NAME:…….. INDEX NO……..

SCHOOL:…… CANDIDATE'S SIGN ……..

DATE ……..

233/1
CHEMISTRY
Paper 1
July/August - 2015
Time: 2 Hours

BONDO SUB-COUNTY SECONDARY SCHOOLS JOINT EVALUATION - 2015

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

233/1
CHEMISTRY
Paper 1
July/August - 2015
Time: 2 Hours

INSTRUCTIONS TO CANDIDATES

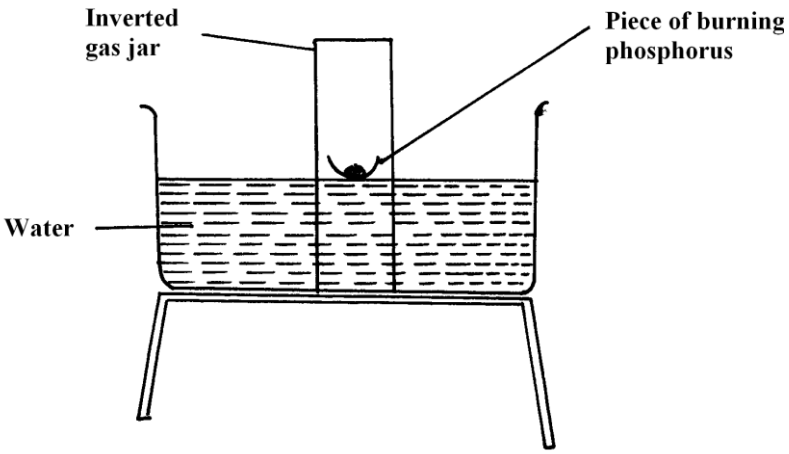
1. Write your name and index number in the spaces provided above
2. Write the school, date and sign in the spaces provided above
3. ALL workings must be clearly shown
4. Mathematical tables and electronic calculators may be used

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
1 – 29	80	

This paper consists of 12 printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing.

1. The diagram below represents a set up that was used to show that part of air is used during burning.



a) Given that phosphorus used was in excess, draw a diagram of the set up at the end of the experiment (When there was no further observable change) (1mk)

b) Suggest one modification that should be made on the apparatus if the percentage of the air used is to be determined. (1mk)

……

……

2. a) State any two differences between luminous flame and non-luminous flame. (2mks)

……

……

……

b) Explain why luminous flame produces bright yellow light. (1mk)

……

……

3. Draw the structural formula of:

(i) Ethanol (1mk)

(ii) Propanoic acid (1mk)

(iii) Give the name of the organic compound formed when ethanol and propanoic acid react in the presence of concentrated sulphuric VI acid (1mk)

……

……

4. The solubility of Potassium nitrate is 155g / 100g of solvent at 80^0C and 389/100g of solvent 25^0C. What mass of potassium nitrate will crystallize out if 50g of its saturated solution at 80^0C was cooled to 25^0C (3mks)

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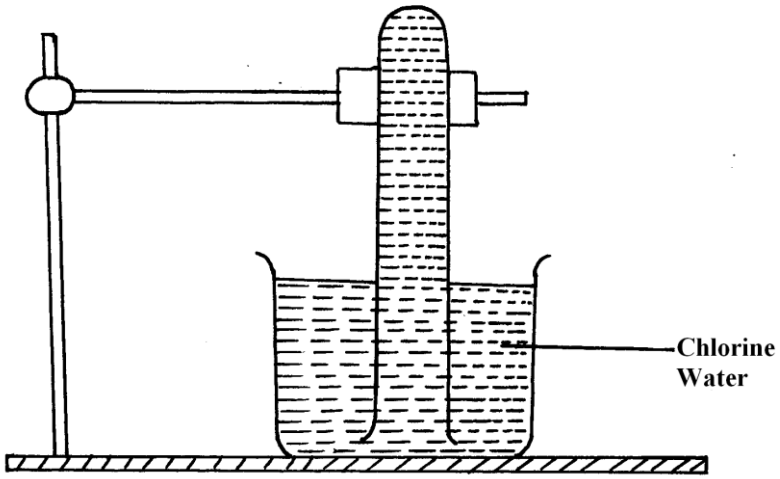
5. In an experiment a test tube full of chlorine water was inverted in chlorine water as shown in the diagram below and set up left in sunlight for one day.



After one day, a gas was found to have collected in the test tube.

a) Identify the gas (1mk)

……

b) What will happen to the PH of the solution in the beaker after one day? Give an explanation. (2mks)

……

……

……

6. a) State the Graham's law of diffusion. (1mk)

……

……

b) The molar masses of gases W and X are 16.0 and 44.0 respectively. If the rate of diffusion of w through a porous material is $12cm^3/s^{-1}$, calculate the rate of diffusion of x through the same material. (2mks)

……

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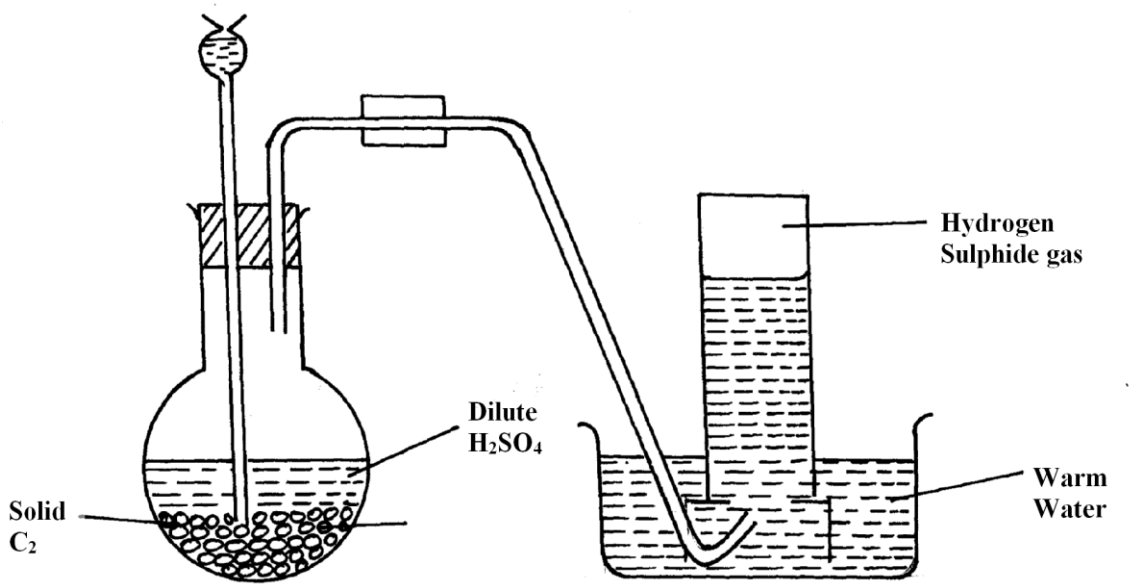
……

……

7. Name one property of neon that makes it possible to be used in electric lamp. (1mk)

……

8. The apparatus shown below was set to prepare and collect hydrogen sulphide.



a) Name solid C_2 (1mk)

……

b) Give a reason why warm water is used. (1mk)

……

……

c) What observation would be made if hydrogen sulphide gas was bubbled into a solution lead II nitrate (1mk)

……

……

9. Explain why the molar heat of neutralization of hydrochloric acid and sodium hydroxide is much higher than that of ethanoic acid and sodium hydroxide. (2mks)

……

……

……

10. Use the reactions given below to answer the questions that follow. The letters do not represent the actual symbols of the elements.

