

NYAMIRA SUB-COUNTY JOINT EVALUATION EXAMS

233 / 3

CHEMISTRY

CONFIDENTIAL

JULY / AUGUST 2014

CONFIDENTIAL TO ALL SCHOOLS FOR CHEMISTRY TEACHERS

INSTRUCTION TO SCHOOLS

The information contained in this paper is to enable the Head of the school and the teacher in charge of chemistry to make adequate preparations for this year's mock chemistry practical examination. **NO ONE ELSE** should have access to this paper or acquire knowledge of its contents. Great care should be taken to ensure that the information contained herein **DOES NOT** reach the candidates either directly or indirectly. The teacher in charge of chemistry should **NOT** perform any of the experiment in the same room as the candidates nor make the results of the experiment available to the candidates or give any other information related to the experiment to the candidates.

Requirements for candidates

Each candidate will require the following

- 3 conical flasks (250ml)
- A 25ml pipette
- A 50ml burette
- About 80cm³ of solution A
- About 100cm³ of solution B
- About 170cm³ of solution C
- Phenolphthalein indicator supplied with a dropper
- Pipette filler
- A label
- 500cm³ of distilled in wash bottle
- 10ml measuring cylinder
- 50ml measuring cylinder
- 100ml measuring cylinder
- One piece of about 7-8 cm of metal M
- 250ml glass beaker
- A thermometer (-10°C-11°C)
- Stop watch
- Retort stand
- 2 boiling tubes
- 30cm long piece of tissue paper
- About 2g of solid E
- About 0.5g of solid F
- 6 clean test-tubes
- Universal indicator + its pH chart
- Ethanol supplied with a dropper
- Clean dry metallic spatula
- A blade/a pair of scissors
- A ruler
- Retort stand
- Filter paper(Watchman No.1)-3pcs
- Wooden splint

Access to solutions:

- Concentrated sulphuric (VI) acid in a dropper bottle
- acidified Potassium dichromate (VI) solution
- Acidified Potassium Manganate (VII) solution.
- 2M hydrochloric acid
- 0.1M Potassium Iodide solution
- 2M Ammonium hydroxide/Aqueous Ammonia
- 0.5M Sodium sulphate
- 0.2M Lead (II) nitrate

- 0.2M Barium nitrate

-Bunsen burner (Source of heat)

Preparations

(a) Solution A=1M HCl

Measure 86cm³ of 1.18g/cm³ of concentrated hydrochloric acid and dilute in 400cm³ of distilled water then top up to 1000cm³ with distilled water

Solution B

(b) Measure 6.3g of oxalic acid into a beaker, add 200cm³ of distilled water to dissolve then top up the resultant solution to 1litre

(c) Solution C: 0.1M NaOH

Measure 4.0g of NaOH pellets and put it into 400cm³ of distilled water, top up the resultant to 1000cm³

(d) Acidified Potassium manganate (VII) solution

Measure 3.16g of KMnO₄ in 400cm³ of 2M H₂SO₄ and top up to 1 litre of solution with distilled water

(e) Acidified Potassium dichromate (VI) solution

Measure 25g of K₂Cr₂O₇, put it into 400cm³ of 2M H₂SO₄ hen top up to 1000cm³ with distilled water

NB

Solid E-Measure 1g of Zinc carbonate and mix it with 1g of Aluminium chloride

Metal M-7.8cm of Magnesium ribbon

Solid F-Maleic acid

Liquid G-Absolute Ethanol

Name..... Index No:.....

233/3
CHEMISTRY
PAPER 3
PRACTICAL
JULAY/AUGUST 2014
TIME: 2 ¼ HOURS

Candidate's Signature.....

Date:

NYAMIRA SUB-COUNTY JOINT EVALUATION EXAM

Kenya Certificate of Secondary Education (K.C.S.E.)

233/3
Chemistry
Paper 3
2 ¼ hours

INSTRUCTIONS TO CANDIDATES

- Write your **name** and **index number** in the spaces provided.
- **Sign** and write the **date** of examination in the spaces provided.
- Answer **all** the questions in the spaces provided in the question paper.
- You are not allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus you need.
- All working **must** be clearly shown where necessary.
- Mathematical tables and electronic calculators may be used.

