2021 ASSESSMENT MATERIALS

GCSE
CHEMISTRY

Chemistry Test 2: Chemical changes (Foundation)

Total number of marks: 36

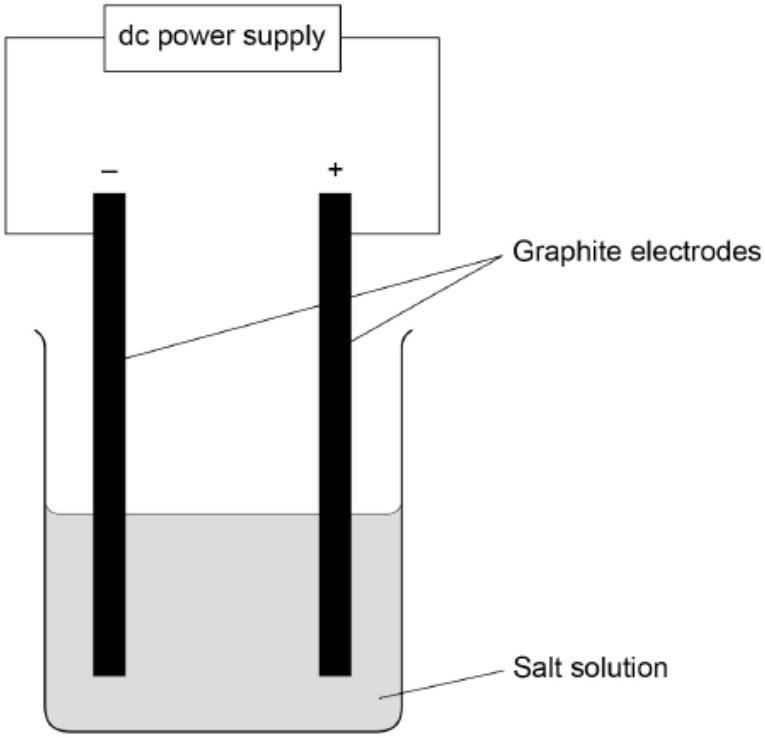
0 4 This question is about electrolysis.

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.

Figure 4



0 4 . 1 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 _____

_____

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

0 4 . 2 Which salt solution in **Table 3** does **not** match the student's hypothesis?

Give **one** reason why.

[2 marks]

Salt solution _____

Reason _____

_____

0 4 . 3 Give **two** reasons why graphite is used for the electrodes.

[2 marks]

1 _____

_____

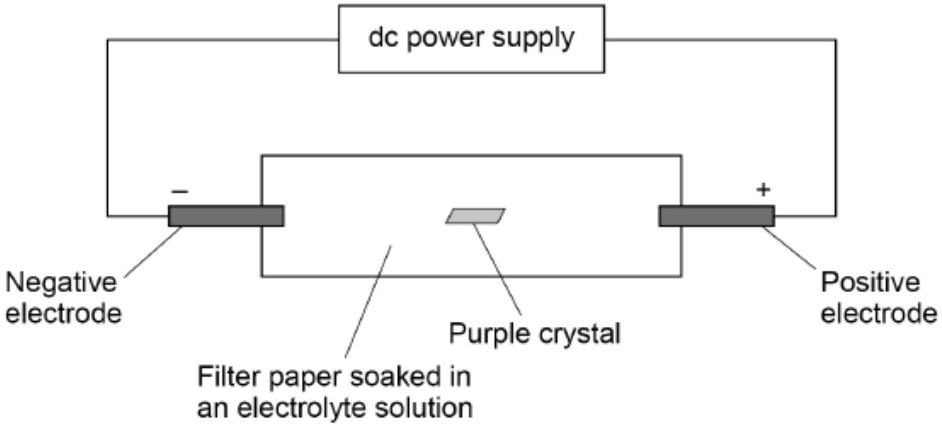
2 _____

_____

A different student investigated what happens during electrolysis.

Figure 5 shows the apparatus.

Figure 5



The purple crystal contained:

- colourless positive ions
- purple coloured negative ions.

The purple crystal dissolved in the electrolyte solution.

0 4 . 4 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 _____

_____

0 5 This question is about aluminium.

Aluminium is extracted by electrolysis.

The aluminium oxide is mixed with cryolite and melted.

The mixture is then electrolysed.

