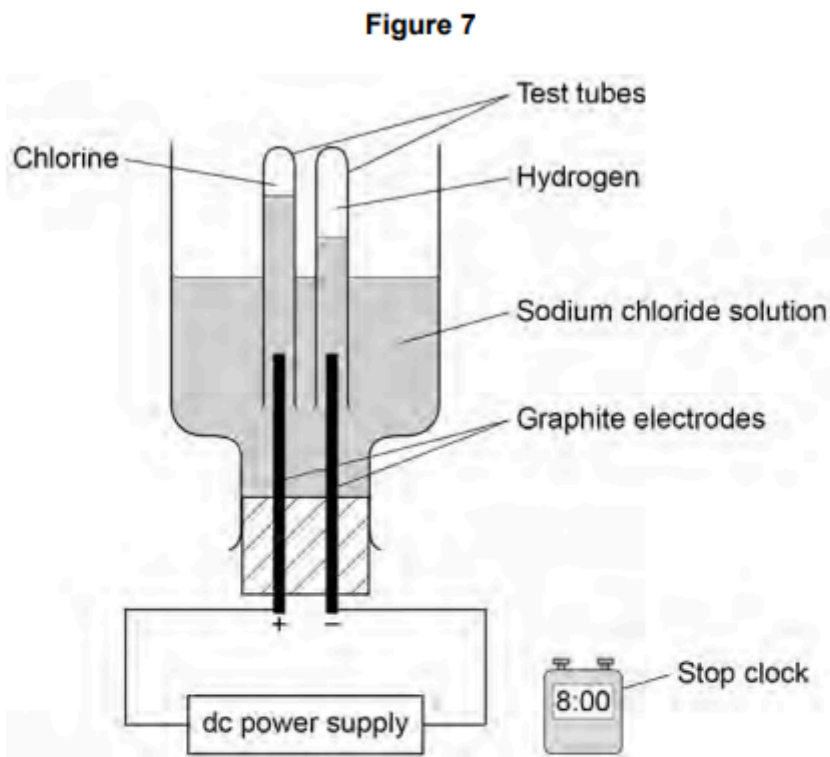
Explain why electrolysis would **not** take place in the apparatus shown in **Figure 6**.

[2 marks]

Q2. a). (2018)

The student investigated how the volume of gases produced changes with time in the electrolysis of sodium chloride solution.

Figure 7 shows the apparatus.



The student made an error in selecting the apparatus for this investigation.

How should the apparatus be changed?