For examiners use only

Question	Maximum Score	Candidate's Score
1	12	
2	7	
3	21	
TOTAL	40	

This paper consists of 4 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

1. You are provided with:
 Aqueous hydrochloric acid, solution A
 Solution B containing 6.3g of dibasic acid $H_2C_2O_4 \cdot 2H_2O$ per litre
 Aqueous sodium hydroxide, solution C
 Phenolphthalein indicator

You are required to:-

- (i) Standardize the sodium hydroxide solution C
 (ii) Use the standardized solution C to determine the concentration of A
 (iii) React the hydrochloric acid, solution A with metal M and determine the mass of 6cm of metal M

Procedure I

Fill the burette with solution B

Pipette 25.0cm^3 solution C into a conical flask. Add 2 drops of phenolphthalein indicator. Titrate solution B against solution C.

Record your results in table I below. Repeat the procedure and fill the table below

Table I

	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Titre volume (cm^3)			

- (a) What is the average volume of solution B used (3 ½ mks)
(1mk)
-

(b) Calculate:

- (i) the concentration of the dibasic solution B in moles per litre (1mk)
 (C=12,H=1,O=16)

- (ii) the concentration of the Sodium hydroxide solution C in moles per litre (1mk)

Procedure II

Using a 100cm^3 measuring cylinder, measure 90cm^3 of distilled water and place it into a 250cm^3 beaker and then add 10cm^3 of solution A

Mix the solution well and label it D

Fill a burette with solution D

Pipette 25.0cm^3 of solution C into a conical flask

Titrate using phenolphthalein indicator

Table II

	I	II	II
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of titre volume (cm^3)			

(3 ½ mks)

(a) What is the average volume of solution D used? (1mk)

.....
(b)(i) Calculate the concentration of the diluted hydrochloric acid, solution D in moles per litre(1mk)

(ii) Determine the concentration of the original hydrochloric acid, solution A in moles per Litre (1 ½ mks)

Procedure III

Measure exactly 6cm of metal M provided.

Measure 49cm³ of solution A and transfer into a clean boiling tube

Wrap the boiling tube with tissue paper

Measure the temperature of this solution and record in table III below

Simultaneously place the metal M into solution A in the boiling tube and start the stopwatch.

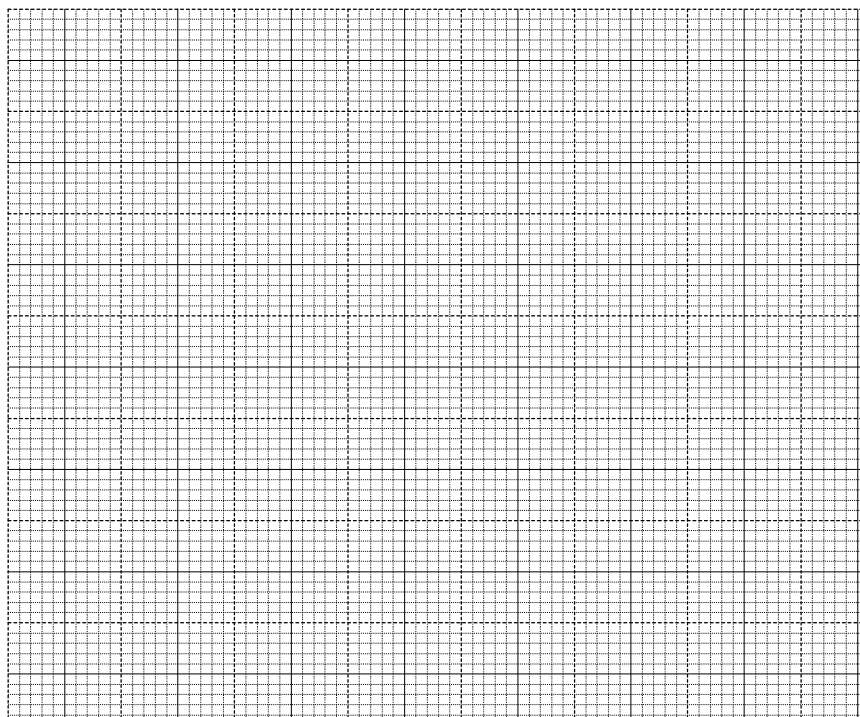
Record the temperature of the contents in the boiling tube after every 30 seconds in the table below

