NAME…….. INDEX NO…….....

233/2
CHEMISTRY
PAPER 2
(THEORY)
JULY/AUGUST, 2016
TIME: 2 HOURS

CANDIDATE'S SIGN……..……

DATE……..……....

KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY JOINT EXAMINATION – 2016

Kenya Certificate of Secondary Education
CHEMISTRY
PAPER 2
(THEORY)
TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

(i) Write your **name** and **index number** in the spaces provided **above**.
(ii) **Sign** and write the **date** of examination in the spaces provided **above**.
(iii) Answer **ALL** the questions in the spaces provided.
(iv) All working **must be** clearly shown where necessary.
(v) Mathematical tables and silent electronic calculators **may be** used.

FOR EXAMINER'S USE ONLY:

Question	Maximum Score	Candidate's Score
1	12	
2	14	
3	13	
4	11	
5	10	
6	10	
7	10	
Total Score	80	

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

for free past papers visit: www.freekcsepastpapers.com or call 0720502479

1. The table below gives some elements of the periodic table (not actual symbols) and their atomic masses, atomic numbers and melting points.

Element	B	C	D	E	F	G	H	I	J	K
Atomic Nº	7	8	19	15	2	9	6	16	12	11
Atomic mass	14	16	39	31	4	19	12	32	40	23
Mpt (ºC)	-	-	63.7	44	-272	-223	Vary	113	669	98

(a) Select **two** elements with oxidation states of -3. (1 mark)

……

(b) Which elements represents:-

(i) the most powerful reducing agent. (½ mark)

……

(ii) the most powerful oxidizing agent. (½ mark)

……

(c) Which metallic element has the highest first ionization energy? (1 mark)

……

(d) Select **two** elements which when reacted form a compound that conducts electricity in both molten and aqueous state. (1 mark)

……

……

(e) Select any **two** elements which when reacted form a compound that dissolves in water to form an acidic solution. (1 mark)

……

……

(f) Using dots (•) and crosses (x) to represent valency electrons, draw diagrams to show bonding between **B** and **J**. (2 marks)

for free past papers visit: www.freekcsepastpapers.com or call 0720502479

(g) Explain why for some elements the atomic mass is not twice the atomic number. (1 mark)

……

……

……

(h) Explain why the melting point of element K is higher than that of element D. (1 mark)

……

……

……

(i) Describe how a solid mixture of the sulphate of element K and lead (II) sulphate can be separated. (3 marks)

……

……

……

……

……

2. The solubilities of two salts D and E are given in the following table in each case the solubility is expressed as grammes per 100g of water.

Temperature (ºC)	10	20	30	40	50	60	70	80
Solubility of D	17	21	24	29	34	40	47	56
Solubility of E	35.8	36	36.2	36.5	36.8	37.3	37.6	38.0

(a) Using these data plot solubility curves for D and E on the same grid. (5 marks)

for free past papers visit: www.freekcsepastpapers.com or call 0720502479

(b) Use your graph to answer the following questions:

(i) At what temperature are the solubilities of the two salts equal? (1 mark)

……

(ii) Estimate the solubility of salt D at O°C. (1 mark)

……

(iii) A saturated solution of E in 50g of water at 25°C was evaporated to dryness. What was the mass of the residue? (1 mark)

……

……

……

for free past papers visit: www.freekcsepastpapers.com or call 0720502479

(iv) Two separate 100g of water are saturated at 75ºC, one with D and the other with E. What is the difference in mass between the two solutions? (2 marks)

……

……

……

……

(v) The saturated solution obtained were each cooled to 20ºC.

