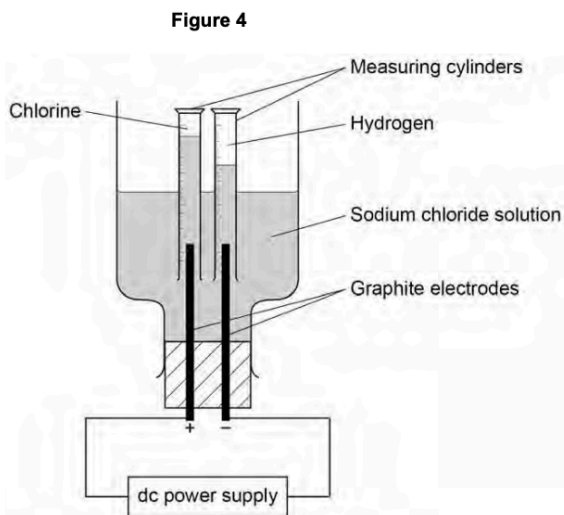


(Electrolysis (including of aqueous solutions, half-equations))

Q1.a). (2018)

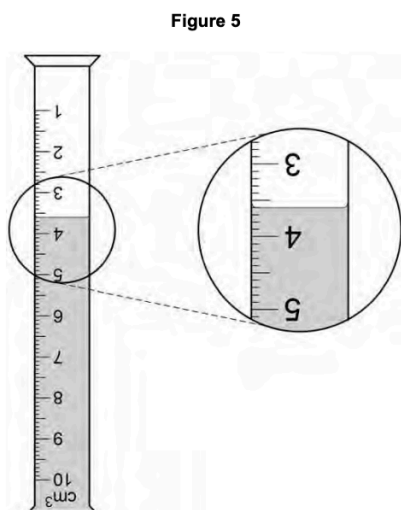
A student investigated the electrolysis of sodium chloride solution.

Figure 4 shows the apparatus.



The student measured the volume of gas collected in each measuring cylinder every minute for 20 minutes.

Figure 5 shows the volume of hydrogen gas collected in the measuring cylinder after 8 minutes.

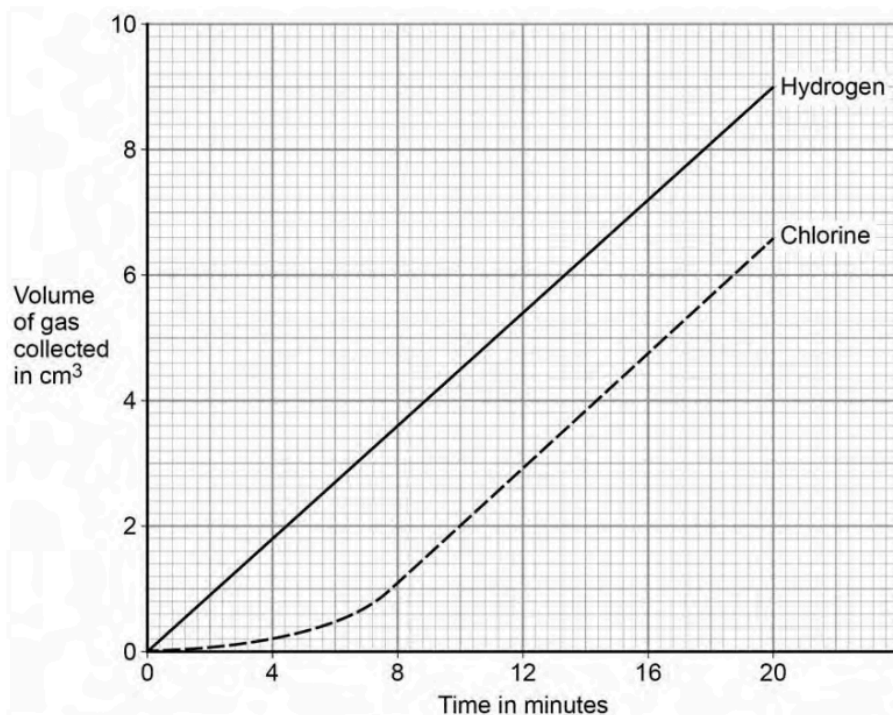


What is the volume of hydrogen gas collected?