Time	0	30	60	90	120	150	180	210	240	270	300
Temp (°c)											

(i) Plot a graph of temperature against time

(2mks)

(3mks)



(ii) From the graph, determine the highest temperature change

(1mk)

(iii) Calculate the heat of reaction in this experiment

(1mk)

(iv) Given that the molar heat of reaction between metal M and solution A is -1600kJmol^{-1} , determine the number of moles of metal M used (1mk)

(v) Determine the mass of metal M used in this experiment (RAM=24) (1mk)

2. You are provided with solid E. carry out the following tests and write your observations and inferences in the spaces provided

a) Place all of solid E into a boiling tube. Add about 12cm^3 of distilled water and shake thoroughly. the mixture into another boiling tube. Retain the filtrate for use in 2(b) below. Dry the residue using pieces of filter papers

(i) Transfer half of the dry residue into a dry test tube. Heat the residue strongly and test any gas produced using a burning wooden splint

Observations	Inferences
1mk	1mk

(ii) Place the other half of the residue in a dry test-tube. Add 3cm^3 of 2M hydrochloric acid. Retain the mixture for test (iii) and (iv) below

Observations	inferences
($\frac{1}{2}$ mk)	($\frac{1}{2}$ mk)

(iii) To 2cm^3 of solution obtained in a(ii) above, add 2cm^3 of Potassium Iodide solution

Observations	inferences
($\frac{1}{2}$ mk)	($\frac{1}{2}$ mk)

(iv) To another 2cm^3 of solution obtained from a(ii) above, add 4cm^3 of aqueous ammonia drop wise till in excess

Observations	Inferences
($\frac{1}{2}$ mk)	($\frac{1}{2}$ mk)

(b) Divide the filtrate obtained into 5 portions

(i) To the first portion of the filtrate obtained in (a) above, add 3cm^3 of aqueous ammonia (excess)

Observations	inferences
($\frac{1}{2}$ mk)	($\frac{1}{2}$ mk)

(ii) To the second portion of the filtrate add 2 drops of sodium sulphate solution provided

Observations	Inferences
(½ mk)	(½ mk)
(iii) To the third portion of the filtrate, add 2 drops of Barium nitrate solution provided	
Observations	Inferences
(½ mk)	(½ mk)
(iv) To the fourth portion of the filtrate, add 2cm ³ of hydrochloric acid provided	
Observations	Inferences
(½ mk)	(½ mk)
(v) To the fifth portion of the filtrate add two drops of Lead (II) nitrate solution and heat to boil	
Observations	inferences
(½ mk)	(½ mk)

3. (I) You are provided with solid F. Carry out the tests below and record your observations and inferences in the spaces provided
 (a)(i) Using a metallic spatula, heat half of solid F in a non-luminous burnsen burner flame for some time then remove when it ignites

Observations	Inferences
(1mk)	(1mk)

- (ii) Put a half spatula endful of solid F into a boiling tube. Add about 10cm³ of distilled water and shake vigorously

Observations	inferences
(½ mk)	(½ mk)

- (b) Divide the resulting solution form a(ii) above

- (i) To the first portion, dip a piece of universal indicator paper and determine its PH

Observations	inferences
(½ mk)	(½ mk)

- (ii) To the second portion, add two drop of acidified potassium Manganate (VII) solution and shake vigorously

Observations	Inferences
(½ mk)	(½ mk)

(c) Put half spatula end ful of solid F into a boiling tube and add 5 drops of ethanol followed by 2 drops of concentrated sulphuric (VI) acid. Warm the mixtures

observations	inferences
(½ mk)	(½ mk)

(II) You are provided with liquid G. Use it to carry out the following tests and record your observations and inferences below.

