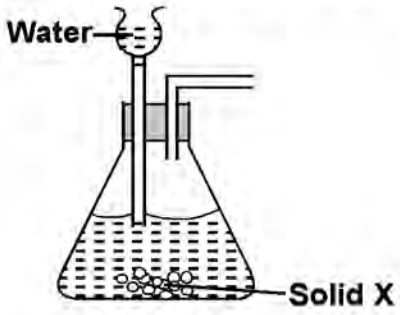
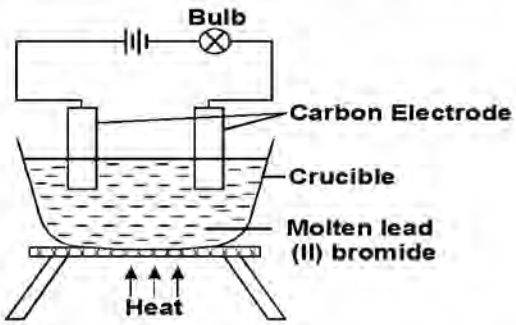
GEM SUB-COUNTY JOINT EVALUATION EXAMS 2016
233/1
CHEMISTRY
PAPER 1

1. When carbon is reacted with concentrated Nitric (V) acid, a brown gas is evolved as one of the products.
   a) Write a chemical equation for the above reaction. (1 mark)
   b) Using oxidation numbers show that the above reaction is a redox reaction. (2 marks)
2. a) State Graham's law of diffusion. (1 mark)
   b) Gas V takes 10 seconds to diffuse through a distance of one fifth of a meter. Another gas W takes the same time to diffuse through a distance of 10cm. If the relative molecular mass of gas V is 16.0, calculate the relative molecular mass of w. (2 marks)
3. The set up below was used to prepare a sample of oxygen gas.



   a) Complete the set up to show the collection of oxygen gas. (1 mark)
   b) Name solid X. (1 mark)
   c) Write a chemical equation for the reaction that occurs in the flask. (1 mark)
4. a) What is meant by the term isotope. (1 mark)
   b) Chlorine consists of two isotopes; chlorine -37 and chlorine -35. If the relative atomic mass of chlorine is 35.5, determine the relative abundance of each isotope. (2 marks)
5. Study the set-up below and then answer the questions that follow.



   State and explain the observations that would be made when the circuit is completed. (3 marks)
6. Describe how a solid sample of zinc carbonate can be prepared starting with zinc oxide. (3 marks)
7. 5.0g of calcium carbonate was allowed to react with 25.0cm³ of 1.0m hydrochloric acid until there was no further change. Calculate the mass of calcium carbonate that remained unreacted. (3 marks)
   (Ca = 40.0 C=12.0, O=16.0)
8. The table below shows the atomic and ionic radii of some period three elements, the letters do not represent the actual symbols.

Element	Atomic radius (nm)	Ionic radius (nm)
P	0.186	0.175
Q	0.160	0.135
R	0.104	0.184

From the table identify:

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a) The strongest reducing agent. Give a reason for your answer. (2 marks)
b) An element whose oxide has pH of below seven when dissolved in water. (1 mark)

9. Study the information in the table below and answer the questions that follow. (C=12.0, H=1.0)

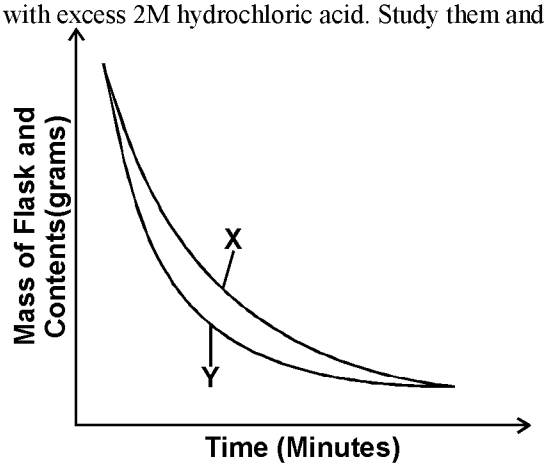
Hydrocarbon	No. of carbon atoms per molecule	No. of hydrogen atoms per molecule	Relative molecular mass
S	3		42
T	4	10	58
U		12	72
V	6	12	84

a) Complete the table by filling the missing information. (1 mark)
b) Name and draw two isomers of hydrocarbon T. (2 marks)