[1 mark]

Volume = _____ cm³

Q1.b) (2018)

Figure 6 shows the results of the investigation.**Figure 6**

Which of the lines on **Figure 6** show that the volume of gas collected is directly proportional to the time?

[1 mark]Tick **one** box.

Both lines

☐

Chlorine line only

☐

Hydrogen line only

☐

Neither line

☐

Q1.c) (2018)

Which of the lines on **Figure 6** show a positive correlation between the volume of gas collected and time?

[1 mark]

Tick **one** box.

Both lines

☐

Chlorine line only

☐

Hydrogen line only

☐

Neither line

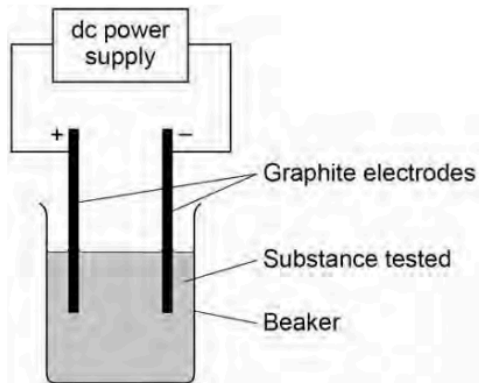
☐

Q2.a) (2018)

A teacher demonstrates the electrolysis of different substances using graphite electrodes.

Figure 7 shows the apparatus used.

Figure 7



Why can graphite conduct electricity?

[1 mark]

Tick **one** box.

Graphite exists in layers of atoms.

☐

Graphite has a giant structure.

☐

Graphite has a high melting point.

☐

Graphite has delocalised electrons.

☐

Q2.b) (2018)

The teacher demonstrates the electrolysis of:

- molten zinc chloride
- potassium bromide solution.

Complete **Table 3** to predict the products.

Choose answers from the box.

[4 marks]

chlorine	bromine	hydrogen	oxygen	potassium	zinc
----------	---------	----------	--------	-----------	------

Table 3

Substance electrolysed	Product at cathode (negative electrode)	Product at anode (positive electrode)
Molten zinc chloride		
Potassium bromide solution		

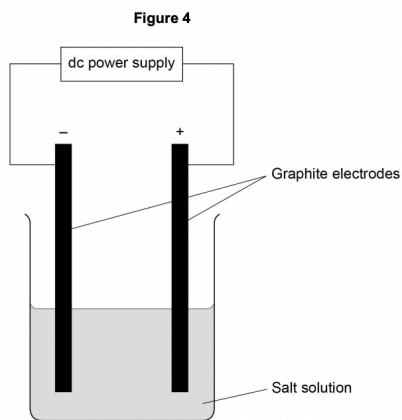
Q3.a) (2020)

This question is about electrolysis.

A student investigated the hypothesis:

'The electrolysis of a salt solution produces a metal at the negative electrode and a gas at the positive electrode.'

Figure 4 shows the apparatus used.



What observation would be made at each electrode if the hypothesis is correct?

[2 marks]

Observation if metal produced at the negative electrode _____

Observation if gas produced at the positive electrode _____

Q3.b) (2020)

Table 3 shows the student's results.

Table 3

Salt solution	Product at the negative electrode	Product at the positive electrode
Copper chloride	Copper	Chlorine
Potassium nitrate	Hydrogen	Oxygen
Silver nitrate	Silver	Oxygen

Which salt solution in **Table 3** does **not** match the student's hypothesis?

Give **one** reason why.

[2 marks]

Salt solution _____

Reason _____

Q3.c) (2020)

Give **two** reasons why graphite is used for the electrodes.