$D_{(s)} + E^{2+}_{(aq)} \longrightarrow D^{2+}_{(aq)} + E_{(s)}$

$D_{(s)} + 2F^{+}_{(aq)} \longrightarrow D^{2+}_{(aq)} + 2F_{(s)}$

$E_{(s)} + 2F^{+}_{(aq)} \longrightarrow E^{2+}_{(aq)} + 2F_{(s)}$

$G_{(s)} + E^{2+}_{(aq)} \longrightarrow G^{2+}_{(aq)} + E_{(s)}$

$G_{(s)} + D^{2+}_{(aq)} \longrightarrow$ No reaction

a) What name is given to the type of reaction given above. (1mk)

……

b) Arrange the elements D, E, F and G in the order of their reactivity starting with most reactive (1mk)

……

c) Complete the equation below. (1mk)

$G_{(s)} + 2F^{+}_{(aq)} \longrightarrow$

11. Starting with copper metal, describe how a sample of crystals of copper II chloride may be prepared in the laboratory. (3mks)

……

……

……

……

12. a) Name the process that takes place when:

(i) Crystale of Zinc nitrate change into solution when exposed to air (1mk)

……

(ii) An alcohol reacts with an organic acid in the presence of a catalyst to form a sweet smelling compound. (1mk)

……

b) Propane can be changed into methane and ethane as shown below in the equation below.

$CH_3CH_2CH_{3(g)} \longrightarrow CH_{4(g)} + C_2H_{4(g)}$

Name the process undergone by propane (1mk)

……

13. Study the standard reductions potentials given and answer the questions that follow (The letters are not the actual symbols of the element)

		E^{θ} (V)
$M^{2+}_{(aq)} + 2e^{-}$	$\longrightarrow M_{(s)}$	- 0.76
$N^{2+}_{(aq)} + 2e^{-}$	$\longrightarrow N_{(s)}$	- 2.37
$P^{+}_{(aq)} + e^{-}$	$\longrightarrow P_{(s)}$	+ 0.80
$Q^{2+}_{(aq)} + 2e^{-}$	$\longrightarrow Q_{(s)}$	- 0.14

a) The standard reduction potential for Fe^{2+} is -0.44 volts. Select the element which would best protect iron from rusting. (1mk)

……

……

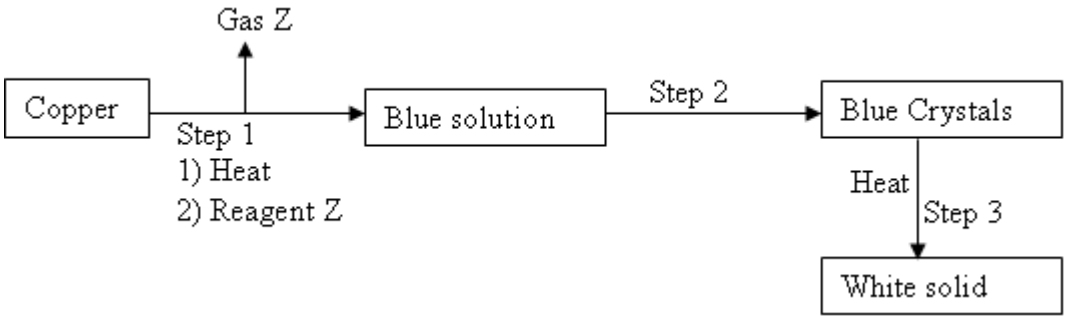
b) Calculate the Eθ value for the cell represented as $M_{(s)} / M^{2+}_{(aq)} // P^{+}_{(aq)} / P_{(s)}$ (2mks)

……

……

……

14. Study the flow chart below and answer the questions that follow



a) Name the reagent Z (1mk)

……

b) Describe the process which takes place in step 2. (1mk)

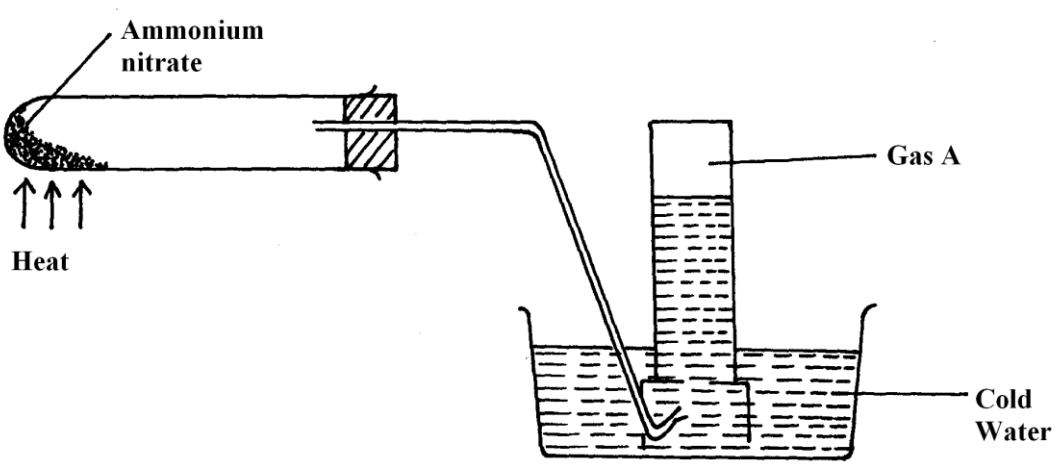
……

……

c) Identify the white solid. (1mk)

……

15. Ammonium nitrate was heated as shown in the set up below.



a) Identify gas A

……

b) State and explain precaution that must be taken before heating is stopped. (1mk)

……

16 0.045 moles of a certain hydrocarbon on complete combustion gave 9.9g of carbon (IV) oxide and 4.86g of water. Calculate the empirical formula of the hydrocarbon (3mks)