Divide the liquid into (three portions)

(i) To the first add 2 drops of acidified Potassium Manganate (VII) solution

Observations	Inferences
(½ mk)	(½ mk)

(ii) To the second portion, dip both red and blue litmus papers provided

Observations	Inferences

NYAMIRA SUB-COUNTY JOINT EVALUATION EXAMS
CHEMISTRY 231/3
MARKING SCHEME
JULY/AUGUST 2014
 Procedure I

Table 1

	I	II	III
Final burette reading (cm ³)	24.0	48.0	24.0
Initial burette reading (cm ³)	0.0	24.0	0.0
Titre volume (cm ³)	24.0	24.0	24.0

CT-1mk
 D.P=1mk
 AC-1mk
 P.A=1mk
 F.A=1mk

Awarding /distribution of marks:

(a) Complete table (C.T)-1mk

Conditions

- (i) Complete table with 3 titrations -1mk
- (ii) Incomplete table with 2 titrations .. ½ mk
- (iii) Incomplete table with 1 titration ...0mk

Penalties

- (i) Wrong arithmetic
 - (ii) Inverted table
 - (iii) Where burette readings are beyond 50 and unexplained
 - (iv) Unrealistic titre readings (values) i.e below 1.0cm³ or hundreds
- (Penalize ½ mk each to maximum of ½ mk /penalize once for any of the above mistakes)

(b) Use of decimals (d.p) 1mk

Tied to the first and second row only

Conditions

- (i) accept either 1 or 2 d.p used consistently, otherwise penalize fully
- (ii) If the 2nd D.P is used, then it should be either '0' or '5'

Accept inconsistency in the use of zeros used as initial burette readings e.g 0.0,0,00.00,0.000

© Accuracy (Tied to the correct titre value).....1mk

Compare the candidates titre value with the school value and award marks as follows

- (i) If atleast one titre value is within ± 0.1 of the schools value (SV>)1mk
- (ii) If none of the titre values within ± 0.2 of SV..... ½ mk

(iii) If none is within ± 0.2 of S.V.....0mk

(Tick the value that awards for the accuracy (AC) mark from the table)

N/B

(i) If there is wrong arithmetic/no subtraction in the table, compare the WORKED OUT correct value with the S,V and award accordingly.

(ii) Where there are two possible school values from the teachers results, indicate both values on the script and use the one closer to the candidates values to award accuracy and final accuracy

(iii) If no S.V is given or cannot be worked out from the teachers titre values as per the principles of averaging, then:

(a) All the candidates correct average titre values should be written down and close values picked for averaging per session

(b) If the candidates values are varied, ignore them and use the values in the marking scheme (24.0cm^3)

(d)Principles of averaging (P.A)1mk

Conditions

(i) If 3 consistent values are all averaged.....1mk

(ii) If 3 titrations are done, but only 2 are consistence and averaged1mk

(iii) If only 2 titrations are done and are consistent and averaged ...1mk

(iv) If 3 titrations are done, and ALL can be averaged, but only two are averaged.....(0mk)

(vi) If only 2 titrations done, inconsistent and averaged0mk

(vii) If any 1 titrations done,.....0mk

Penalties

(i) Penalize $\frac{1}{2}$ mk for wrong arithmetic if error is outside \pm units in the 2nd decimal place (on the answer)

(ii) Penalise $\frac{1}{2}$ mk for no working shown but correct answer is shown

(iii) Wrong answer and no working shown....0mk

(iv) Wrong working with correct answer shown....0mk

NB

(i) Accept rounding off or truncation of answer to 2d.p, otherwise penalize $\frac{1}{2}$ mk for rounding off or truncating to 1d.p or whole number unless it works out exactly to a whole number

(ii) Accept answer if it works out to exactly to 1d.p or whole number

(e) Final accuracy (F.A).....(1mk)

(Tied to correct averaged titre)

Compare the candidates average titre with the S.V

- (i) If within ± 0.1 of S.V1mk
- (ii) If not within ± 0.1 of S.V but within ± 0.2 of S.V..... $\frac{1}{2}$ mk
- (iv) If not within ± 0.2 of S.V.....(0mk)