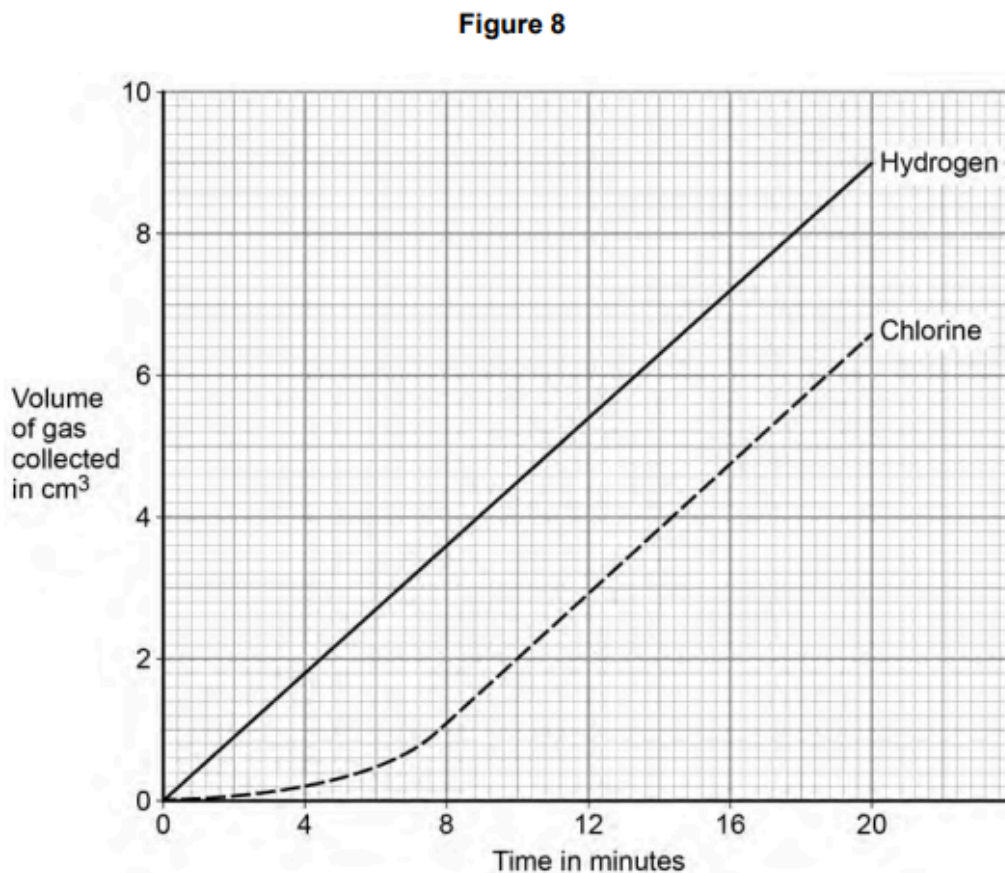
Give **one** reason for your answer.

[2 marks]

Another student used the correct apparatus.

This student measured the volumes of gases collected every minute for 20 minutes.

Figure 8 shows the student's results.



Describe the trends shown in the results.

Use values from **Figure 8**.

[3 marks]

The number of moles of each gas produced at the electrodes is the same.

No gas escapes from the apparatus.

Suggest **one** reason for the difference in volume of each gas collected.

[1 mark]

Q2. d). (2018)

Calculate the amount in moles of chlorine collected after 20 minutes.

Use **Figure 8**.

The volume of one mole of any gas at room temperature and pressure is 24.0 dm^3

Give your answer in standard form.

[3 marks]

Moles of chlorine = _____ mol

Q3. (2019)

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.

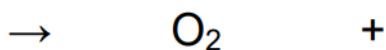
☐

Q4. (2019)

Oxygen is produced at the positive electrode.

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

[2 marks]



Q5. (2019)

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

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

[2 marks]

Q6. (2020)

This question is about electrolysis.

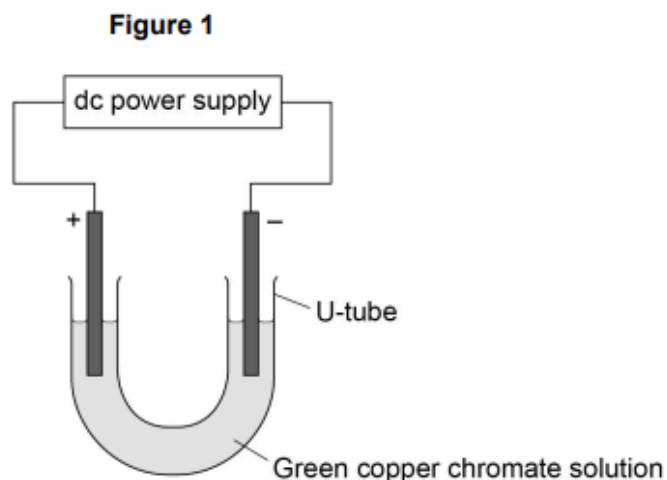
A student investigated the electrolysis of copper chromate solution.

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

Explain why the colour changed at the positive electrode.

[2 marks]

Q7. (2020)

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]

Q8. (2020)

Describe how the solid forms at the negative electrode.

[3 marks]

Q9. (2020)

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 _____

Q10. (2021)

This question is about chemical reactions and electricity.

