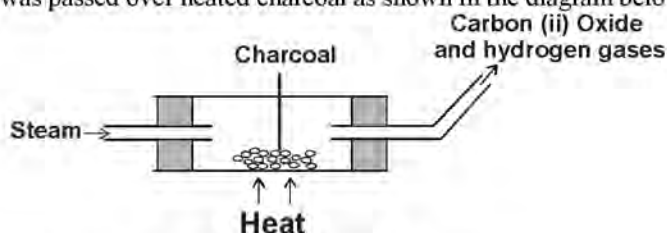


Explain why the amount of hydrogen gas liberated in test-tube 2 is greater than that in test-tube 1 before the reaction is complete. (3 marks)

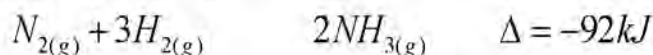
23. When steam was passed over heated charcoal as shown in the diagram below, hydrogen-gas and carbon (II) oxide were formed.



- a) Write the equation for the reaction which takes place. (1 mark)
 b) Name **two** uses of carbon (II) oxide gas which are also uses of hydrogen gas. (2 marks)
24. The table below shows the tests carried out on a sample of water and the observations made.

Test number	Tests	Observation
1	Addition of sodium hydroxide solution dropwise until in excess	white precipitate which dissolves in excess
2	Addition of excess aqueous ammonia	Colourless solution obtained
3	Addition of dilute hydrochloric acid followed by barium chloride solution	White precipitate

- a) Identify the anion present in the water. (1 mark)
 b) Write an ionic equation for the reaction in test number 3. (1 mark)
 c) Write the formula of the complex ion formed in test number 2. (1 mark)
25. In the Haber process, the optimum yield of ammonia is obtained when a temperature of 450°C, a pressure of 200 atmospheres and iron catalyst are used.



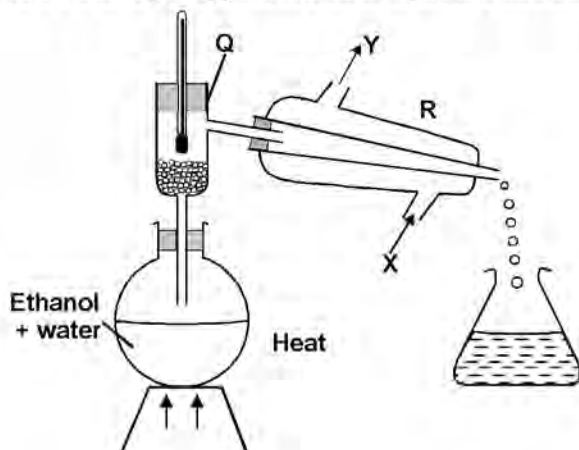
- a) How would the yield of ammonia be affected if the temperature was raised to 600°C. (2 marks)
 b) Give **one** use of ammonia. (1 mark)
26. Iron is extracted from its ore by the blast furnace process.
- a) Name **two** ores from which iron is extracted. (2 marks)
 b) One of the impurities in iron ore is removed in the form of calcium silicate. Write an equation for the reaction in which calcium silicate is produced. (1 mark)
27. With reference to chlorine, distinguish between covalent bonds and van der Waals forces. (2 marks)

GEM SUB-COUNTY JOINT EVALUATION EXAMS 2016

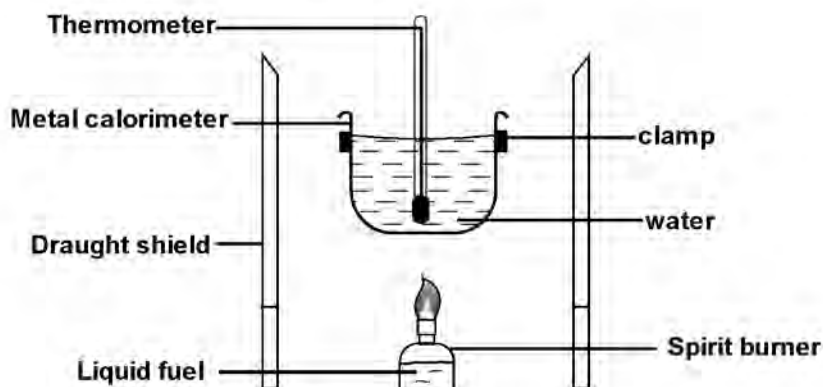
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CHEMISTRY PAPER 2

1. The diagram below shows a set-up of apparatus used to separate a mixture of ethanol (B.P=78.0°C) and water (B.P = 100.0°C)



