

**MONDAY, 6 JANUARY –
FRIDAY, 21 FEBRUARY 2025**

CHEMISTRY – Unit 3 (3410U30)

PRACTICAL ASSESSMENT

**INVESTIGATING THE ELECTROLYSIS
OF COPPER(II) SULFATE**

SECTION A

1 hour, plus your additional time allowance

Surname _____

First name(s) _____

Centre Number _____

Candidate Number 0 _____

ADDITIONAL MATERIALS

A calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

Answer ALL questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional pages at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The total number of marks available for this section of the task is 6.

The number of marks is given in brackets at the end of each question or part-question.

This task is in 2 sections, A and B. You will complete Section A in one lesson and Section B in the next science lesson.

(Turn over)

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
Section A	6	

INTRODUCTION

Your task is to investigate the effect of electrode length on the electrolysis of copper(II) sulfate solution.

(Turn over)

APPARATUS REQUIRED

The following apparatus is required for each group: (each group should consist of no more than three candidates).

eye protection

1 × 250 cm³ beaker

1 × d.c. power supply set at 6 V

1 × ammeter

1 × 250 cm³ measuring cylinder

3 × connecting wire

2 × crocodile clip

2 × copper foil electrode (1 cm width)

200 cm³ of dilute copper(II) sulfate solution (0.5 mol/dm³)

Access to:

waste bowl

CLEAPSS student safety sheet:

