GCSE

MONDAY, 8 JANUARY – FRIDAY, 9 FEBRUARY 2024

CHEMISTRY – Unit 3 (3410U30)

PRACTICAL ASSESSMENT

INVESTIGATING EXOTHERMIC REACTIONS

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.

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

Introduction

Your task is to investigate the temperature change during the reaction between zinc and copper(II) sulfate solution.

Apparatus Required

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

eye protection
1 × polystyrene cup
1 × 100 cm^3 measuring cylinder
1 × 250 cm^3 beaker
1 × 250 cm^3 beaker containing approximately 60 cm^3 of 0.5 mol/dm^3 copper(II) sulfate solution
2 × pre-weighed sample of zinc powder (2.5 g in each sample)
1 × thermometer
1 × stopwatch

(Turn over)

ACCESS TO:
waste bowl

CLEAPSS student safety sheet:
40 – Copper and its compounds.

This is provided on pages 13–22 of this examination paper.

(Turn over)

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

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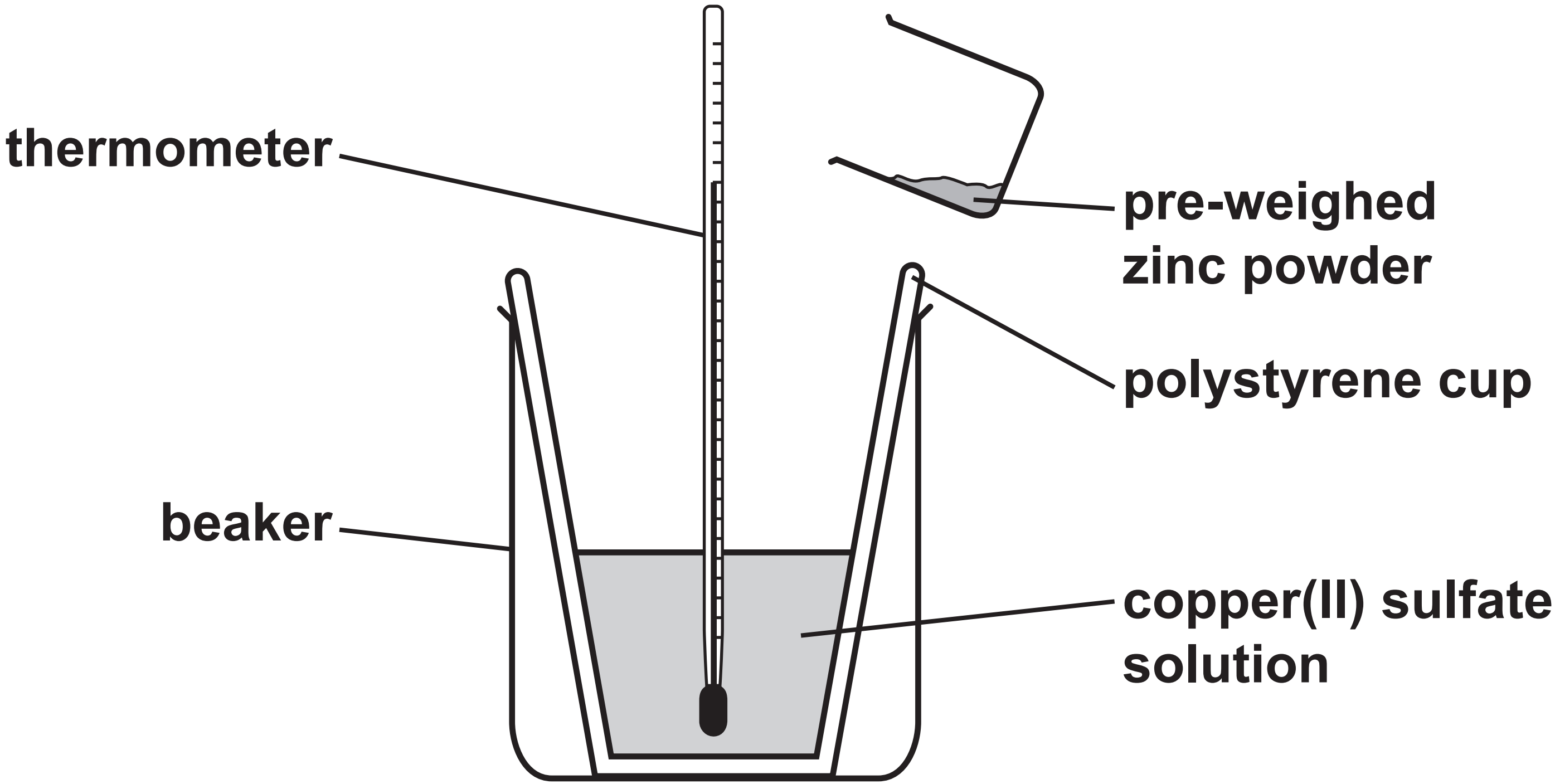
Diagram