N/B

- (i) If there are 2 possible averaged titre values, use the one that is closer to the S.V and credit accordingly.
- (ii) If wrong titre values are averaged by the candidate, pick correct values if any, average and award accordingly
- (b)(i) Concentration of dibasic acid, solution B in moles per litre

$$\frac{\text{mass in g per litre}}{R.M.M}$$

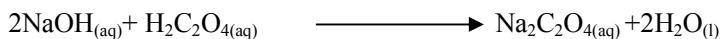
$$\frac{6.3}{126} \sqrt{1}$$

$$=0.05M \sqrt{\frac{1}{2}} / 0.05 \text{ moles /litre}$$

Conditions and penalties

- (i) Penalize fully for strange values other than 6.3 and 126
- (ii) Penalize fully for wrong substitution
- (iii) Penalize $\frac{1}{2}$ mk for wrong answer if substitution is correct
- (iv) Penalize $\frac{1}{2}$ mk for wrong units if shown, otherwise ignore and credit accordingly if units are omitted
- (v) Penalize fully if answer is correct and no method is shown

(ii) The concentration of sodium hydroxide, solution C in moles per litre



Moles of NaOH: $\text{H}_2\text{C}_2\text{O}_4$ (aq) is 2:1 respectively

No of moles of $\text{H}_2\text{C}_2\text{O}_4$ used

Average titre volume x answer in b(i)

$$1000$$

Hence no of moles of NaOH used = Answer obtained above x 2

25cm^3 of NaOH =answer above

$$100\text{cm}^3 = ?$$

$\frac{100}{25}$ x answer obtained

25

OR

No of moles of $\text{H}_2\text{C}_2\text{O}_4$ (aq) used =

$\frac{\text{Average titre} \times \text{answer in (i)}}{1000} = \text{Ans (a)} \sqrt{\frac{1}{2}}$

1000

No of moles of NaOH used = $2 \times \text{Ans (a)}$

25 cm^3 of NaOH = $2 \times \text{Ans (a)}$

1000 cm^3 of NaOH = ?

$\frac{1000 \times 2 \times \text{answer (a)}}{25} = \text{Molarity} \sqrt{\frac{1}{2}}$

25

Conditions /penalties

(i) The chemical equation must be correct for $\frac{1}{2}$ mk

(ii) Penalise fully for strange values

(iii) Accept method used if correct even if the equation is wrong

(iv) Penalise fully for wrong answer if arithmetic error is beyond ± 2 units to the 5th d.p

(v) Penalise $\frac{1}{2}$ mk for wrong units at every step in the calculation to a maximum of (1 $\frac{1}{2}$ mks)

If not shown, ignore and credit fully

(vi) Accept units M, moles /litre/Mole l^{-1} /Moles dm^{-3} /moles/ dm^3

(vii) Accept any other correct method used by the candidate

Procedure II

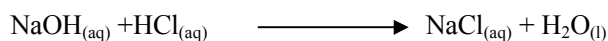
Table II

	I	II	III
Final burette reading (cm^3)	26.0	26.0	26.0
Initial burette reading (cm^3)	0.0	0.0	0.0
Titre (cm^3)	26.0	26.0	26.0

Conditions and penalties are as in Table I

$$(a) \frac{26.0 + 26.0 + 26.0}{3} = 26.0 \text{ cm}^3$$

(b) (i) Concentration of dilute HCl, solution D in moles/litre



Mole ratio of NaOH:HCl=1:1

No. of moles of HCl, solution D used in the experiment

= $\frac{25 \times \text{Ans in b(ii) in procedure I}}{1000}$ = ans b

1000

26.0 cm^3 of HCl = ans b moles

$$1000\text{cm}^3 = ?$$

= $\frac{1000 \times \text{ans b. or } 100 \times \text{Ans (b) moles}}{26}$ average titre in table II

Conditions and penalties are as above (in (ii) procedure)

(ii) Concentration of A in moles /liter

Solution D is a derivative of solution A

1000cm³ of D \longrightarrow Ans c

100cm³ of D \longrightarrow ?