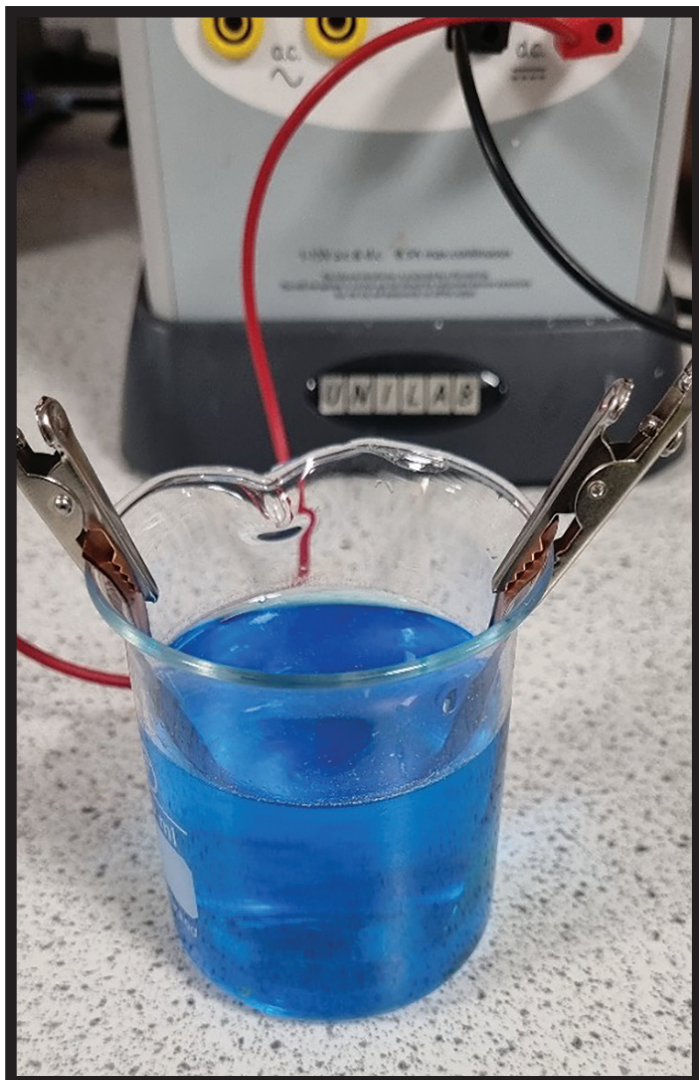
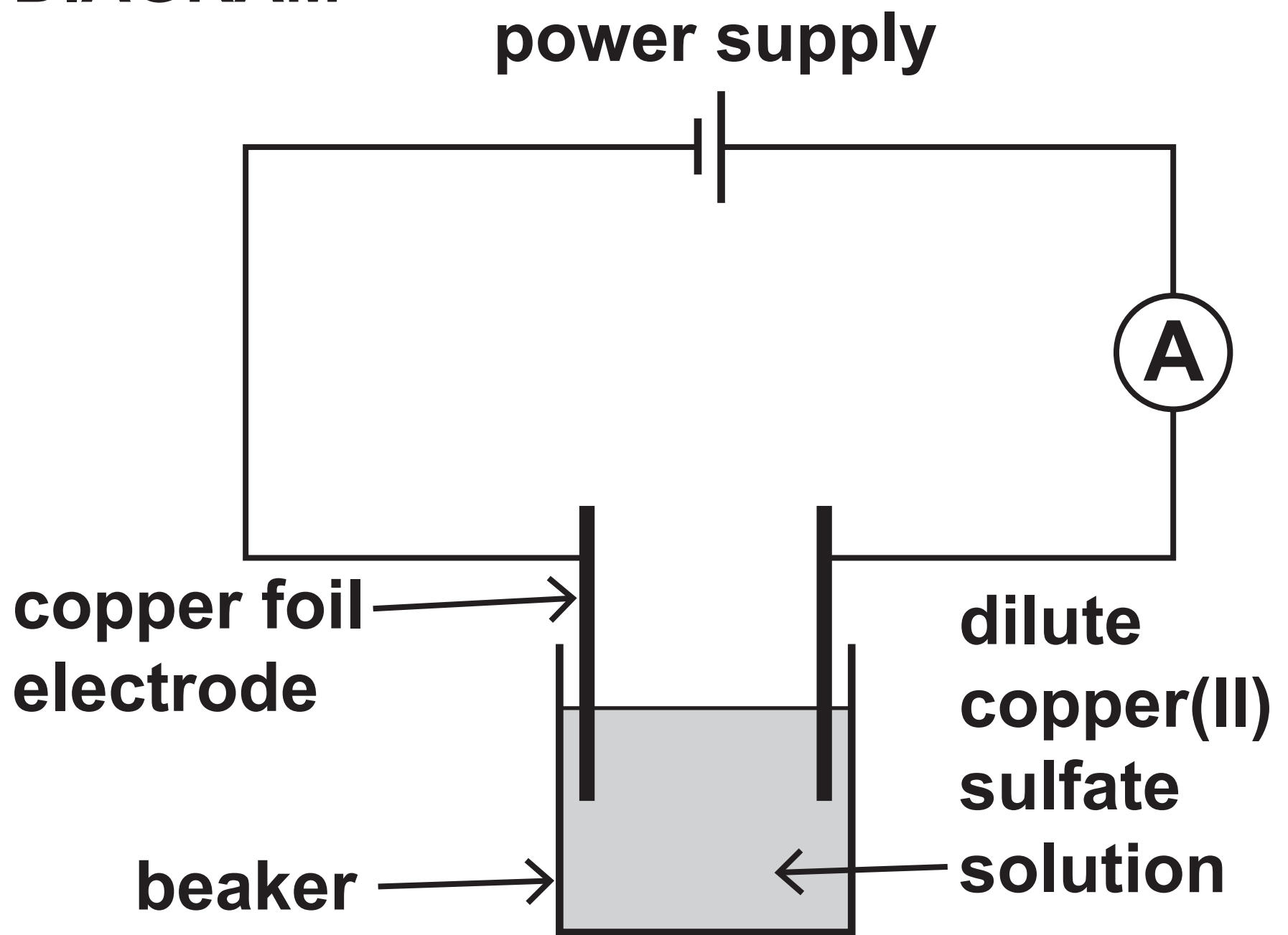
40 – Copper and its compounds. This is provided on page 11 of this examination paper.