17. A sample of water drawn from a river passing through an agricultural district was divided into two portions. The first portion gave a white precipitate when acidified barium chloride was added. The second portion when warmed with aqueous sodium hydroxide gave a colourless gas, which turned a moist red litmus paper blue.

a) Identify the ions present in the river water. (1mk)

……

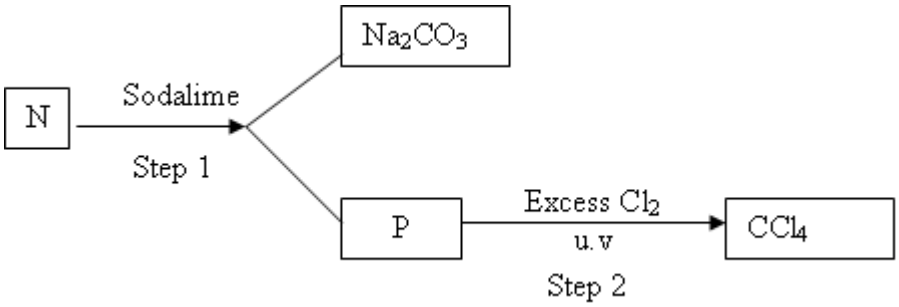
……

b) Suggest the possible sources of the ions identified in (a) above. (1mk)

……

……

18. Study the chart below and answer the questions that follow.



a) Identify N and P (2mks)

N……

P…….

b) Write an equation for the production of Gas P (1mk)

……

……

19. When 0.6g of element J were completely burnt in oxygen and all the heat evolved was Used to heat 500cm^3 of water, the temperature of the water rose from 23^{0}C to 32^{0}C. Calculate the relative atomic mass of element J given that specific heat capacity of Water = 4.2j/g/k, density of water = 1.0g/cm^3 and molar heat of combustion of J is 380kJmo^{l}- (3mks)

20. The grid below shows part of a periodic table. The letters do not represent the actual Symbols of the elements.

				G				
				H			I	
F								

a) Select the;

(i) element which has the largest atomic radius (1mk)

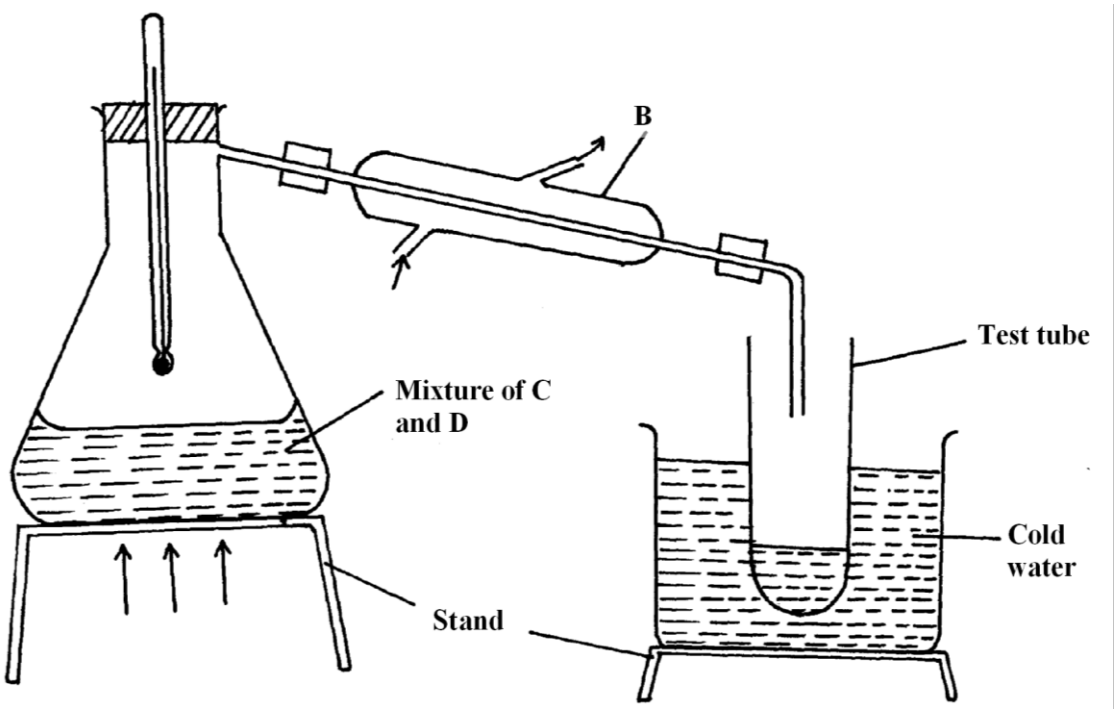
……

(ii) Most reactive non-metal (1mk)

……

b) Show on the grid the position of the element J^{2+} ions with electronic configuration 2.8.8 (1mk)

21. The set up below represents the apparatus that may be used to separate a mixture of Two missible liquids C and D whose boiling points are 80^{0}C and 110^{0}C.



a) Name B (1mk)

……

b) What is the purpose of the thermometer (1mk)

……

c) Which liquid was collected in the test tube. (1mk)

……

22. Oleum ($H_2S_2O_7$) is an intermediate product in the industrial manufacture of sulphuric (IV) acid

a) How is oleum converted into sulphuric (VI) acid. (1mk)

……

……

b) Give one use of sulphuric (VI) acid (1mk)

……

……

23. Using dote (•) and crosses (x) to represent outermost electrons, draw diagrams to show the bonding n CO_2 and H_3O^+ (Atomic number; O = 8.0 H = 1.0) (3mks)

24. The relative atomic mass of R is 10.28. It has two isotopes ${}^{10}_{5}R \; and \; {}^{11}_{5}R$. Calculate the relative percentage abundanix of each isotope (3mks)

25. a) Define half-life of radioisotopes. (1mk)

……

……

b) X grams of a radioactive isotope takes 100 days to decay to 20grams. If the half life of the element is 25days. Calculate the initial mass of x of the radio-isotope (2mks)

……

……

……

26. Nitric (V) acid rarely give hydrogen with metals eg Zinc

a) Give a reason for this (1mk)

……

……

b) Give a condition under which nitric (V) acid can produce hydrogen with the metal (1mk)

……

c) State one use of hydrogen gas. (1mk)

……

27. a) Name the two common ores from which Zinc metal can be extracted (1mk)

……

……

b) Taking one of the ores named above in (a) above. Write a chemical equation for the roasting process to get the required oxide. (1mk)

……

……

c) State any two uses of Zinc metal (1mk)