Electrolysis and chemical cells both involve chemical reactions and electricity.

Explain the difference between the processes in electrolysis and in a chemical cell.

[2 marks]

Q11. (2021)

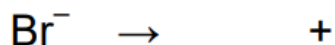
A teacher demonstrates the electrolysis of molten lead bromide.

Bromine is produced at the positive electrode.

Complete the half equation for the production of bromine.

You should balance the half equation.

[2 marks]



Q12. (2021)

Two aqueous salt solutions are electrolysed using inert electrodes.

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

[3 marks]

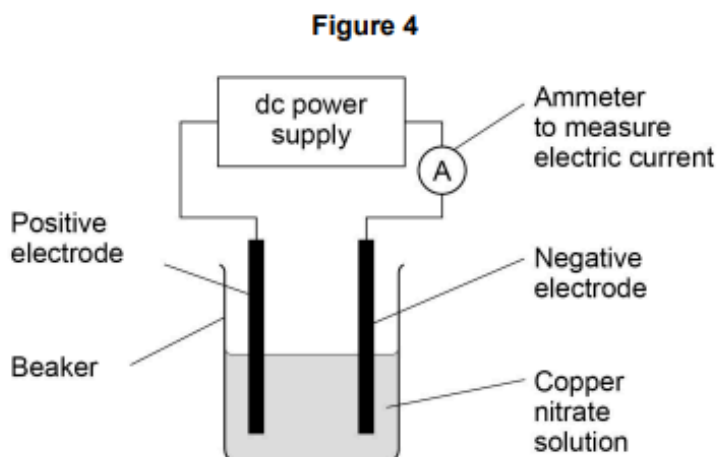
Table 4

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

Q13. a). (2021)

Some students investigated the electrolysis of copper nitrate solution using inert electrodes.

Figure 4 shows the apparatus.



The students investigated how the mass of copper produced at the negative electrode varied with:

- time
- current.

This is the method used.

1. Weigh the negative electrode.
2. Set up the apparatus shown in **Figure 4**.
3. Adjust the power supply until the ammeter shows a current of 0.3 A
4. Switch off the power supply after 5 minutes.
5. Rinse the negative electrode with water and allow to dry.
6. Reweigh the negative electrode.
7. Repeat steps 1 to 6 for different times.
8. Repeat steps 1 to 7 at different currents.

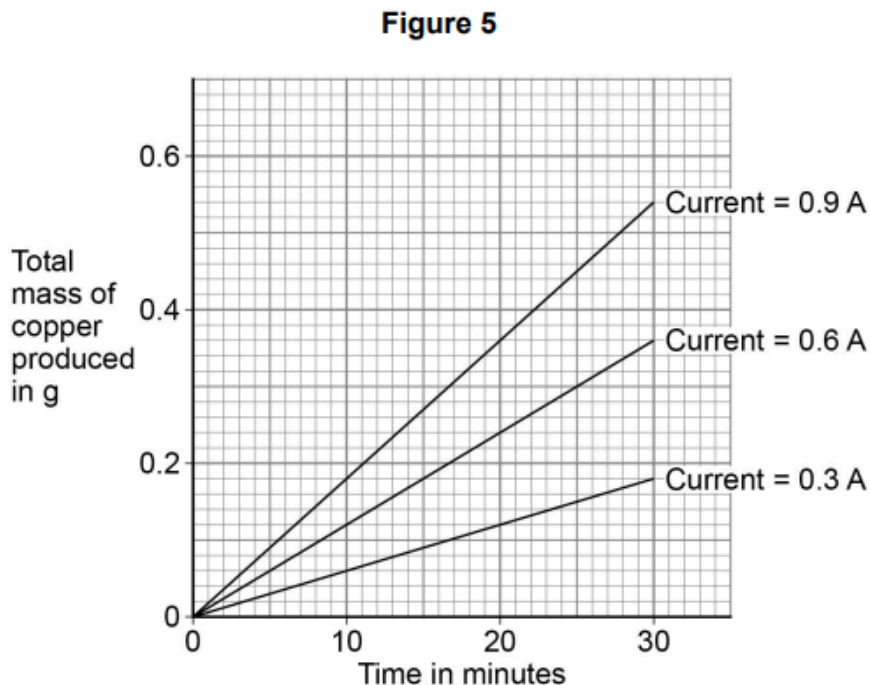
Some of the copper produced did not stick to the negative electrode but fell to the bottom of the beaker.