I Calculate the total mass of the two salts precipitated. (2 marks)

……

……

……

……

II Calculate the mass of each salt dissolved at saturation in 20g of water at 20ºC. (2 marks)

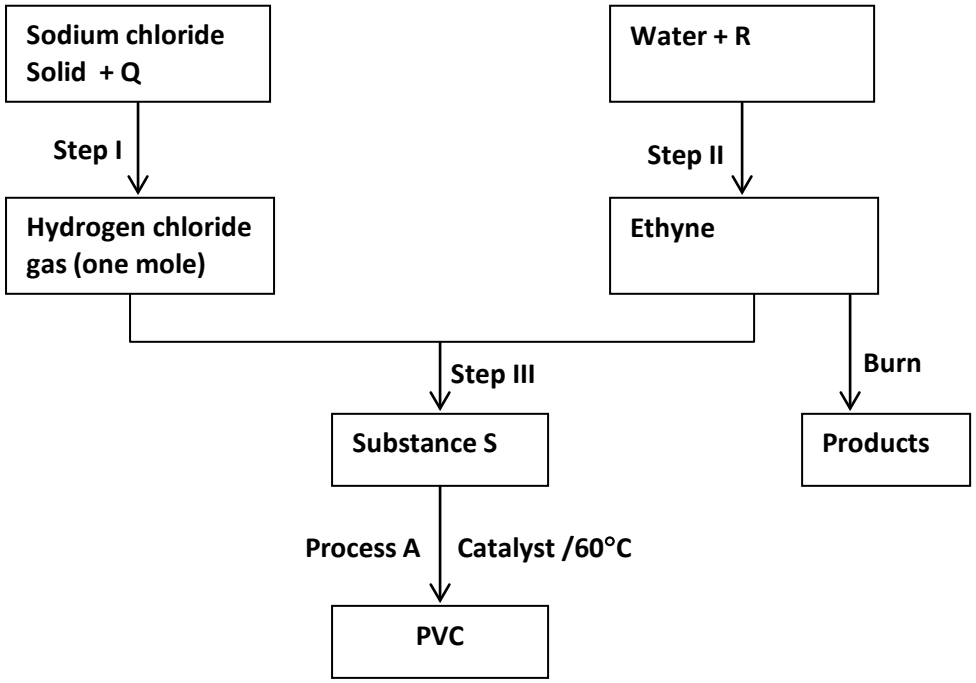
……

……

……

……

3. (i) Study the flow chart below and answer the questions that follow.



for free past papers visit: www.freekcsepastpapers.com or call 0720502479

(i) Identify substances **Q** and **R**. (2 marks)

Q …… **R** ……

(ii) Using a chemical equation, show how **R** reacts with water. (1 mark)

……

……

(iii) Name and draw the structures of substance **S**. (2 marks)

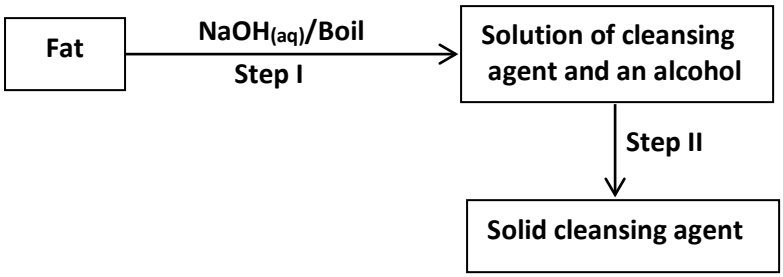
(iv) Name process **A**. (1 mark)

……

(v) State **two** uses of PVC. (1 mark)

……

(b) The scheme below was used to prepare a cleansing agent. Study it and answer the questions that follow.



(i) What name is given to the type of cleansing agent prepared by the method above? (1 mark)

……..

(ii) Name **one** chemical substance added in Step **II**. (1 mark)

……..

(iii) What is the purpose of adding the chemical named in b(ii) above. (1 mark)

……..

for free past papers visit: www.freekcsepastpapers.com or call 0720502479

(iv) Name any other suitable substance that can be used in Step **I**. (1 mark)

……..