- a) Name the parts labelled Q and state its function. (2 marks)
- b) Name the apparatus R. (1 mark)
- c) At what point should apparatus R be connected with water? (1 mark)
- d) Name the distillate that was collected first. (1 mark)
- e) State the purpose of the thermometer. (1 mark)
- f) What property of the mixture makes it possible to be collected as shown above? (1 mark)
- g) Why is a round bottomed flask preferred for the experiment instead of the flat bottomed flask? (1 mark)
- h) Name three industrial applications of the above process. (3 marks)
2. a) Carbon (II) oxide, methane and hydrogen are major sources of energy.
- i) State and explain three reasons why hydrogen is a very attractive fuel. (3 marks)
- ii) State one disadvantage of using hydrogen fuel instead of methane. (1 mark)
- b) The diagram below shows the set up of the apparatus by a student to determine the enthalpy change of combustion of ethanol. The heat produced by burning fuel warms known mass of known.



Results

Volume of water in the beaker = 500cm^3

Initial temperature of water = 12°C

Final temperature of water = 31.5°C

Mass of ethanol burnt = 1.50g

Density of water = 1g/cm^3

Specific heat capacity of water = $4.2\text{ kJ kg}^{-1}\text{ K}^{-1}$

- i) Define standard heat of combustion. (1 mark)
- ii) Calculate the heat required to raise the temperature of water from 12°C to 31.5°C . (2 marks)
- iii) Find the molar enthalpy of combustion of ethanol. (C=12, O=16, H=1) (2 marks)
- iv) Draw an energy level diagram for the combustion of ethanol. (2 marks)
3. I.
- a) Study the data in the table below and answer the questions that follow. The letters do not represent actual symbol of the elements.

Element	Atomic No.	M.P. $^\circ\text{C}$	B.P $^\circ\text{C}$	Ionic radius (nm)
A	11	98	890	0.095
B	12	650	1110	0.065
C	13	660	2470	0.05
D	14	1410	2360	0.041
E	15	4412 590	280	0.034
F	16	113 119	445	0.212
G	17	-101	-35	0.184
H	18	-189	-186	0.181

- i) Write the electronic arrangement for the atoms represented by letters F & B. (1 mark)
- ii) State the nature of the oxides of the elements represented by B and F. (1 mark)
- Oxide of B

Oxide of F

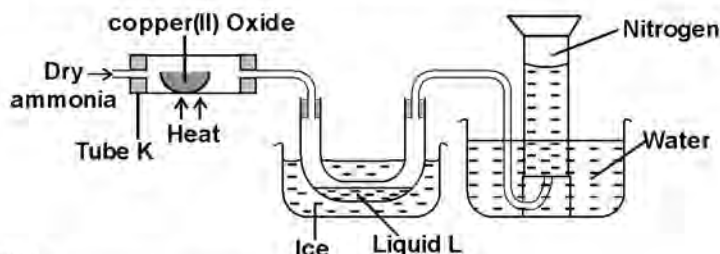
- b) Why does the elements represented by letter E have two values of melting point? (1 mark)
- c) Explain the following observations in terms of structure and bonding. (1 mark)
- i) There is an increase in boiling point from A to C. (1 mark)
- ii) Element D has a high boiling point. (1 mark)
- d) Explain the difference in ionic radius between elements represented by letters A and G. (2 marks)

II

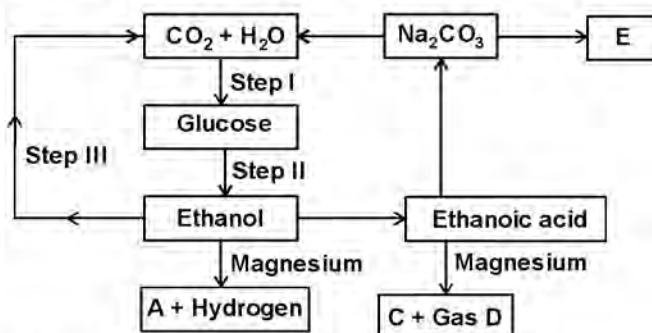
- .a) The table below gives the percentage of radioactive isotope of lead that remains after decaying at different times.

Time (min)	0	6	12	22	38	62	100
percentage of lead	100	81	65	46	29	12	3

- i) On the grid provided plot a graph of the percentage of lead remaining (vertical axis) against time. (3 marks)
- ii) Using the graph:
Determine the
I. Half life the lead. (1 mark)
- II. Original mass of lead isotope given that the mass remained after 70 minutes was 0.16g. (2 marks)
4. a) The diagram below shows a set-up that can be used to obtain nitrogen gas in an experiment.