Suggest how the students could find the total mass of copper produced.

[4 marks]

The students plotted their results on a graph.

Figure 5 shows the graph.



A student correctly concluded that the total mass of copper produced is directly proportional both to the time and to the current.

How do the results in **Figure 5** support the conclusion that the total mass of copper produced is directly proportional to the time?

[1 mark]

How do the results in **Figure 5** support the conclusion that the total mass of copper produced is directly proportional to the current?

Use data from **Figure 5** in your answer.

[1 mark]

Q13. d). (2021)

Determine the number of atoms of copper produced when copper nitrate solution is electrolysed for 20 minutes at a current of 0.6 A

Give your answer to 3 significant figures.

Use **Figure 5**.

Relative atomic mass (A_r): Cu = 63.5

The Avogadro constant = 6.02×10^{23} per mole

[3 marks]

Number of atoms (3 significant figures) = _____

Q14. (2021)

Copper nitrate solution is blue.

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

[1 mark]

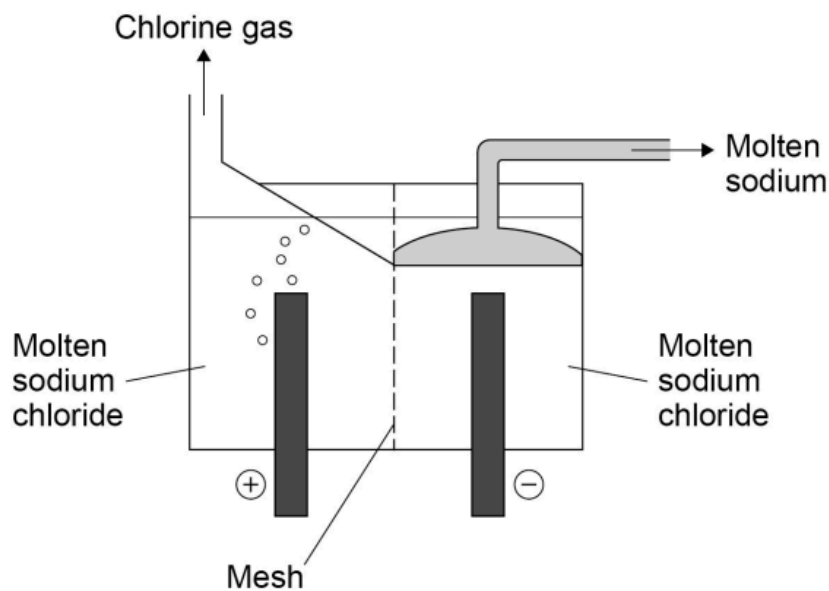
Q15. a). (2022)

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.

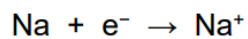
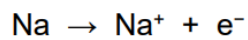
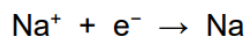
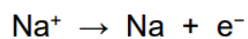
Figure 8



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

[1 mark]

Tick (✓) **one** box.

☐☐☐☐

Q15. b). (2022)

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

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

[1 mark]

Q15. c). (2022)

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

[1 mark]

Tick (✓) **one** box.

Atom

☐

Electron

☐

Ion

☐

Molecule

☐

Q16. a). (2022)

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

Two gases and an alkaline solution are produced.

