Coordination Contribution from unknown Chemistry Educator

Candidate's Name: ....

Signature: ....

Random No.						Personal No.		

(Do not write your School/ Centre Name or Number anywhere on this Booklet.)

545/3
CHEMISTRY
Paper 3
(Practical)

2 hours

TA 24

0772194332
0752194332

Disclaimer

Coordination Contribution are not in any case linked to final decisions by the assessment body but rather knowledge sharing based on previous interactions and consultations from colleagues on current assessment standards

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

CHEMISTRY

Paper 3
(Practical)

2 hours

INSTRUCTIONS TO CANDIDATES:

This paper consists of **one compulsory** *examination item.*

Answers to this item are to be written in the spaces provided in this booklet. Use **blue** *or* **black** *ink. Any work done in pencil* **except** *drawings and graph will* **not** *be scored.*

All *working* **must** *be clearly shown. Graph paper will be provided.*

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

You are **not** *allowed to use reference books.*

Candidates are advised to carefully read the item, make sure they have all the apparatus and chemicals they may need and then **plan** *appropriately before starting.*

ITEM

Rashid is a student who intends to make a presentation during a science fair on **Alternative Energy Solutions**. He wants to use the reaction of iron with copper(II) sulphate solution to generate heat. However, he does not know the maximum amount of heat generated by the reaction.

Iron reacts with copper(II) Sulphate according to the following equation:

$$CuSO_{4\,(aq)} + Fe_{(s)} \longrightarrow FeSO_{4\,(aq)} + Cu_{(s)}$$

You have been contacted to help Rashid and you are provided with the following:
BA1, which is 30 cm^3 of copper(II) sulphate solution.
X, which is iron.

Task:

As a learner of Chemistry,

(a) design an experiment you will use to determine the maximum heat change for the reaction.
(*Your design should include; aim, hypothesis, variables, apparatus and materials, procedure, risks and their mitigations.*)

qward Aim is Heat/or Enthalpy
2 key words — BA1 and Solid X

AIM: AN EXPERIMENT TO DETERMINE THE ENTHALPY OF DISPLACEMENT WHEN IRON REACTS WITH COPPER (II) SULPHATE SOLUTION A1 (02)

HYPOTHESIS: The reaction between Iron and Copper (II) Sulphate solution is exothermic/ gives out heat. H1 (01)
Acceptable negative hypothesis

VARIABLES
Independent Variable: Time taken for reaction IV1 (03)
Dependent Variable: Temperature change DV1
Controlled Variable: Volume of BA1 solution/ or Volume of Copper(II) Sulphate Sln; Mass of iron/metal CV1 X1

IV, DV, CV } -03

Total = 06

List of Materials/Requirements

- 50cm³/100cm³ measuring cylinder/~~measuring~~
- plastic beaker (250ml)
- Thermometer
- Mass of Solid X/iron metal (2g) R1 02
- Solution BA1/copper (II) Sulphate solution 02
- Weighing balance.
- Stop watch/Stop clock R2.

Procedure

(b) carry out the experiment and record your results.
(*A minimum of six readings required.*)

PROCEDURE

- $30cm^3$ / $50cm^3$ / $100cm^3$ of Solution BA, was measured using a measuring cylinder and transfered into a clean plastic beaker; ✓ 1P
- The thermometer was inserted into the Solution BA, in a plastic beaker and initial temperature T_1 measured and recorded $T_1 = 27.0\,^{\circ}C$; ✓ P2
- 1g / 2g of Solid X was weighed using a weighing balance / scale and added into Solution BA, in the plastic beaker, stirred well to mix with a thermometer and the stop watch was started immediately ✓ P3
- The temperature readings of the mixture were noted and recorded at ~~end~~ 1 every One minute / or 30 seconds for Six minutes. ✓ P4

04

The results were recorded in a suitable table.

Risks and mitigations

Risk: Breaking of a thermometer R1

Mitigation: The breaking of thermometer can be mitigated by placing the thermometer in its casing after using it. M1 02

(c) analyse your results and inform Rashid accordingly.

The table of results is tabulated below;

Initial temperature of solution BA, F_1 = 27.0°C

Table of results

Time in minutes	0.0	0.5	1.0	1.5	2.0	2.5	3.0
Temperature change	27.0	31.0	32.0	34.0	34.0	34.0	34.0
	27.0	31.0	32.0	34.0	34.0	34.0	34.0

05

The results in the table above was plotted in a suitable graph

(See graph next page) ⇒

QR

Analysis of Results

Time in minutes	0.0	0.5	1.0	1.5	2.0	2.5	3.0
Temperature Change in °C	27.0	31.0	32.0	34.0	34.0	34.0	34.0