$$\frac{100\text{cm}^3 \text{ of D} \times \text{Ans C} \sqrt{1/2}}{1000\text{cm}^3}$$

100cm³ of solution D has an equal no. of moles of solution A

Hence 10cm³ = Ans C

$$1000\text{cm}^3 = ? \sqrt{1/2}$$

$$\frac{1000\text{cm}^3 \times \text{Ans C}}{10}$$

$$= \text{ans } \sqrt{1/2}$$

Procedure III

Table III

Time	0	30	60	90	120	150	180	210	240	270	300
Temp(oC)	22.0	24.0	26.0	27.0	29.0	31.0	32.0	32.0	31.0	30.0	29.0

Distribution of marks

(i) Complete table.....1mk

Conditions

(i) Incomplete table with at least 7 readings1mk

(ii) Incomplete table with atleast 7 readings... 1/2 mk

(iii) Incomplete table with less than 7 readings0mk

(iv) Penalize 1/2 mk if readings given in the table are constant.

(v) Where there are 2 or more rows of readings, penalize 1/2 mk and then mark the readings used to plot the graph.

However, if no graph is plotted, mark the 1st row in the table. If there are two or more graphs plotted, mark the graph based on the FIRST row,

(vi) For temperature readings showing continuous increase without a constant,, penalize 1/2 mk for any readings showing above 45.0oC to a maximum of 1/2 mk

(vii) Penalise 1/2 mk and treat reading before candidates constant drop in temperature reading which are less than 15.oC as unrealistic to a maximum of 1/2 mk

(viii) For initial temperature, treat temperature below 10°C and those above 40°C as unrealistic and penalize 1/2 mk once

(ix) If the candidates reading start with a constant, penalize 1/2 mk and award accordingly.

B. Use of decimals.....(1/2 mk)

Conditions and penalties

Accept ONLY if all readings are recorded CONSISTENTLY as whole numbers or ONE d.p of .0 or .5 otherwise penalize fully

C. Accuracy (AC) 1/2 mk

Compare candidates FIRST READING with the SCHOOL VALUE

If within $\pm 2^\circ\text{C}$ of the S.V award 1/2 mk otherwise penalize fully

D. Trend.....(1mk)

Conditions/penalties

(i) Award 1mk for continuous increase in temperature followed by a constant then a drop or a drop (i.e continuous rise in temperature followed by a drop)

(ii) Award only 1/2 mk when there is a continuous increase in temperature, then a constant without a drop

(iii) Award only 1/2 mk where there is an increase in temperature, then a constant without a drop

(iv) Award 0mk where there are more than one drop in temperature

(v) Award 0mk where all readings are constant or where there is a temperature decrease

Graph3mks

Distribution of marks:

(i) Labelling axes (L.A).... ½ mk

Conditions and penalties

(i) Penalize fully for inverted axes

(ii) Penalize fully for wrong units otherwise ignore if no units given and award fully

(iii) If only one axis is labeled /units given, conditions (ii) above is applied

2. Scale(½ mk)

(i) Area occupied by the ACTUAL PLOTS MUST be at least ¾ of the graph paper provided

(ii) Scale intervals MUST be constant/consistent

(iii) The scale chosen must be able to accommodate all the plots points

NB: Penalize fully if any of these three conditions is not met

3. Plotting.(1mk)

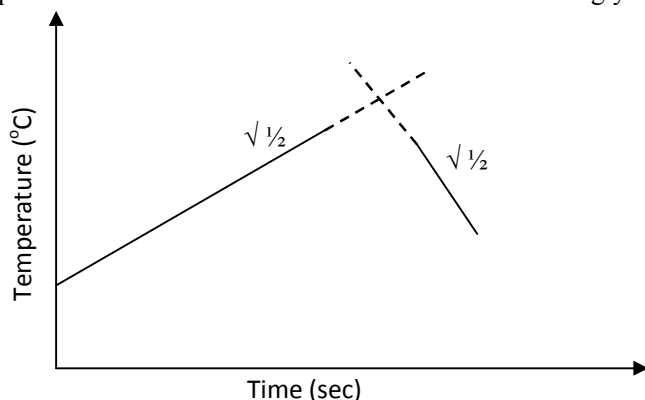
(i) Award 1mk if at least 10 points are correctly plotted

(ii) Award ½ mk if only 7-9 points are correctly plotted, otherwise if less than 7 points are plotted correctly award.