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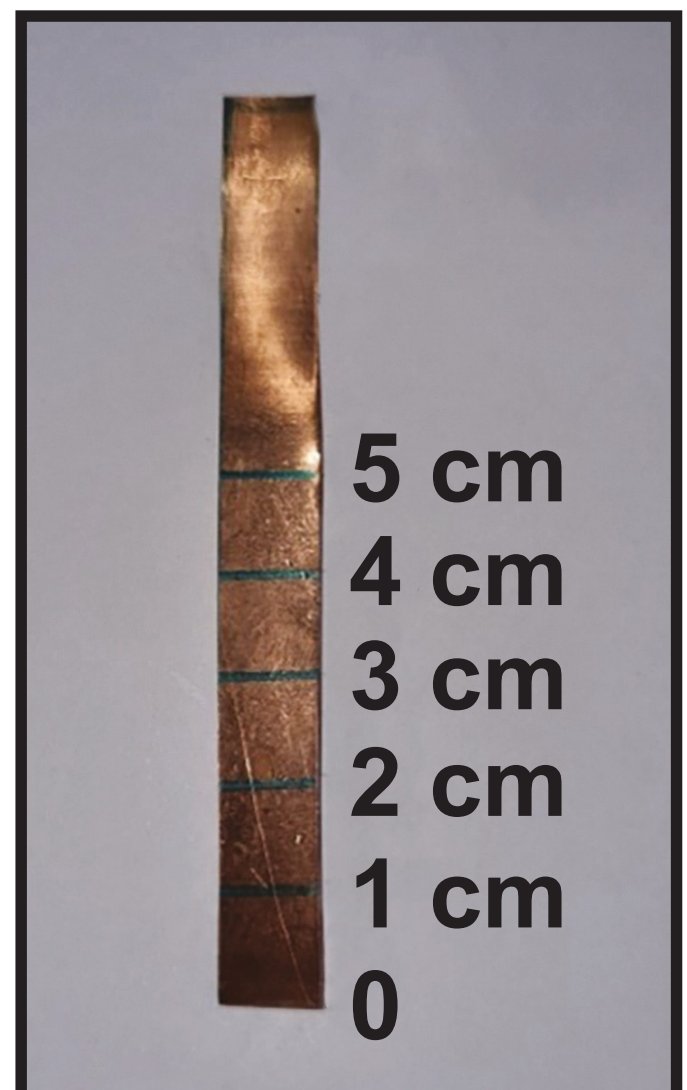
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DIAGRAM



Electrodes clipped to sides of the beaker



Copper foil electrode

READ THE METHOD AND ANSWER QUESTIONS 1 (a) AND 1 (b) BEFORE CARRYING OUT THE EXPERIMENT AND RECORDING YOUR RESULTS.

METHOD

- 1. Wear eye protection.**
- 2. Use the measuring cylinder to measure 200 cm^3 of dilute copper(II) sulfate solution into the beaker.**
- 3. Clip the copper foil electrodes, using the crocodile clips, to opposite sides of the beaker containing dilute copper(II) sulfate solution so that 5 cm of each electrode is immersed.**
- 4. Connect the electrodes and the ammeter to the power supply.**
- 5. Switch on the power supply, measure and record the current IMMEDIATELY.**

(Turn over)

- 6. Switch off the power supply.**
- 7. Repeat steps 5–6 two more times to give a total of three results.**
- 8. Repeat steps 3–7 adjusting both electrodes so that the following lengths are immersed in the dilute copper(II) sulfate solution: 4 cm, 3 cm, 2 cm and 1 cm.**
- 9. Pour the contents of the beaker into the waste bowl and wash your hands.**

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HAZARD	RISK	CONTROL MEASURE
DILUTE COPPER(II) SULFATE SOLUTION IS AN IRRITANT		

SECTION A

Answer ALL questions.

1 (a) State a hypothesis for this experiment. [1 mark]

(b) Complete the risk assessment on the opposite page for dilute copper(II) sulfate solution in this experiment. [1 mark]
Use the student safety sheet on page 11 of this examination paper.

(Turn over)

**YOU MAY RECORD RAW RESULTS IN
THE SPACE BELOW.**

(Turn over)

**1 (c) Present your results in a table.
Include all of your results. [4 marks]**

6

END OF PAPER

CLEAPSS**Student safety sheets****40**

**Copper and its compounds
including COPPER OXIDES,
CARBONATE, SULFATE, CHLORIDE,
NITRATE**

Substance	Copper (metal)
Hazard	Currently not classified as hazardous
Comment	Sharp edges can present a risk of cuts. Granulated copper may be classified by some suppliers as toxic to aquatic life with long lasting effects.

(Turn over)

Substance	Copper(I) oxides (Cuprous oxides) Copper(II) oxides (Cupric oxides)
Hazard	CORR.* IRRITANT ENVIR.
Comment	DANGER. Copper(I) oxide: *causes serious eye damage; skin irritant; harmful if swallowed/inhaled; toxic to aquatic life. WARNING. Copper(II) oxide: causes serious eye irritation; skin irritant; harmful if swallowed/inhaled; toxic to aquatic life.