……

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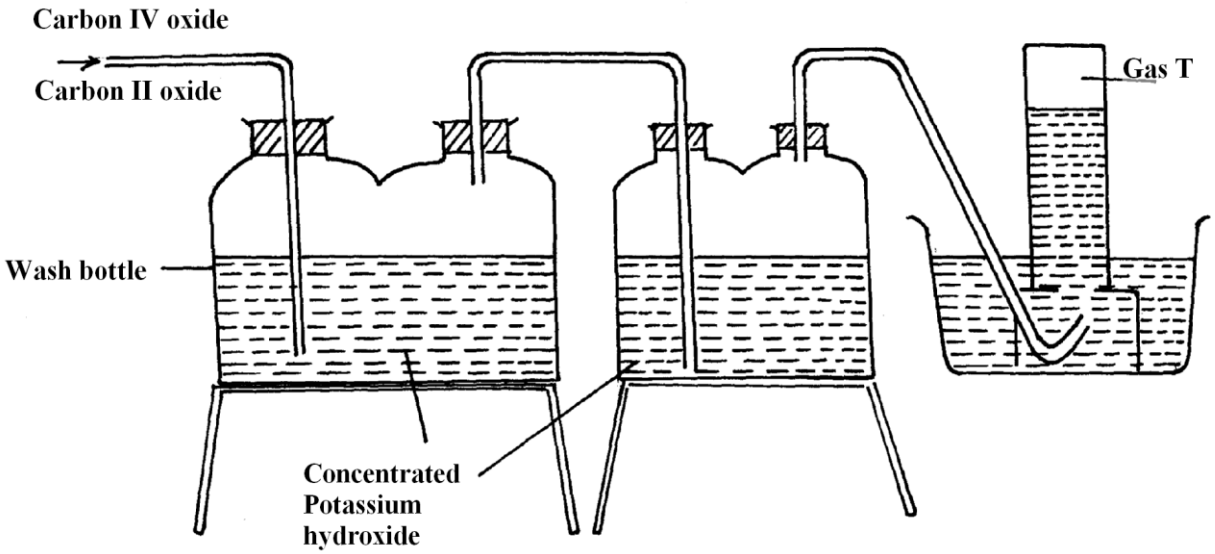
28. The diagram below represents part of a set up used to prepare and collect gas T. Study and answer the questions that follow.



a) Name two reagents that are reacted to produce both carbon (IV) oxide and carbon (II) oxide. (1mk)

……

……

b) Write the equation for reaction which takes place in the wash bottles. (1mk)

……

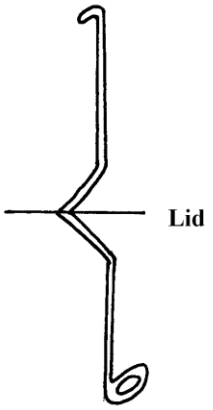
c) Give a reason why carbon (II) oxide is not easily detected. (1mk)

……

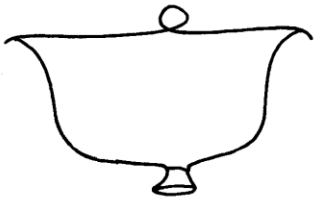
……

29. Identify the following apparatus stating their uses in the laboratory

i)



ii)



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End

NAME:…….. INDEX NO……..

SCHOOL:…… CANDIDATE'S SIGN ……..

DATE ……..

233/2
CHEMISTRY
Paper 2
July/August - 2015
Time: 2 Hours

BONDO SUB-COUNTY SECONDARY SCHOOLS JOINT EVALUATION - 2015

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

233/2
CHEMISTRY
Paper 2
July/August - 2015
Time: 2 Hours

INSTRUCTIONS TO CANDIDATES

1. Answer all the questions in the spaces provided
2. Mathematical tables and calculators may be used
3. ALL workings must be clearly shown where necessary

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
1	10	
2	11	
3	12	
4	11	
5	11	
6	14	
7	11	
Total Score	80	

This paper consists of 12 printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing.

1. Study the data in the table below and answer the questions. The letters do not represent the actual symbols of the elements.

Element	**Atomic number**	**Boiling point ^{0}C**
P	3	1333
Q	13	2470
R	16	445
S	18	- 186
T	19	774

a) Select the elements that belong to the same

(i) Group (½ mk)

……

(ii) Period (½ mk)

……

b) Which element:

(i) is a gas at room temperature? Explain

(Assume room temperature is 25^0C) (4mks)

……

……

……

……

(ii) Does not take an oxide (1mk)

……

c) Write the:

(i) Formula of the sulphate of element Q (1mk)

……

……

(ii) Equation for the reaction between elements P and R (1mk)

……

……

d) What type of bonding would exist in the compound formed when elements R and Q react? Give a reason for your answer. (2mks)

……

……

……

……

e) Select the most electropositive element (1mk)

……

f) Explain why the boiling point of element Q is higher that that of element P. (2mks)

……

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2. In order to determine the molar heat of neutralization of potassium hydroxide, 200cm3 of 1M hydrochloric acid both at the same initial temperature were mixed and stirred continuously with a thermometer. The temperature of the resulting solution was recorded after every 30 seconds until the highest temperature of the solution was attained. Thereafter, the temperature of the solution was recorded for a further two minutes

a) (i) Why was it necessary to stir the mixture of the two solutions? (1mk)

……

……

(ii) Define molar heat of neutralization (1mk)

……

……

……

(iii) Write an ionic equation for the reaction which took place (1mk)

……

……

b) If the initial temperature for both solution was 24.5^0C and the highest temperature attained by the mixture was 30.9^0C

Calculate the:

I heat change for the reaction (specific heat capacity of the solution = $4.2Jg^{-1}K^{-1}$ and the density of the solution = $1.0g/cm^3$) (2mks)

……

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……

……

II Molar heat at neutralization of potassium hydroxide. (2mks)

……

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……

c) Explain how the value of the molar heat of neutralization obtained in the experiment would compare with the one that would be obtained if the experiment was repeated using $200cm^3$ of 1M ammonium hydroxide instead of 1M potassium hydroxide. (2mks)