10. a) Hydrogen chloride gas can be prepared by reacting two substances. Name the two substances.
b) Write a chemical equation for the reaction between the two substances. (1 mark)
c) Give **two** uses of hydrogen chloride. (1 mark)

11. Draw a set-up that can be used to separate a mixture of sand and ammonium chloride. (3 marks)

12. The curves below represents the change in mass when equal masses of powdered magnesium and magnesium ribbon were reacted with excess 2M hydrochloric acid. Study them and answer the questions below.



Which curve represents the reaction with magnesium powder ? Explain your answer. (3 marks)

13. Study the information in the table below and answer the questions that follow.

Salt	Solubility g/100g of water	
	at 40°C	of 60°C
$CuSO_4$	28	38
$Pb(NO_3)_2$	79	98

A mixture containing 35g of $CuSO_4$ and 78g of $Pb(NO_3)_2$ in 100g of water at 60°C was cooled to 40°C.
a) Which salt crystallised out? Give a reason. (2 marks)
b) Calculate the mass of the salt that crystallized out. (1 mark)

14. Complete the nuclear equation below.

a) $^{131}_{53}\mathrm{I} \rightarrow {}^{131}_{54}Xe +$

b) the half-life of $^{131}_{53}\mathrm{I}$ is 8 days.

Determine the mass of $^{131}_{53}\mathrm{I}$ remaining if 50g decayed for 40 days. (1 mark)

c) Give one harmful effect of radioisotopes. (1 mark)

15. When a hydrocarbon was completely burnt in oxygen, 4.2g of carbon (IV) oxide and 1.71g of water was formed. Determine the empirical formula of the hydrocarbon. (3 marks)
(C=12.0, H=1.0, O=16.0)

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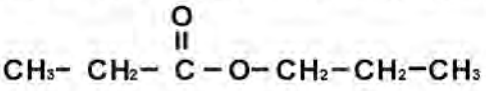
16. The structure below represents a certain compound



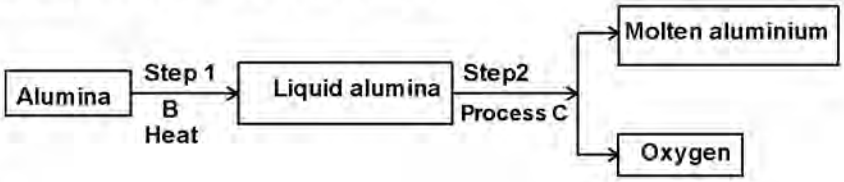
a) Draw and name two organic compounds that can be used to prepare this compound in the laboratory. (2 marks)
b) Give the name of the above compound. (1 mark)

17. The following are half-cell reactions and their reduction potentials.

	$E^{\theta}(volts)$
$Zn^{2+}_{(aq)} + 2e^{-} \rightarrow Zn_{(S)}$	-0.76
$Pb^{2+}_{(aq)} + 2e^{-} \rightarrow Pb_{(S)}$	-0.13
$Ag^{+}_{(aq)} + e^{-} \rightarrow Ag_{(S)}$	$+0.80$
$Cu^{2+}_{(aq)} + 2e^{-} \rightarrow Cu_{(S)}$	$+0.30$

a) Write the cell representation for the electrochemical cell that would give the highest electrode potential. (1 mark)
b) State and explain the observations made when a copper rod is placed in a beaker containing silver nitrate solution. (2 marks)

18. During the extraction of aluminium from its ores, the ore is first purified to obtain alumina. The flow chart below shows the stages in the extraction of aluminium from alumina.