0mk

(iii) If scale intervals are inconsistent then accept plots if any within the FIRST intervals only

(iv) Accept plots even if the axes are inverted and award accordingly



The two lines must be joined by a ruler, otherwise penalize fully.

There must be an evidence of extrapolation

Conditions and penalties

Award 1mk for an extrapolated ascending straight line followed by an extrapolated descending straight line, otherwise penalize fully

(ii) Correctly read value from extrapolated graph√1 nk

(iii) Heat of reaction in this experiment

$$\Delta H = MC\Delta T$$

ΔT = Highest values from extrapolated graph - initial temperature

$$\Delta H = \frac{40 \times 4.2 \times \Delta T}{1000} = kJ \quad 1mk$$

Conditions and penalties

(i) ΔT used must be the obtained from the graph whose ascending and descending lines are extrapolated; otherwise award 0mk

(ii) Penalize ½ mk if the units are wrong, if no units, ignore and award accordingly

- (iii) Accept error within ± 2 units in the fourth digit if answer is in Joules or 3rd D.P if in KJ, otherwise penalize fully
- (iv) Ignore formula for ΔH ; if given it must be correct otherwise penalize fully
- (v) Penalize fully for wrong transfer
- (vi) Penalize $\frac{1}{2}$ mk if negative sign is absent.
- (iv) No of moles of metal M used
 $1 \text{ mole} = -1600\text{kJ}$
 $? = \text{Ans in (iii) above in kJ}$
 $= \frac{\text{answer in (iii) above in kJ} \times 1 \text{ mole}}{-1600\text{kJ}}$

=Ans

Conditions and penalties

- (i) The answer in (iii) above must be transferred intact, otherwise penalize fully
- (ii) Accept any error within \pm units in the 4 D.P otherwise penalize fully
- (iii) Accept Ans. Given to atleast 4 D.P if in kJ, otherwise penalize fully
- (iv) Ignore units if omitted, otherwise penalize $\frac{1}{2}$ mk for wrong units
- (v) Penalize fully for strange figures
- (vi) Penalize fully if the Ans is correct and no method is shown

(v) Mass of metal M

1 mole of M.....24g

Asnw in (iv) above...?

= $\frac{\text{Ans in (iv) above} \times 24\text{g}}{1 \text{ mo}}$

1 mo

=Ans $\sqrt{\frac{1}{2}}$

Conditions and penalties

- (i) The value in (iv) above must be transferred intact otherwise penalize fully
- (ii) Penalize fully for strange values
- (iii) Penalsie $\frac{1}{2}$ mk for an arithmetical error + 2 at the 5th d.p

2. You are provided with solid E. Carry out the following tools and write your observations and inferences in the spaces provided

(a) Place all of solid E into a boiling tube. Add 12cm³ of distilled water and shake thoroughly. Filter the mixture into another boiling tube. Retain the filtrate for use in 2(b) below. Dry the residue using piece of filter papers

(i) Transfer half of the dry residue into a dry test tube. Heat the residue strongly and test any gas produced using a burning wooden splint

Observations	Inferences
- <u>colourless</u> $\sqrt{\frac{1}{2}}$, <u>odourless</u> $\sqrt{1.2}$ gas produced that extinguishes a burning splint; $\frac{1}{2}$ -white solid residue turns <u>yellow</u> on heating white on <u>cooling</u> ; $\frac{1}{2}$ 1mk	-CO ₃ ²⁻ $\sqrt{\frac{1}{2}}$ (tied to gas extinguishes a burning splint) Zn ²⁺ /ZnO $\frac{1}{2}$ (tied to white solid turning yellow on heating, white on cooling; 1mk

(ii) Place the other half of the residue in a dry test-tube. Add 3cm³ of 2M hydrochloric acid. Retain the mixture for test (iii) and (iv) below