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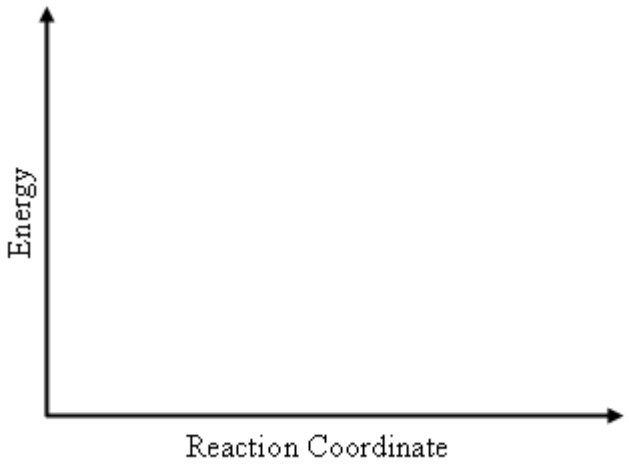
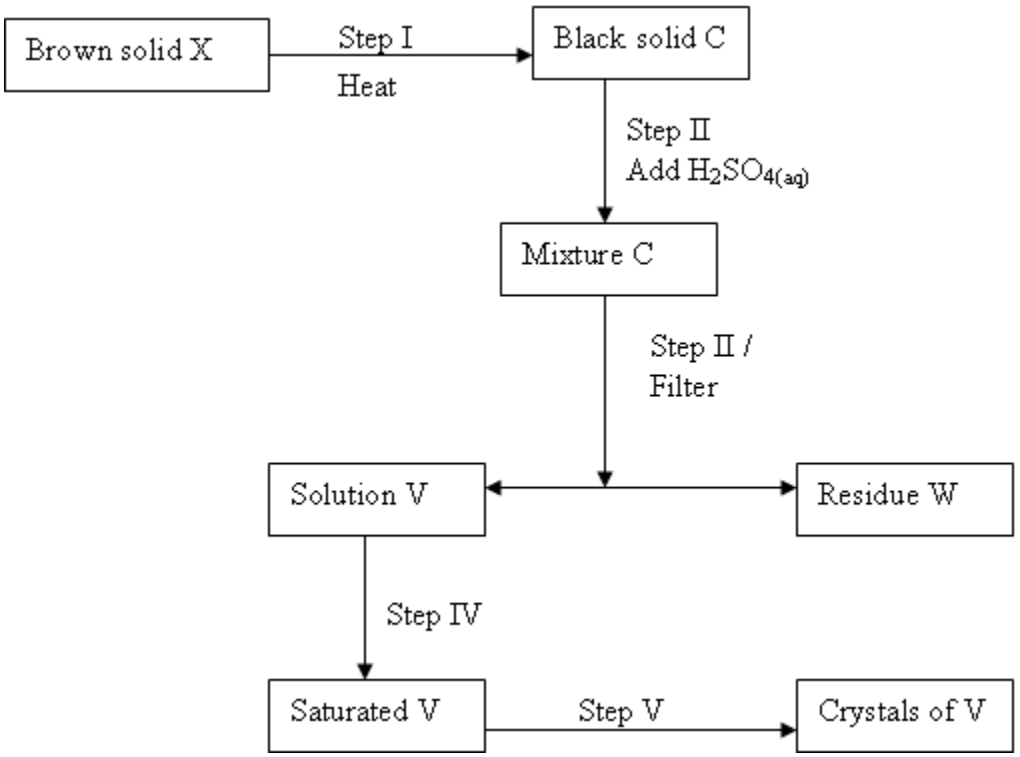
d) On the grid provided below, draw an energy level diagram for the reaction between hydrochloric acid and potassium hydroxide. (2mks)



3. The reaction scheme below are some reactions starting with a brown solid X. Study the Scheme and answer the questions that follow.



a) Identify each of the following

(i) Solid X……..

(ii) Solid C……..

(iii) Mixture C…….

(iv) Solution V…….

(v) Residue W…….

b) (i) Write an equation for each of the reactions in steps I and II (1mk)

…….

…….

(ii) Name the type of reaction in step II (1mk)

…….

c) Identify the reagent that was in excess in step II. Why should the reagent be in excess? (2mks)

…….

…….

…….

d) State the condition for step II. Explain (4mks)

…….

…….

……

e) Describe how step V was carried out. (2mks)

……

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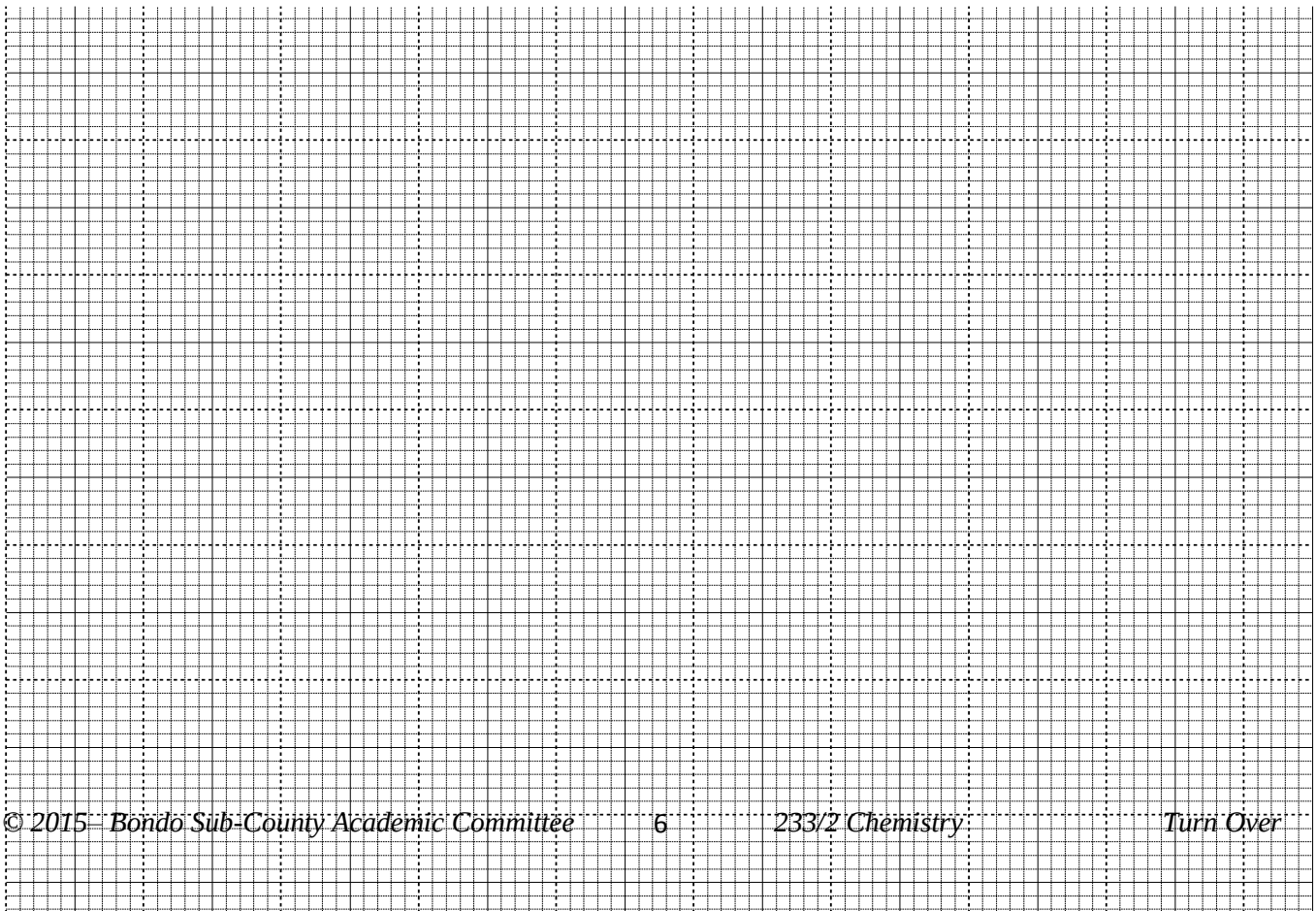
4. In an experiment to study the rate of reaction between duralumin (an alloy of aluminium, magnesium and copper) and hydrochloric acid, 0.5g of the alloy were reacted with excess 4M Hydrochloric acid. The data in the table below was recorded. Study it and answer the questions that follow.