thermometer
pre-weighed zinc powder
polystyrene cup
beaker
copper(II) sulfate solution

Method

1. Wear eye protection.

2. Measure 25 cm^3 of 0.5 mol/dm^3 copper(II) sulfate solution using the measuring cylinder.

3. Place the polystyrene cup in the beaker for stability.

4. Pour the copper(II) sulfate solution into the polystyrene cup.

5. Record the temperature of the copper(II) sulfate solution. This is the start temperature at 0 seconds.

6. Add the pre-weighed zinc powder to the polystyrene cup and start the stopwatch.

(Turn over)

7. Stir the mixture constantly with the thermometer and record the temperature every 30 seconds for three minutes.

8. Empty the contents of the polystyrene cup into the waste bowl and rinse with cold water.

9. Repeat steps 2–8 one more time to get a total of two sets of results.

(Turn over)

SECTION A

Answer ALL questions.

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

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

1 (b) Complete the risk assessment on the opposite page for this experiment. [1 mark]

You may use the student safety sheet on pages 13–22 of this examination paper.

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

KEY: CORR. = CORROSIVE
ENVIR. = ENVIRONMENT

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 (≥ 1.0 mol / dm^3 SULFATE, ≥ 1.3 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.**

(Turn over)

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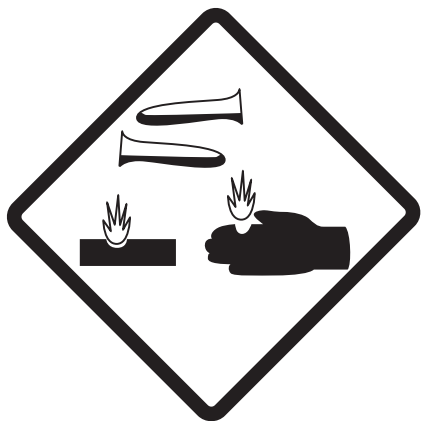
Substance	**Copper(II) sulfate** **Copper(II) nitrate** **Dilute solutions**
Hazard	 **CORROSIVE**  **IRRITANT**

Comment	DANGER. SULFATE (< 1.0 mol / dm^3 and ≥ 0.2 mol / dm^3) and NITRATE (<1.3 mol / dm^3 and ≥ 0.2 mol / dm^3): skin irritant; cause serious eye damage. WARNING. SULFATE (< 0.2 mol / dm^3 and ≥ 0.02 mol / dm^3) and NITRATE (< 0.15 mol / dm^3 and ≥ 0.05 mol / dm^3): skin and eye irritant. Currently not classified as hazardous. SULFATE (< 0.02 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.

(Turn over)

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 / dm^3 or more)**
Hazard	 **IRRITANT**
Comment	**WARNING. Eye and skin; harmful if swallowed (≥ 1.8 mol / dm^3).**

(Turn over)

Substance	**Copper(II) chloride Solution (if less than 0.8 mol / dm^3)**
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).

(Turn over)

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

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