(Turn over)

Substance	Copper(II) carbonate hydroxide (Basic copper carbonate, malachite)
Hazard	 IRRITANT ENVIRONMENT
Comment	WARNING. Copper(II) carbonate hydroxide: causes serious eye irritation; skin irritant; harmful if swallowed/inhaled, toxic to aquatic life. Also known as malachite.

(Turn over)

Substance	Copper(II) sulfate Copper(II) nitrate Solids and concentrated solutions
Hazard	CORR. IRRITANT ENVIR.*
Comment	DANGER. Solids and solutions ($\geq 1.0 \text{ mol/dm}^3$ SULFATE, $\geq 1.3 \text{ mol/dm}^3$ NITRATE): cause serious eye damage; skin irritant; harmful if swallowed (especially saturated solutions for crystal-growing). *Solid only: very toxic to aquatic life. Water added to anhydrous solid copper(II) sulfate(VI) produces heat.

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Substance	Copper(II) sulfate Copper(II) nitrate Dilute solutions
Hazard	  CORROSIVE IRRITANT

Comment	DANGER. SULFATE ($< 1.0 \text{ mol/dm}^3$ and $\geq 0.2 \text{ mol/dm}^3$) and NITRATE ($< 1.3 \text{ mol/dm}^3$ and 0.2 mol/dm^3): skin irritant; cause serious eye damage. WARNING. SULFATE ($< 0.2 \text{ mol/dm}^3$ and 0.02 mol/dm^3) and NITRATE ($\geq 0.15 \text{ mol/dm}^3$ and 0.05 mol/dm^3): skin and eye irritant. Currently not classified as hazardous. SULFATE ($< 0.02 \text{ mol/dm}^3$) and NITRATE (0.05 mol/dm^3). Benedict's solution and Fehling's solution both contain dilute copper(II) sulfate but Fehling's solution has other hazards.
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Substance	Copper(II) chloride Solid
Hazard	  IRRITANT ENVIRONMENT
Comment	WARNING. eye and skin irritant; harmful if swallowed; toxic to aquatic life.

Substance	Copper(II) chloride Solutions (if 0.8 mol/dm³ or more)
Hazard	 IRRITANT
Comment	WARNING. Eye and skin; harmful if swallowed (≥ 1.8 mol/dm³).

(Turn over)

Substance	Copper(II) chloride Solution (if less than 0.8 mol/dm³)
Hazard	Currently not classified as hazardous
Comment	

Typical control measures to reduce risk

- **Wear eye protection.**
- **Use the lowest concentration possible.**
- **Avoid raising dust, e.g. by dampening powders.**
- **Take care if evaporating solutions to dryness.**

(Turn over)

Assessing the risks

- **What are the details of the activity to be undertaken? What are the hazards?**
- **What is the chance of something going wrong?**
e.g. Solutions spurting out of test tubes when heated or solutions decomposing to toxic products when heated to dryness.
- **How serious would it be if something did go wrong?**
e.g. Are there hazardous reaction products (such as chlorine from the electrolysis of copper chloride)?
- **How can the risk(s) be controlled for this activity?**
e.g. Can it be done safely? Does the procedure need to be altered? Should goggles or safety spectacles be worn?

(Turn over)

Emergency action

In all emergency situations, alert the responsible adult immediately. Be aware that actions may include the following:

- **IN THE EYE**
Irrigate the eye with gently-running tap water for at least 20 minutes. Call 999/111.
- **IN THE MOUTH/SWALLOWED**
Do no more than rinse and spit with drinking water. Do NOT induce vomiting. Call 999/111.
- **DUST BREATHED IN**
Remove the casualty to fresh air. Consult a medic if breathing is difficult.

(Turn over)

- **SPILT ON THE SKIN OR CLOTHING**
Remove contaminated clothing. Irrigate the affected area with gently-running tap water for at least 20 minutes. Call 999/111 as appropriate. Rinse clothing.
- **SPILT ON THE FLOOR, BENCH, ETC**
Scoop up solid (take care not to raise dust). Wipe up small solution spills or any traces of solid with cloth; for larger spills use mineral absorbent (e.g. cat litter).

Question number	Additional page, if required. Write the question numbers in the left-hand margin.

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