Time in (Min)	0	1	2	3	4	5	6	7
Volume of gas evolved (cm^3)	0	220	410	540	620	640	640	640

a) Plot a graph of total volume of gas produced against time (3mks)



b) From the graph determine; the volume of the gas produced at the end of
2 ½ minutes (1mk)

……

……

……

c) From the graph determine the rate of reaction between 3rd and 4th minute. (2mks)

……

……

……

……

d) Give a reason why some solid remained at the end of the experiment (2mks)

……

……

……

e) Given that 2 – 5cm^3 of the total volume of gas was from the reaction between the

magnesium and hydrochloric acid. Calculate the percentage by mass of aluminium present in 0.5g of the alloy. (Al = 27.0, Molar gas volume = 24,000cm^3 at 2981C) (2mks)

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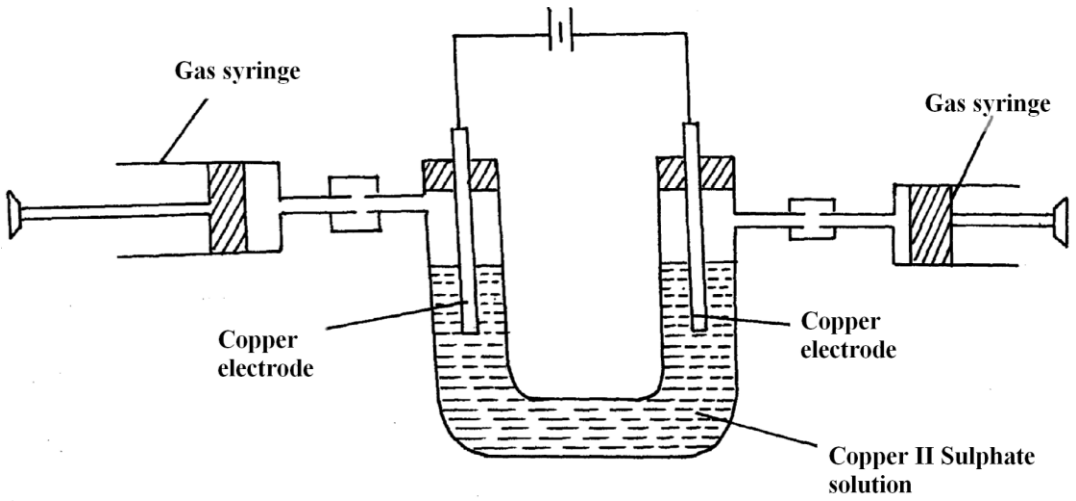
5. Aqueous copper II sulphate was electrolysed using the set up represented by the diagram below



a) After sometimes it was found that no gas was produced at both electrodes. Explain. (1mk)

……

……

……

b) Write an equation for the reaction at each electrode.

(i) Anode

……

(ii) Cathode (2mks)

……

c) What happens to the colour of the electrolyte during electrolysis. Explain (2mks)

……

……

……

d) If in the above set up inert electrodes were used instead of copper electrodes; write equation at each electrode

Anode

……

Cathode

……

e) An iron spoon is to be electroplated with silver. Draw a labeled diagram of the set-up that could be used to represent the process. (2mks)

f) The table below shows ammeter readings obtained when different electrolytes of the same concentration were tested.

Electrolyte	Ammeter reading amps
Copper II sulphate solution	4.4
Ethanoic acid	1.2

Why does ethanoic acid give a lower ammeter reading. Explain your answer. (2mks)

……

……

6. a) Distinguish between soaps and soapless detergents. (2mks)

……

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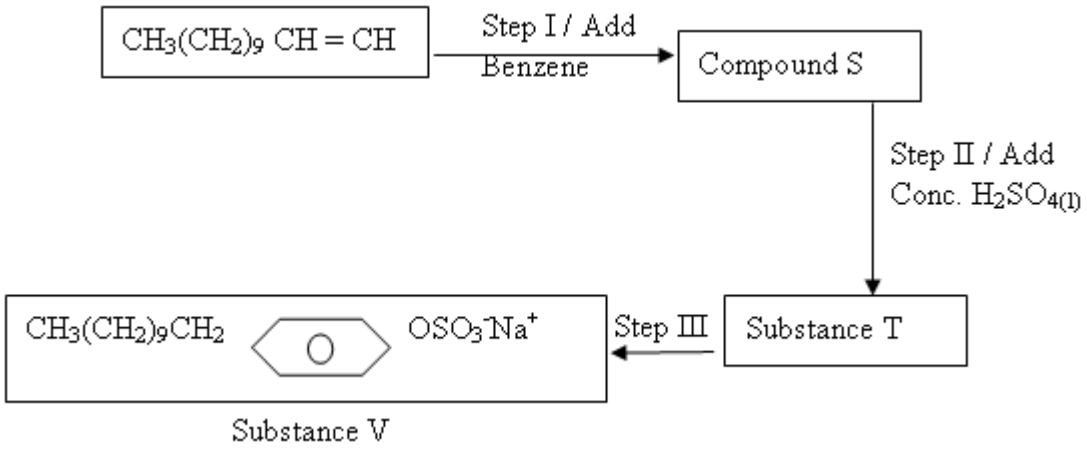
……

……

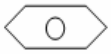
b) The flow diagram below shows the steps in the manufacture of soapless detergent. Study it and answer the questions that follow.



(i) State the conditions necessary to step I (1mk)

……

……

(ii) Write an equation for the reaction in step I (benzene, C_6H_6) is represented as  (1mk)

……

……

c) (i) Name the process in step III (1mk)

……

(ii) Give the reagent in step III (1mk)

……

(iii) Give the name of the product V (1mk)

……

d) In industries tetraoxophosphates materials are added.