05

Data

Initial temperature $T_1 = 27.0\ °C$

Highest temperature $T_2 = 34.0\ °C$

Temperature change $\Delta T = T_2 - T_1 = 34.0 - 27.0$

$\Delta T = 7.0\ °C$

Heat evolved $= MC\Delta T$ where;

$M_w = D \times V$

$= 1g \times 100\ cm^3$

M = Mass of solid + Mass of BA_1

$= 6g + 100g$

$= 106g$

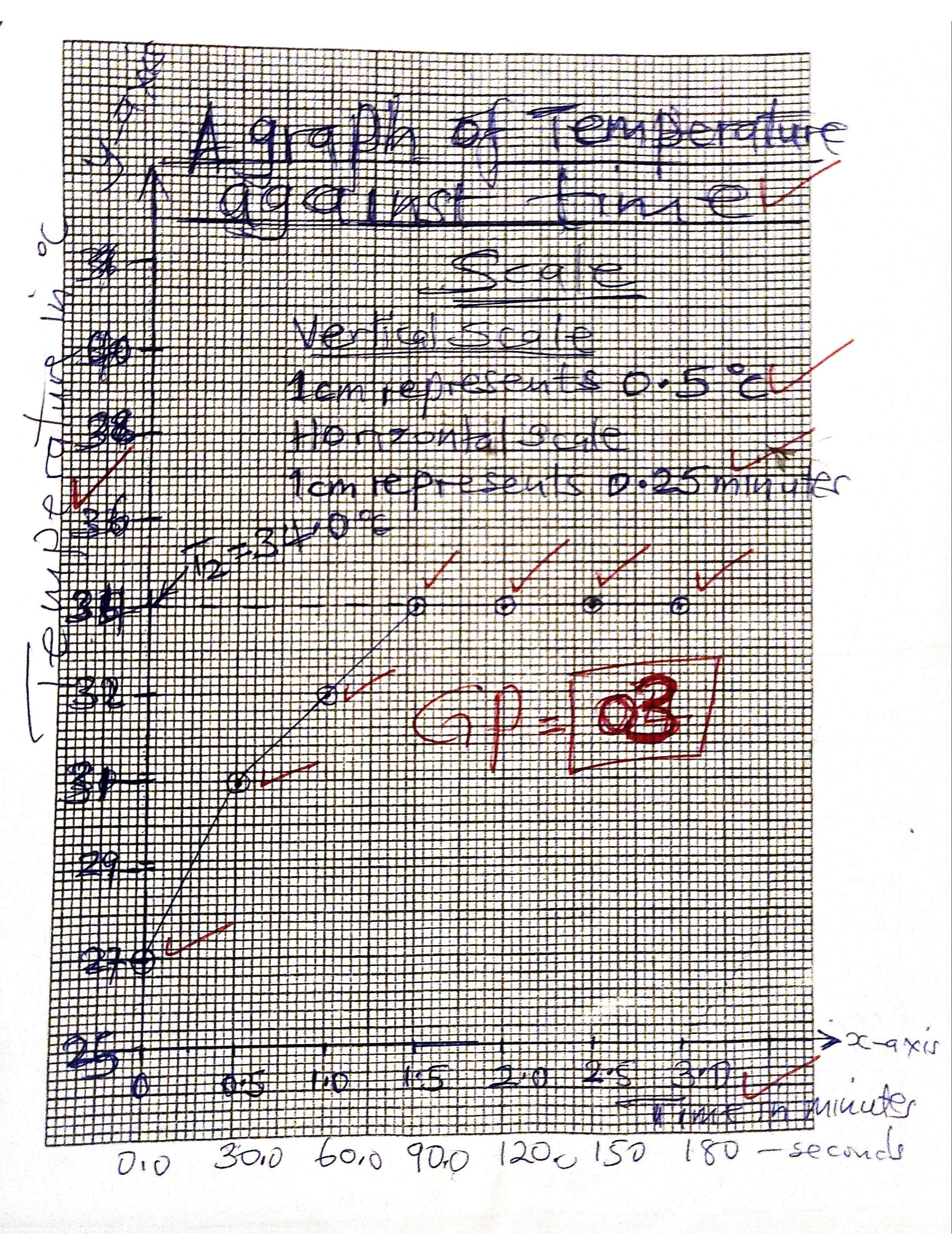
$C = 4.2$

∴ Heat given out $= MC\Delta T$

$= (106 \times 4.2 \times 7.0)j$

$= 3116.4$ Joules

OR $= 3.1164\ Kj$


A graph of Temperature against time
Scale
Vertical Scale
1cm represents 0.5°C
Horizontal Scale
1cm represents 0.25 minutes
T2 = 34.0°C
Temperature in °C
39
38
37
36
35
34
33
32
31
30
29
28
27
25
0
0.5
1.0
1.5
2.0
2.5
3.0
x-axis
time in minutes
0.0
30.0
60.0
90.0
120.0
150
180 - seconds