[2 marks]

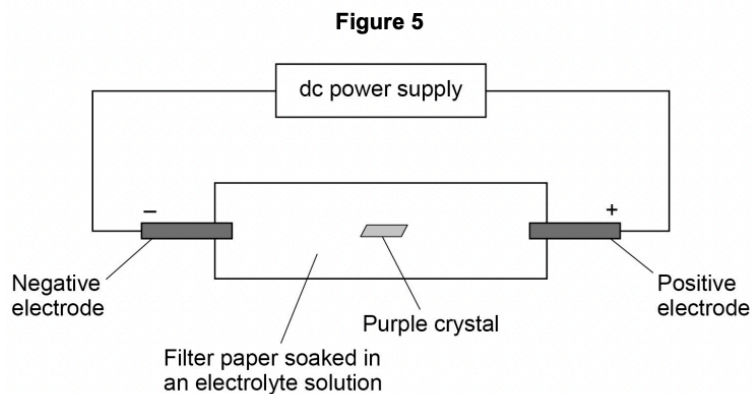
1 _____

2 _____

Q4. (2020)

A different student investigated what happens during electrolysis.

Figure 5 shows the apparatus.



The purple crystal contained:

- colourless positive ions
- purple coloured negative ions.

The purple crystal dissolved in the electrolyte solution.

What happens to the purple coloured ions?

Give **one** reason for your answer.

[2 marks]

Tick (✓) **one** box.

The ions do not move.

☐

The ions move towards the negative electrode.

☐

The ions move towards the positive electrode.

☐

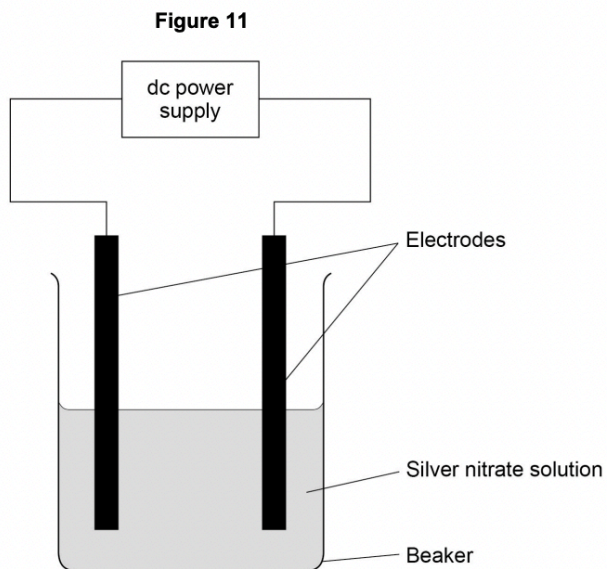
Reason _____

This question is about electrolysis.

Some students investigated the electrolysis of silver nitrate solution.

This electrolysis produces silver at the negative electrode.

Figure 11 shows the apparatus.



This is the method used.

1. Weigh the negative electrode.
2. Set up the apparatus shown in **Figure 11**.
3. Switch on the power supply.
4. Switch off the power supply after five 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.

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

The students needed to weigh this silver.

How could the students separate the silver from the silver nitrate solution?

[1 mark]

Tick (✓) **one** box.

By chromatography

☐

By crystallisation

☐

By distillation

☐

By filtration

☐

Q5.b)(2021)

Table 5 shows the students' results.

Table 5

Time in minutes	Mass of silver in g
0	0.00
5	0.06
10	0.12
15	0.18
20	0.24
25	0.30

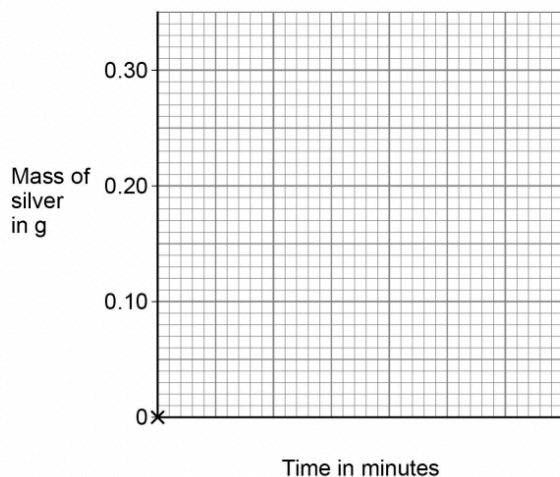
Draw a graph on **Figure 12**.