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

[2 marks]

1 _____

2 _____

Q16. b). (2022)

Name the alkaline solution produced.

[1 mark]

Q16. c). (2022)

Explain how the alkaline solution is produced.

You should refer to the processes at the electrodes.

[3 marks]

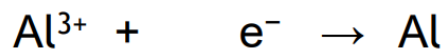
Q17. (2023)

This question is about electrolysis.

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

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

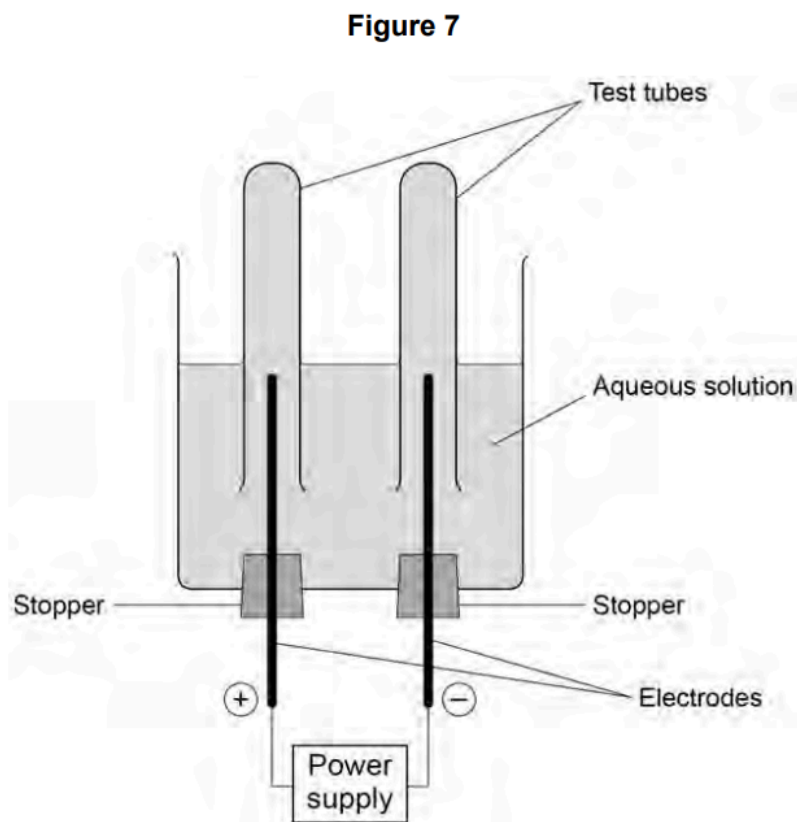
[1 mark]



Q18. a). (2023)

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

Figure 7 shows the apparatus.



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

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

[4 marks]

Q18. b). (2023)

The student compared the volumes of the two gases collected.

How can the student change the apparatus in **Figure 7** to compare the volumes of the two gases produced more accurately?

Give **one** reason for your answer.

[2 marks]

Change _____

Reason _____

Q19. (2024)

Solid calcium chloride **cannot** be electrolysed.

Give **one** reason why.

[1 mark]

Q20. (2024)

Name the product formed at the negative electrode when aqueous calcium chloride solution is electrolysed.

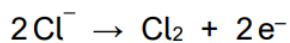
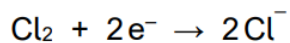
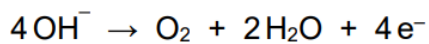
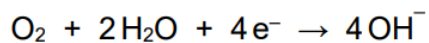
[1 mark]

Q21. (2024)

What is the half equation for the reaction at the positive electrode when aqueous calcium chloride solution is electrolysed?

[1 mark]

Tick (✓) **one** box.

☐☐☐☐

Q22. (2024)

A student investigated the electrolysis of green copper chromate solution.

Figure 4 shows the apparatus.