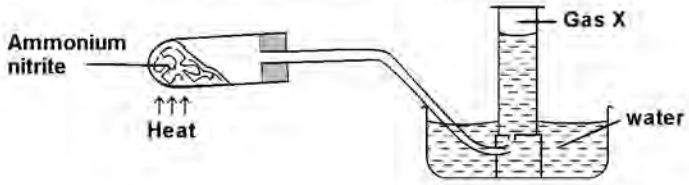
a) Name:
i) Substance B. (1 mark)
ii) Process C. (1 mark)
b) Give two reasons why aluminium is used extensively in making cooking pans. (1 mark)

19. Copper (II) sulphate reacts with Barium chloride according to the equation below.

$$CuSO_{4(aq)} + BaCl_{2(aq)} \rightarrow BaSO_{4(S)} + CuCl_{2(aq)} \qquad \Delta H = -17.7kJmol^{-1}$$

Calculate the temperature change when 900cm³ of 1M copper (II) sulphate were added to 600cm³ of 1M Barium chloride solution.
(Specific heat capacity of solution = 4.2Kj $kg^{-1}k^{-1}$ and density of solution = 1g/cm³) (3 marks)

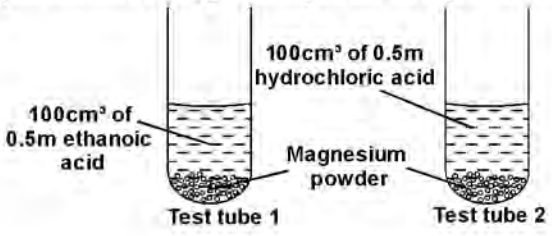
20. Ammonium nitrite was heated as shown in the set-up below.



Identify, gas X. (1 mark)
b) State and explain the precaution that must be taken before heating is stopped. (2 marks)

21. When wood is burnt, a grey powder called ash remains. When the ash is stirred with water and filtered, a colourless solution is obtained.
a) What is the name of the main component of the colourless solution? (1 mark)
b) Explain your answer in (a) above. (2 marks)

22. In an experiment, equal amounts of magnesium powder were placed into test-tube 1 and test-tube 2 as shown below.



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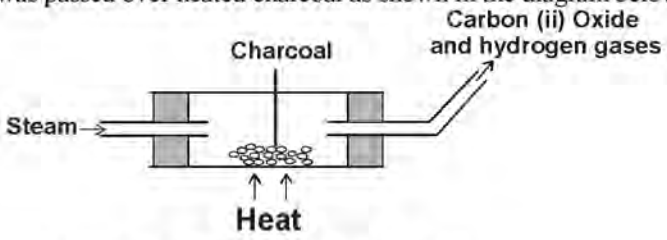
Explain why the amount of hydrogen gas liberated in test-tube 2 is greater than that in test-tube 1 before the reaction is complete. (3 marks)

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

$$N_{2(g)} + 3H_{2(g)} \qquad 2NH_{3(g)} \qquad \Delta = -92kJ$$

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 one 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)

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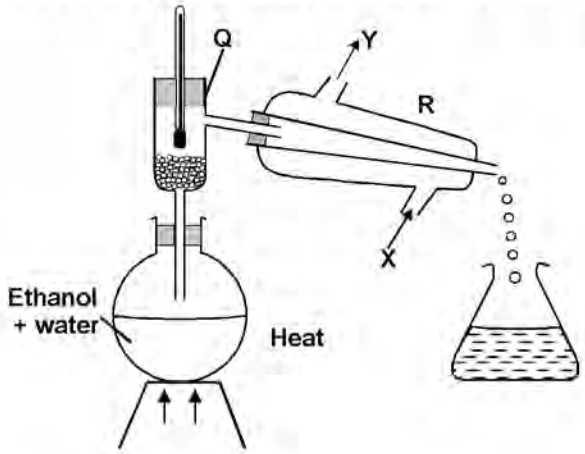
233/2
CHEMISTRY
PAPER 2

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)



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