

Candidate's Name: T. I.

School:

Sign:

| Centre No. | | | | | Personal No. | | |
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545/2
CHEMISTRY
PRACTICAL
Paper 2
JULY/AUG. 2024
2 hours



HOIMA DIOCESE EXAMINATIONS BOARD

UCE Mock Examination, 2024

CHEMISTRY

Paper 2

2 hours

INSTRUCTIONS TO CANDIDATES

Attempt the item in this paper. Responses are to be written in the spaces provided in this booklet.

You are **not** allowed to use reference books (i.e. text books, booklets on qualitative analysis etc.)

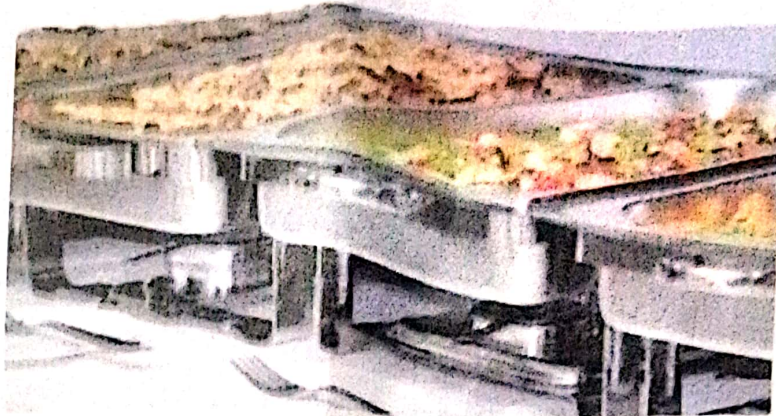
All working **must** be clearly shown.

Mathematical tables and silent non-programmable calculators may be used.

| FOR ASSESSMENT USE ONLY | | |
|-------------------------|--|--|
| ITEM 1 | | |

Item 1

A metal scrap recycling company is exploring an innovative method to generate heat in food warmers. Their idea involves using **iron scrap** in a process that **displaces copper (II) ions** from a solution. This approach would potentially reduce use of polluting fossil fuels. However, the company needs to determine if this method can produce a significant amount of heat, ideally above 50,000 joules, to be a viable solution.



You are provided with:

- Solid **P** which is sample of Iron filings from scrap.
- **BA1** which is Copper (II) sulphate solution.
- Some apparatus.

Tasks

- (a) Design an experiment that can be used to determine the amount of heat involved.

Accept rxn between solid P and soln BA1
Aim: To determine the heat evolved for the reaction between iron and copper(II) sulphate solution ✓ (1)

Hypothesis: The reaction between iron and copper(II) sulphate produces heat change of above 50,000J making the reaction suitable for use. ✓ (1)

Relevant apparatus: iron metal, copper(II) sulphate soln, measuring cylinder, plastic beaker (cup), thermometer, stop clock or stop watch. ✓ (1) any correct 3

Variables: Independent variable ✓ - time

Dependent variable ✓ - temperature of soln

Controlled variable - Volume of copper(II) sulphate or mass of solid P or Iron

RISKS

pouring of soln on table
fumes from

Mitigation

- perform the experiment carefully
- clean the table as soon as the soln pours
- put on face mask

accept any vol of BA1 less than 50 ml
accept any mass of solid P less than 5g

- (b) Carry out the experiment and determine the amount of heat involved.
- Using a measuring cylinder, 50 cm³ of copper(II) sulphate solⁿ was transferred into a plastic beaker or cup. The initial temperature of the solution was determined using a thermometer and recorded. 5g of Icos powder was then added at once to the beaker containing the solution and at the same time a stop clock or watch started. The mixture was stirred gently with a thermometer and temperature recorded after intervals of 30 seconds for (4-8) minutes. The results were then tabulated as below.

| | | | | | | | | | |
|--------------------------------|------|------|------|------|-------|-------|-------|-------|-------|
| Time (s) | 0.0 | 30.0 | 60.0 | 90.0 | 120.0 | 150.0 | 180.0 | 210.0 | 240.0 |
| Temp. of sol ⁿ (°C) | 27.0 | 35.0 | 38.0 | 38.0 | 37.5 | 37.0 | 36.5 | 36.0 | 35.5 |

- (c) Analyse the results and draw the conclusion.
- Data analysis:

From the table above, it can be seen that there is an increase in temperature as the reaction proceeds indicating that heat energy is given out to the surroundings, temperature remains constant and then decreases.

- (c) Analyse the results and draw the conclusion.

maximum temperature = 38.4 (must have come from the graph)

Initial temp = 27.0 } ignore

maximum temperature rise = $(38.4 - 27.0) = 11.4^{\circ}\text{C}$

Heat change produced by the reaction

mass of solⁿ = $(50 \times 1) = 50\text{g}$

$C = 4.2 \text{ Jg}^{-1}\text{K}^{-1}$

Heat = $m \times C \times \Delta T$

$50 \times 4.2 \times 11.4 = -2394\text{J}$

Turn Over

164

1 cm represent

Title - 0 1/2

axes - 01

Scale - 01

Plotting - 03

Coverage - 01 1/2

06

rej: rep.

- equal signs

Scale - ratio

arrow

- equivalent (→)

rej: without unit

Interchange of axes - (06)

axes without units (06)

Time without units, no mark

Conclusion - Since the reaction evolves heat of 2394 J which is below 50,000 J, the reaction is not suitable for use to generate heat in food warmers.

Recommendation: - Use a metal which is more reactive than solid P or Iron in the electrochemical series.
- Use any other source of fuel

02