You should:

- use a suitable scale for the x-axis
- plot the data from **Table 5**
- draw a line of best fit.

[4 marks]

Figure 12



Q5.c)(2021)

Determine the mass of silver that would be produced after 12 minutes.

Use **Figure 12**.

[1 mark]

Mass of silver = _____ g

Q6. (2021)

A student investigated the electrolysis of two aqueous salt solutions.

Hydrogen is produced at the negative electrode when the metal in the salt solution is more reactive than hydrogen.

Complete **Table 6** to show what the student would **observe** at the negative electrode for each salt solution.

[2 marks]

Table 6

Salt solution	Observation at negative electrode
Copper sulfate	
Sodium chloride	

Q7.(2021)

A teacher demonstrates the electrolysis of molten lead bromide.

The products at the electrodes are lead and bromine.

Why should the teacher do the demonstration in a fume cupboard?

[1 mark]

Q8.(2021)

Two other molten compounds are electrolysed.

Complete **Table 7** to show the molten compounds and the products.

[3 marks]

Table 7

Molten compound electrolysed	Product at the negative electrode	Product at the positive electrode
Zinc chloride		
	Potassium	Iodine

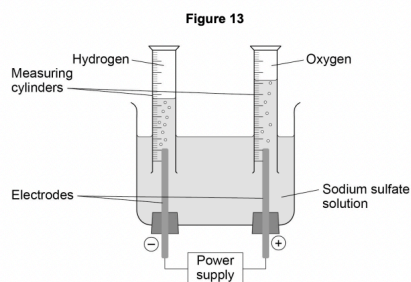
Q9.a)(2022)

This question is about electrolysis.

Ionic compounds decompose when they are electrolysed.

A student electrolyses sodium sulfate solution.

Figure 13 shows the apparatus used.



Sodium sulfate solution contains:

- hydrogen ions
- hydroxide ions
- sodium ions
- sulfate ions.

Oxygen is produced at the positive electrode.

Which ions are discharged at the positive electrode to produce oxygen?

[1 mark]

Tick (✓) **one** box.

Hydrogen ions

☐

Hydroxide ions

☐

Sodium ions

☐

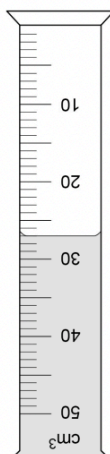
Sulfate ions

☐

Q9.b)(2022)

Figure 14 shows one of the measuring cylinders during the electrolysis.

Figure 14



What is the volume of gas in the measuring cylinder?

[1 mark]

Volume of gas = _____ cm³

Q9.c)(2022)

Ionic compounds can be electrolysed when molten or dissolved in water.

Why can ionic compounds **not** be electrolysed when solid?

You should answer in terms of ions.

[1 mark]

Q10. (2022)

Table 7 shows the products of electrolysis of two molten compounds.

Table 7

Molten compound	Product at negative electrode	Product at positive electrode
Potassium iodide	Potassium	_____
Zinc bromide	_____	Bromine

Complete Table 7.

[2 marks]

Q11. (2022)

Chemical Change

<http://www.pcfgstudy.com>

The electrolysis of molten sodium chloride is used to extract sodium metal.

Why is sodium metal extracted by electrolysis instead of by reduction with carbon?

[1 mark]

Tick (✓) **one** box.

Carbon conducts electricity.

☐

Carbon is less reactive than sodium.

☐

Carbon reduction uses more energy.

☐

Q12. (2022)

What is the state symbol for molten sodium chloride?