0 5 . 6 What is the reason for adding cryolite to the aluminium oxide?

[1 mark]

Tick (✓) **one** box.

To increase the amount of aluminium extracted ☐

To lower the melting point of the mixture ☐

To reduce the amount of aluminium oxide needed ☐

0 5 . 7 Complete the sentences.

Choose answers from the box.

[2 marks]

aluminium	**carbon**	**fluorine**
oxygen	**sodium**	

When the molten aluminium oxide and cryolite mixture is electrolysed the product at the positive electrode is _____.

This product reacts with the positive electrode because the positive electrode is made of _____.

0 5 . 8 A sample of bauxite contains 25% aluminium.

Calculate the maximum mass of aluminium that can be extracted from 300 000 kg of the sample of bauxite.

Give your answer in standard form.

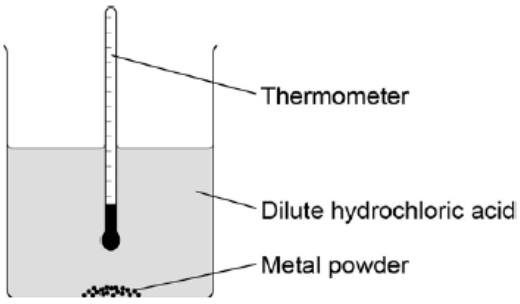
[3 marks]

Maximum mass (in standard form) = _____ kg

0 4 A student investigated the reactivity of different metals.

The student used the apparatus shown in **Figure 7**.

Figure 7



The student used four different metals.

The student measured the temperature rise for each metal three times.

The student's results are shown in **Table 3**.

Table 3

Metal	Temperature rise in °C			Mean temperature rise in °C
	Test 1	Test 2	Test 3	
Calcium	17.8	16.9	17.5	
Iron	6.2	6.0	6.1	6.1
Magnesium	12.5	4.2	12.3	12.4
Zinc	7.8	8.0	7.6	7.8

0 4 . 2 One of the results for magnesium is anomalous.

Which result is anomalous?

Suggest **one** reason why this anomalous result was obtained.

[2 marks]

Result _____

_____

Reason _____

_____

0 4 . 3 Calculate the mean temperature rise for calcium.

[1 mark]

_____

Mean temperature rise = _____ °C

0 4 . 4 The temperature rose when the metals were added to sulfuric acid.

Give **one** other observation that might be made when the metal was added to sulfuric acid.
How would this observation be different for the different metals?

[2 marks]

0 4 . 5 Aluminium is more reactive than iron and zinc but less reactive than calcium and magnesium.

Predict the temperature rise when aluminium is reacted with dilute hydrochloric acid.
[1 mark]

Temperature rise = _____ °C

0 7 This question is about acids, bases and salts.

Zinc nitrate is a salt.

A student produces zinc nitrate using an acid and a base.

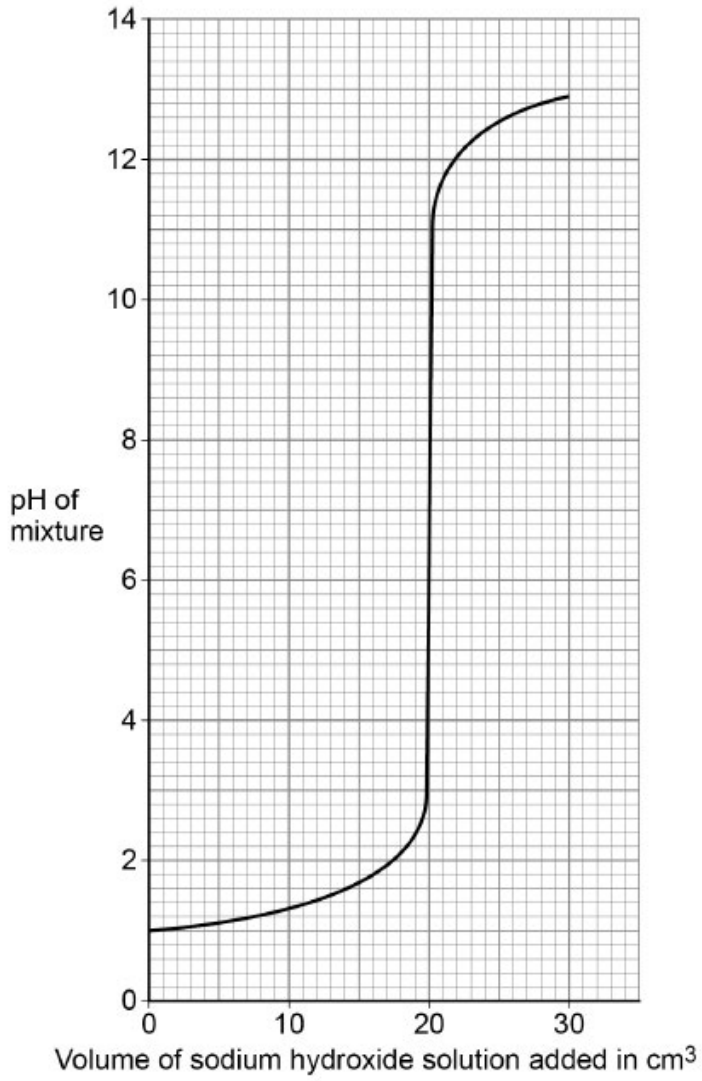
A student investigated how pH changes during a titration.