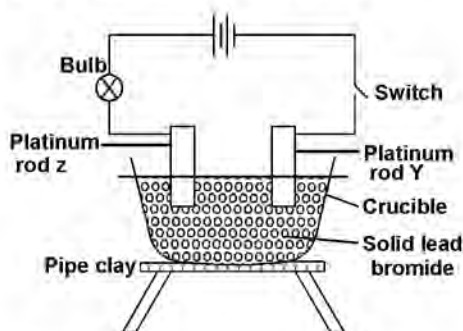


- i) Name liquid L. (1 mark)
- ii) What observation would be made in tube K after sometime? (1 mark)
- iii) Write down the equation for the reaction that took place in tube K. (1 mark)
- iv) If 320cm³ of ammonia gas reacted completely with copper (II) oxide, calculate:
- I. The mass of copper (II) oxide that reacted. (3 marks)
(Cu = 63, O=16, molar gas volume at r.t.p = 24dm³)
- II. The volume of nitrogen gas produced. (2 marks)
- v) At the end of the experiment the pH of water in the beaker was found to be about 10. Explain. (2 marks)
- b) Why is it advisable to obtain nitrogen from air instead of from ammonia. (1 mark)
5. a) Draw the structures of the following organic compounds. (2 marks)
- i) 3-chloro-2-methylpent-2-ene
- ii) 2, 2-dimethylpropane
- b) Methanoic acid has higher melting and boiling point than methane. Explain. (2 marks)
- c) Study the flow chart below and answer the questions that follow.



- i) I. State the conditions necessary for step I to occur. (1 mark)
- II. Identify substances A, C, E and Gas D (1 mark)
- ii) Write an equation for the reaction taking place in step III. (1 mark)
- iii) Name the type of reaction in Step IV. (1 mark)
- iv) State the alternative method of preparing ethanol. (1 mark)
- d) State two advantages of synthetic materials over natural ones. (2 marks)

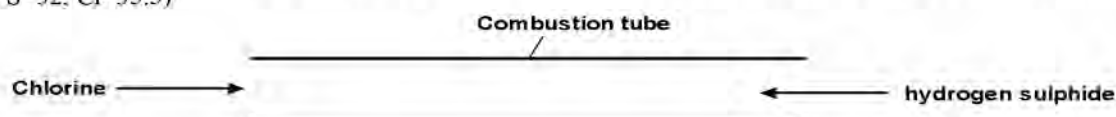
6. a) The set-up below was used to electrolyse lead bromide.



- Identify the anode
 - Did the experiment succeed ? Explain (2 marks)
 - The electrodes used in the experiment were made of platinum, give a reason. (1 mark)
 - Give a reason why this experiment is carried out in fume cupboard. (1 mark)
 - When the switch was closed, some mass of metal were deposited. Described how the amount of metal deposited was determined. (3 marks)
- b) Study the half cells below and answer the questions that follow, the letters do not represent the actual symbols of the elements.

Half cell	$E^\ominus$ (v)
$A_{(s)}/A^+_{(aq)}$	-2.60
$B_{(s)}/B^{2+}_{(aq)}$	+0.34
$C_{(s)}/C^{2+}_{(aq)}$	-0.83
$D_{2(g)}/D^+_{(aq)}$	+1.20
$E_{(s)}/E^{3+}_{(aq)}$	+0.77

- Name the electrode that was used as a reference. (1 mark)
 - Identify the strongest oxidising agent. (1 mark)
 - Identify a pair of half cells that will yield the lowest voltage when connected and give the cell notation.
Half cell
Notation :
7. a) State Graham's law of diffusion. (1 mark)
- b) An experiment was carried out to compare the rates of diffusion of chlorine gas and hydrogen sulphide gas. (H=1, S=32, Cl=35.5)



- What observation was made in the combustion tube? (1 mark)
 - Indicate where the observation in (i) above would occur. (1 mark)
 - It takes 15 seconds for 45cm³ of chlorine to diffuse through the combustion tube. How long will it take 135cm³ of hydrogen sulphide to diffuse under similar conditions? (3 marks)
- c) i) Complete the table below involving variation of volume with pressure at constant temperature. (3 marks)

Pressure (Pascals)	101325		103221	
Volume (cm ³)	80	100		120

- State the law being investigated in (i) above. (1 mark)