[1 mark]

Tick (✓) **one** box.

(aq)

☐

(g)

☐

(l)

☐

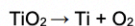
(s)

☐

Q13. (2022)

Titanium can be produced from titanium oxide by electrolysis.

The equation for the reaction is:



Calculate the percentage atom economy for the production of titanium from titanium oxide by electrolysis.

Use the equation:

$$\text{Percentage atom economy} = \frac{\text{Relative atomic mass of desired product}}{\text{Relative formula mass of reactant}} \times 100$$

Relative atomic mass (A_r): Ti = 48

Relative formula mass (M_r): TiO₂ = 80

[2 marks]

Percentage atom economy = _____ %

Q14.(2023)

Give **one** reason why molten sodium chloride conducts electricity.

Refer to ions in your answer.

[1 mark]

Q15.(2023)

Table 3 shows products of the electrolysis of two molten ionic compounds.

Complete **Table 3**.

[2 marks]

Table 3

Molten compound	Product at the negative electrode	Product at the positive electrode
Magnesium bromide	Magnesium	_____
Potassium chloride	_____	Chlorine

Q16.(2023)

Aluminium is extracted by electrolysis.

The electrolyte is a molten mixture of aluminium oxide and cryolite.

Why is a mixture used instead of pure aluminium oxide as the electrolyte?

[1 mark]

Tick (✓) **one** box.

The mixture has a lower melting point than pure aluminium oxide.

☐

The mixture has the same melting point as pure aluminium oxide.

☐

The mixture has a higher melting point than pure aluminium oxide.

☐

Q17.(2023)

Electrolysis of an aqueous solution of sodium sulfate produces hydrogen and oxygen.

Why is hydrogen produced instead of sodium in the electrolysis of aqueous sodium sulfate solution?

[1 mark]

Tick (✓) **one** box.

Hydrogen is less reactive than sodium.

☐

Hydrogen has the same reactivity as sodium.

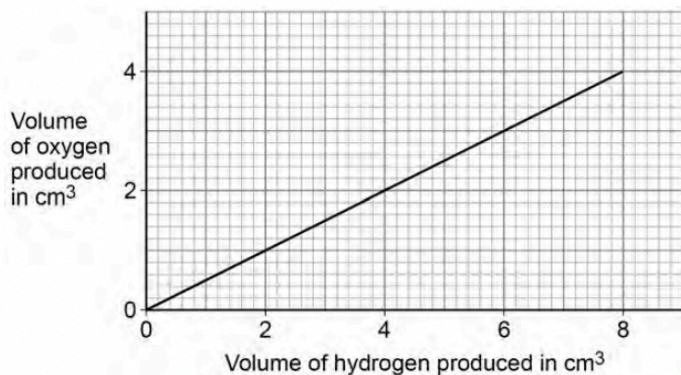
☐

Hydrogen is more reactive than sodium.

☐

Q18.(2023)

Figure 9 shows the relationship between the volume of hydrogen and the volume of oxygen produced during the electrolysis.

Figure 9

Give **one** conclusion that can be made about the volume of hydrogen produced compared to the volume of oxygen produced.

[1 mark]

Q19.(2024)

Why can some molten substances be electrolysed?

[1 mark]

Tick (✓) **one** box.

Electrons can move through the molten substance to the electrodes.

☐

Ions can move through the molten substance to the electrodes.

☐

Protons can move through the molten substance to the electrodes.

☐

Q20.(2024)

Table 3 shows the products of the electrolysis of some molten compounds.

Complete **Table 3**.

[3 marks]

Table 3

Molten compound	Product at negative electrode	Product at positive electrode
Lead chloride	_____	Chlorine
Potassium iodide	Potassium	_____
_____	Zinc	Bromine

Q21. (2024)

Aluminium is extracted by electrolysis of molten aluminium oxide.

Balance the equation for the reaction.

Choose numbers from the box.

[2 marks]

2	3	4	5
---	---	---	---