This is the method used.

1. Pour 25.0 cm^3 of hydrochloric acid into a beaker.
2. Measure the pH of the hydrochloric acid with a pH probe.
3. Add 1.0 cm^3 of sodium hydroxide solution from a burette.
4. Swirl the mixture.
5. Measure the pH of the mixture.
6. Repeat steps 3 to 5 until a total of 30.0 cm^3 of sodium hydroxide solution has been added.

Figure 10 shows the student's results.

Figure 10



0 7 . 4 Describe how the pH of the mixture changes as sodium hydroxide solution is added to hydrochloric acid.

Use data from **Figure 10** in your answer.

[3 marks]

0 7 . 5 What volume of sodium hydroxide solution is needed to neutralise 25.0 cm^3 of hydrochloric acid?

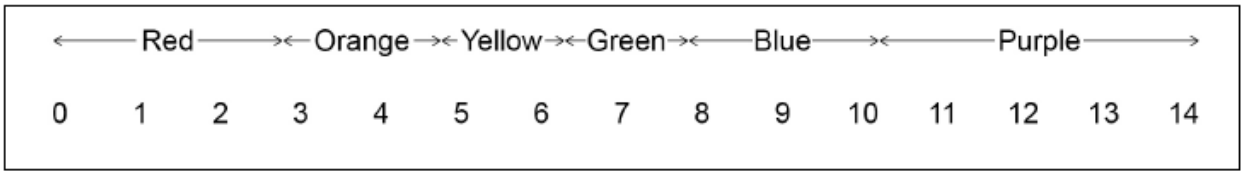
Use **Figure 10**.

[1 mark]

Volume = _____ cm^3

0 7 . 6 **Figure 11** shows the colour of universal indicator at different pH values.

Figure 11



The student could have used universal indicator instead of a pH probe.

Determine the colour of universal indicator when 10.0 cm^3 of sodium hydroxide solution has been added to 25.0 cm^3 of hydrochloric acid.

Use **Figure 10** and **Figure 11**.

[1 mark]

Colour = _____

0 7 . 7 The student used a pipette to measure 25.0 cm^3 of hydrochloric acid.

Figure 12 shows a pipette.

Figure 12

The pipette is labelled 25.0 ± 0.06 cm^3

Calculate the percentage uncertainty in the volume measured using this pipette.

Use the equation:

$$\text{percentage uncertainty} = \frac{\text{uncertainty}}{\text{volume measured}} \times 100$$

[2 marks]

_____

_____

_____

Percentage uncertainty = _____ %

0 7 . 8 Give **one** advantage of using a pipette rather than using a measuring cylinder to measure the volume of hydrochloric acid.

[1 mark]

0 8 Soluble salts are formed by reacting metal oxides with acids.

0 8 . 1 Give **one** other type of substance that can react with an acid to form a soluble salt.

[1 mark]

0 8 . 2 Calcium nitrate contains the ions Ca^{2+} and NO_3^-

Give the formula of calcium nitrate.

[1 mark]

0 8 . 3 Describe a method to make pure, dry crystals of magnesium sulfate from a metal oxide and a dilute acid.

[6 marks]