(i) Suggest a reason for the addition of tetraoxophosphates (1mk)

……

……

(ii) Give a disadvantage of the addition of tetraoxophosphates (1mk)

……

……

e) Explain

(i) One advantage of soapless detergent over soaps. (1mk)

……

……

……

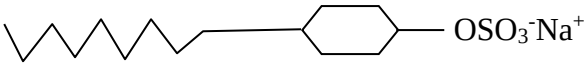
(ii) One disadvantage of soapless detergent over soaps (1mk)

……

……

……

f) Representing the detergent as shown below, explain the role of the detergent in cleansing. (3mks)



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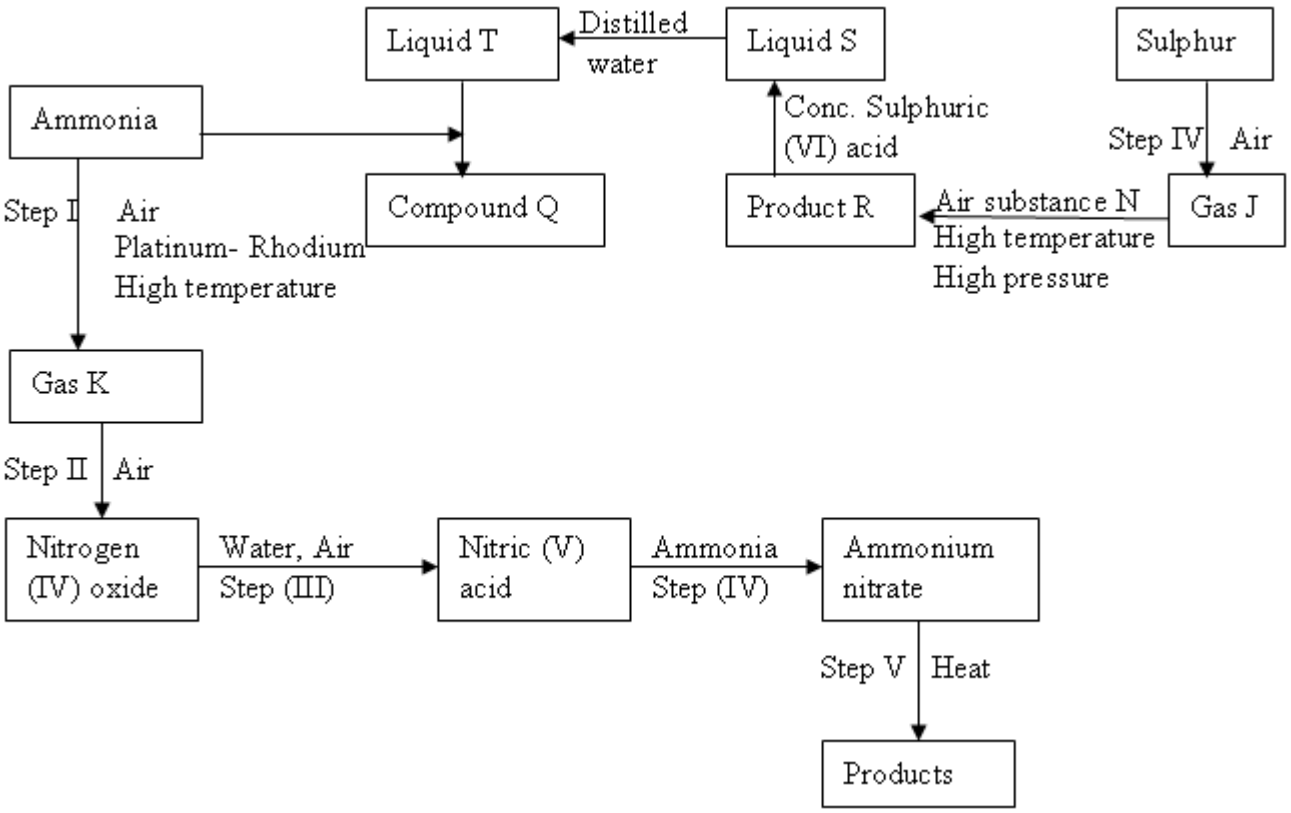
7. Study the flow chart below and answer the questions that follow



(i) Identify gas: (i) J…… (1mk)

(ii) K…….. (1mk)

(ii) Write the equation for the reaction that occurs in steps:

i) (V)…….. (1mk)

(VI)…… (1mk)

(iii) Name substance N……. (1mk)

(iv) Explain why high pressure is required in converting J to R (2mks)

…….

…….

…….

(v) Give one commercial use of;

i) Liquid T……. (1mk)

ii) Compound Q……. (1mk)

(vi) Describe a chemical test that would be used to distinguish the anion in compound Q and the product in Step IV (2mks)

…….

…….

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…….

NAME:…….. INDEX NO……..

SCHOOL:…… CANDIDATE'S SIGN ……..

DATE ……..

233/3
CHEMISTRY PRACTICAL
Paper 3
July/August - 2015
Time: 2 ¼ Hours

BONDO SUB-COUNTY SECONDARY SCHOOLS JOINT EVALUATION - 2015

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

233/3
CHEMISTRY PRACTICAL
Paper 3
July/August - 2015
Time: 2 ¼ Hours

INSTRUCTIONS TO CANDIDATES

1. Write name and Index number in the spaces provided above.
2. Answer ALL the questions in the spaces provided in the question paper
3. 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 red the question paper and make sure you have all the chemicals and apparatus that you may need.
4. Mathematical tables and silent electronic calculators may be used
5. ALL workings MUST be clearly shown where necessary.

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
1	22	
2	14	
3	04	
Total Score	40	

This paper consists of 8 printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing.

1. You are provided with
   - Magnesium ribbon solid P
   - 0.4m sulphuric VI acid solution Q
   - 0.2M sodium hydroxide solution R
   - Distilled water