Figure 4

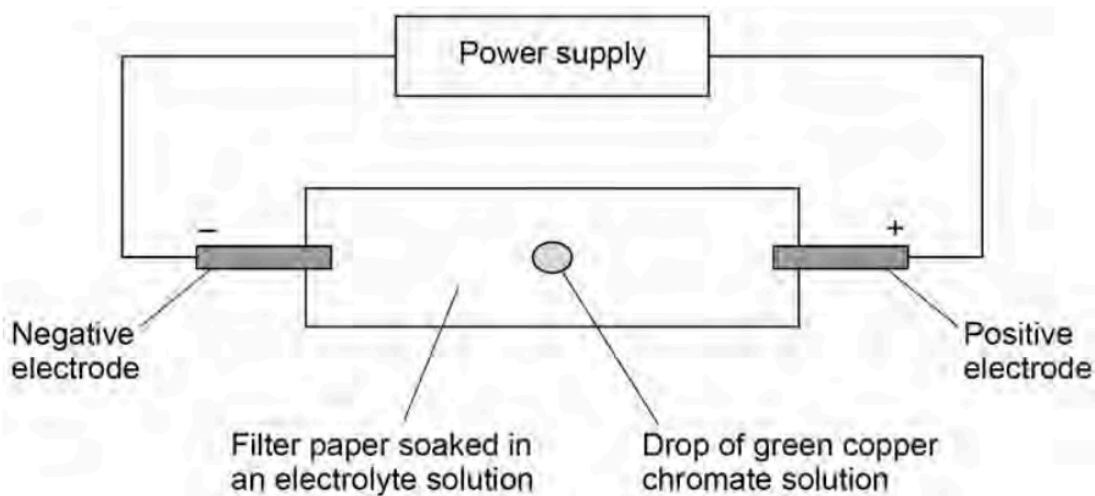
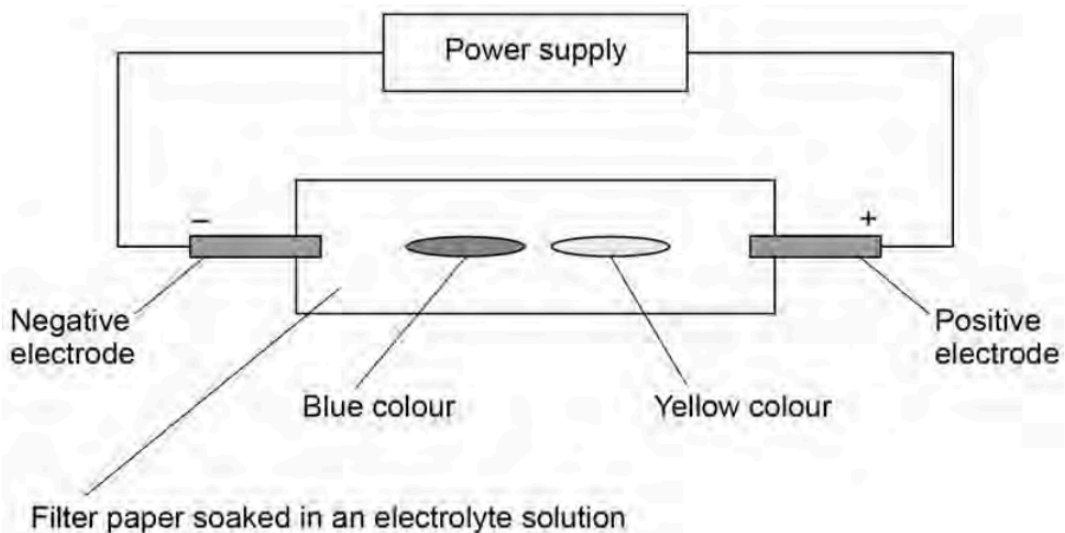


Figure 5 shows the results.

Figure 5



Copper chromate solution contains the ions Cu^{2+} and CrO_4^{2-}

Explain the results shown in **Figure 5**.

[3 marks]