Observations	Inferences
Effervesce /bubbles/fizzing ; ½ (½ mk)	CO_3^{2-} √ ½ (Penalize fully for any contradictory ion) Potassium iodide solution dropwise

(iii) To 2cm³ residue add 2cm³ of Potassium Iodide solution dropwise:

Observations	Inferences
No yellow ppt (½ mk)	Pb^{2+} absent (½ mk)

(iv) To 2cm³ of the solution obtained in (ii) above, add 4cm³ of aqueous ammonia drop wise

Observations	Inferences
White √ ½ ppt, soluble √ ½ in excess (½ mk)	Zn^{2+} present√1 Penalize fully for any contradictory ion (½ mk)

(b) Divide the filtrate obtained into 5 portions

(i) To the 1st portion of the filtrate obtained in (a) above, add 3cm³ of aqueous ammonia (excess)

Observations	Inference
White ppt insoluble (½ mk)	Al^{3+} , Pb^{2+} present

(ii) To 2nd portion of the filtrate add 2 drops of sodium sulphate solution provided

Observations	Inferences
No white ppt (½ mk)	Al^{3+} present or Pb^{2+} absent

(iii) To the 3rd portion of the filtrate add 2 drops of Barium nitrate solution provided

Observations	Inferences
White ppt (½ mk)	SO_4^{2-} , SO_3^{2-} , CO_3^{2-} present(½ mk)

(iv) To the 4th portion of the filtrate add 2cm³ of 2M hydrochloric acid

Observations	Inferences
No. effervescence	CO_3^{2-} or SO_3^{2-} absent
No white ppt	Absence of $\text{Pb}^{2+}/\text{Al}^{3+}$ present

(v) To the 5th portion of the filtrate add two drops of Lead (II) nitrate solution and heat to boil

Observations	Inferences
White ppt soluble on heating (½ mk)	Cl^- present

3. You are provided with solid F. Carry out the tests below and record your observations and inferences in the spaces provide

(a)(i) Using a metallic spatula, heat half of solid F in a non-luminous burnsen burner flame for some time then remove when it ignites

Observations	Inferences
Melts burns with a sooty/smoky/luminous yellow flame√1 (accept melts on its own for ½ mk)	$C=C$ or $C\equiv C$ present √1 Organic compound with high C:H ratio long chain organic compound (½ mk)

(ii) Put a half spatula endful of solid F into a boiling tube. Add about 10cm³ of distilled water and shake vigorously

Observations	Inferences
Dissolves into a colourless solution ½ mk	Soluble compound /salt/polar substance ½ mk

(b) Divide the resulting solution into two portions

(i) To the first portion, dip a piece of universal indicator paper and dertermine its PH

Observations	inferences
pH ₅ √ ½	Weakly H ⁺ /-COOH √ ½ (½ mk)

(ii) To the second portion, add two drops of acidified potassium manganate (VII) solution and shake vigorously

Observations	Inferences
H ⁺ /KMnO ₄ decocLOURISES √1 (½ mk)	$C=C$ or $C\equiv C$ present √ ½ Or R-OH present √ ½

© Put half spatula of solid F into a boiling tube and ad 5 drops of ethanol followed by 2 drops of concentrated Sulphuric (Vi) acid warm the mixture

Observations	Inference
Pleasant /fruity smell (½ mk)	$C-O$ or $R-C-O-R$ O O (½ mk)

(II) You are provided with liquid G. Use it to carry out the following tests an record your observations and inferences below

(i) To the first portion add 2 drops of acidified Potassium Manganate (VII) solution

Observations	Inferences
H ⁺ ,KMnO ₄ decolourises (½ mk)	$C=C$ or R-OH present (½ mk)

(ii) To the second portion, dip the blue and red litmus papers provided

Observations	Inferences
Blue litmus remains blue Red litmus remain red (½ mk)	Neutral compound (½ mk)

(iii) To the third portion, add 2 drops of acidified Potassium dichromate (VI) solution

Observations	Inferences
Orange $H^+/K_2Cr_2O_7$ solution turns green(½ mk)	R-OH present (½ mk)