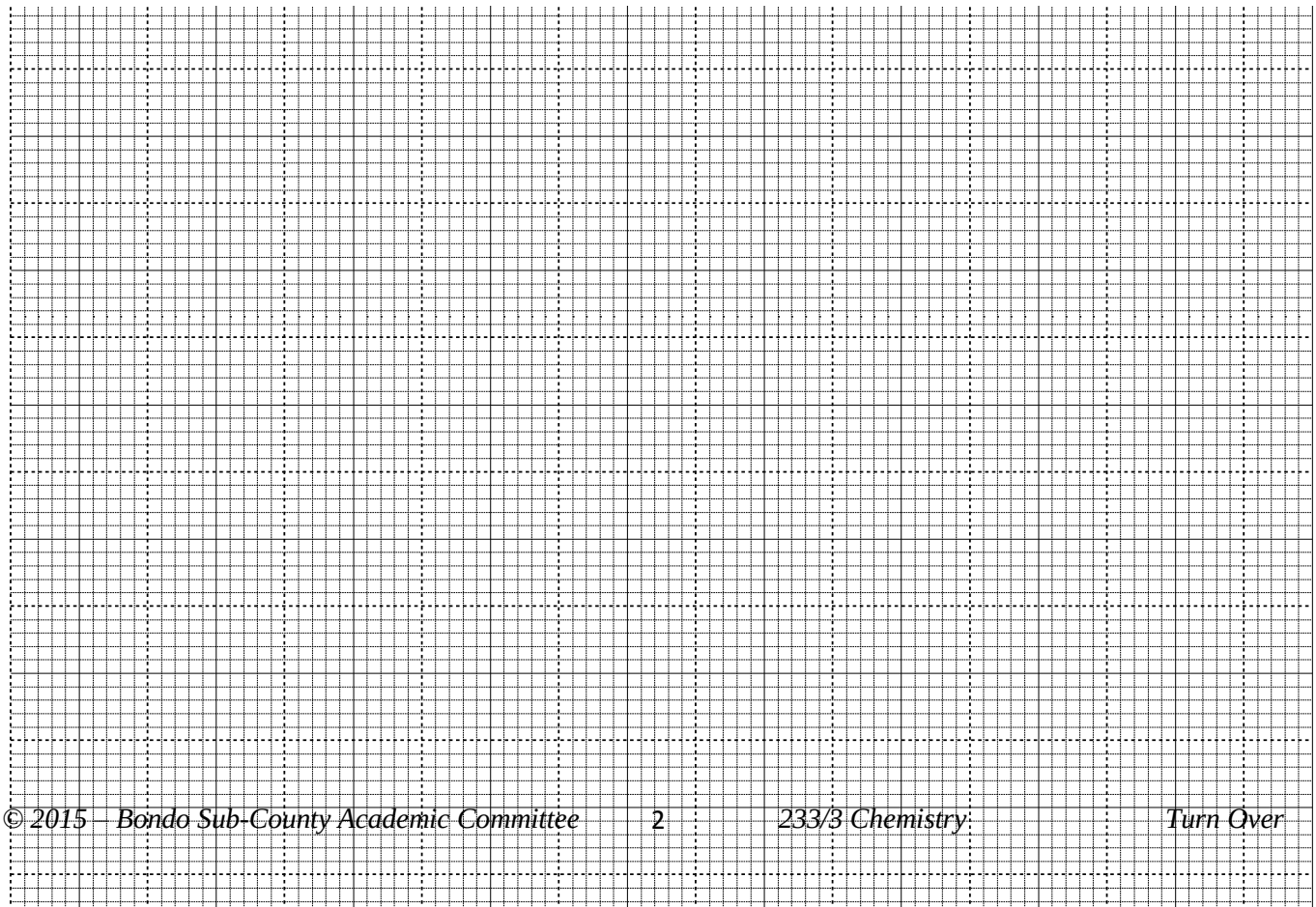
   You are required to determine the;
   (i) The temperature change when Magnesium reacts with excess sulphuric VI acid
   (ii) Number of moles of sulphuric VI acid that remain unreacted
   (iii) Number of moles of Magnesium that reacted
   (iv) Molar heat of reaction between Magnesium and sulphuric VI acid.

Procedure I

- Measure 50cm^3 of solution Q using a burette and transfer into a 100ml beaker.
- Measure the temperature of the solution in the beaker at half-minute intervals up to 1 ½ minutes. At exactly 2 minutes put the Magnesium in the 50cm^3 of solution in the beaker and continue recording the temperature at a half minute intervals up to 4 minutes (Stir the mixture with the thermometer continuously and make sure the ribbon remains in the solution as it reacts)
- Use the results to complete the table below (4mks)

Time (Minutes)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Temperature (^{0}C)									

b) Plot a graph of temperature against time on the grid provided. (3mks)



(i) From your graph determine the maximum temperature change (ΔT) (1mk)

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Procedure II

- Transfer all the mixture obtained in procedure I into a 250ml conical flask.
- Clean the burette and use it to place 50cm^3 of distilled water into the beaker used in procedure 1. Transfer all the solution from the beaker into a 250ml conical flask containing mixture from procedure 1 label this solutions.
- Empty the burette and fill it with solution R. Pipette 25cm^3 of solution S and place in an Empty 250ml conical flask. Add 2 drops of phenolphthalein indicator and titrate with Solution R from the burette.

Repeat the procedure for two more titrations and complete table 2.

	I	II	III
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution R used (cm^3)			

i) Determine the average volume of solution R used. (1mk)

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ii) Calculate the number of moles of:

I Sodium hydroxide solution R used (1mk)

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II Sulphuri VI acid used in 25cm^3 of solution S (1mk)

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III Sulphuric VI acid 100cm^3 (1mk)

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IV Sulphuric VI acid in $50cm^3$ of solution Q (1mk)

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V Sulphuric VI acid that reacted with Magnesium (1mk)

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VI Magnesium that reacted (1mk)

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iii) Using your answer in VI above determine the molar heat reaction between Magnesium and Sulphuric VI acid (Take specific heat capacity of the solution as 4.2J/g/k (3mks)

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2. You are provided with solid N. Carry out the test below on N. Record your observations and inferences in the spaces provided below.

a) Put a spatula end-ful of solid N in a boiling tube. Add about 10cm3 of distilled water and shake thoroughly. Filter to obtain the filtrate and the residue.

Observations	Inferences
(1mk)	(1mk)

b) Divide the filtrate into five different portions. To the first portion add 2M NaOH solution drop wise until in excess

Observations	Inferences

(1mk)	(2mk)

c) To the second portion add 4 drops of dilute hydrochloric acid solution

Observations	Inferences
(1mk)	(1 ½ mk)

d) To the third portion add 2M NH_3 solution dropwise until excess

Observations	Inferences
(1mk)	(½mk)

e) To the fourth portion add 3 drops of lead II nitrate and heat the mixture.

Observations	Inferences
(1mk)	(1mk)

f) Transfer all the residue into a test-tube. Add about 5cm3 of dilute nitric r acid.
Test for the gases using litmus paper.

Observations	Inferences
(1mk)	(½mk)

g) To small amount of the filtrate above add 2M $NH_{3(aq)}$ dropwise until in excess.

Observations	Inferences

(1mk)	(½mk)

3. You are provided with solid T. Carry out the tests below and record your observations and inferences.

a) Using a metallic spatula, burn half of solid T on a non-luminous flame of a Bunsen burner,

Observations	Inferences
(½ mk)	(1mk)

b) Put the remaining amount of solid T in a boiling tube. Add about 10cm3 of distilled water and shake thoroughly. Divide the mixture into two portions. To the first portion add about 0.3g of sodium hydrogen carbonate

Observations	Inferences
(½ mk)	(½ mk)

c) To the second portion, add 3 drops of acidified $KMnO_{4(aq)}$

Observations	Inferences

(½ mk)	(1mk)