(v) Explain how an aqueous solution of the cleansing agent removes oil during washing. (2 marks)

……..

……..

……..

……..

4. (a) The standard reduction potentials for five half cells are shown in the table below. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

			E^{θ}(V)
$A_{2(aq)} + 2e^-$	$\rightarrow$	$2A^-_{(aq)}$	+1.09
$Q^{2+}_{(aq)} + 2e^-$	$\rightarrow$	$Q_{(S)}$	−0.13
$R^{2+}_{(aq)} + 2e^-$	$\rightarrow$	$R_{(S)}$	−2.37
$Y^{2+}_{(aq)} + 2e^-$	$\rightarrow$	$Y_{(S)}$	+0.34
$25^{+}_{(aq)} + 2e^-$	$\rightarrow$	$S_{2(g)}$	0.00

(i) With a reason identify the strongest reducing agent. (1 mark)

……..

……..

(ii) Which element is likely to be hydrogen. Explain. (1 mark

……..

……..

……..

(iii) Write an equation for the cell formed when Q and Y half cells are joined. (1 mark)

……..

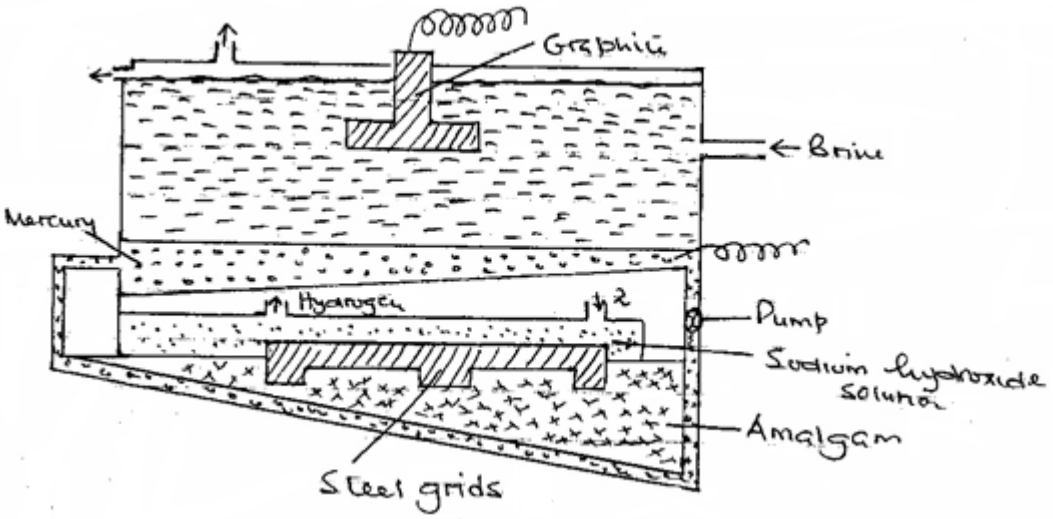
……..

(iv) Calculate the e.m.f of the cell in (iii) above. (1 mark)

……..

for free past papers visit: www.freekcsepastpapers.com or call 0720502479

(b) The diagram below represents a mercury cell that can be used in the industrial manufacture of sodium hydroxide. Study it and answer the questions that follow.



(i) Name raw material introduced at **2**. (½ mark)

……..

(ii) Name another material that can be used in the cell instead of graphite.

…… (½ mark)

(iii) Write an equation for the reaction.

I that occurs at the anode. (1 mark)

……

……

II In which sodium hydroxide is produced. (1 mark)

……

……

(iv) Give **two** reasons why mercury is recycled. (1 mark)

……

……

……

……

for free past papers visit: www.freekcsepastpapers.com or call 0720502479

(iv) A current of 100 amperes was passed through the cell for five (5) hours. Calculate the mass of sodium hydroxide that was produced.
(Na = 23.0, O = 16.0, H = 1.0, 1 Faraday = 96500C). (3 marks)

……

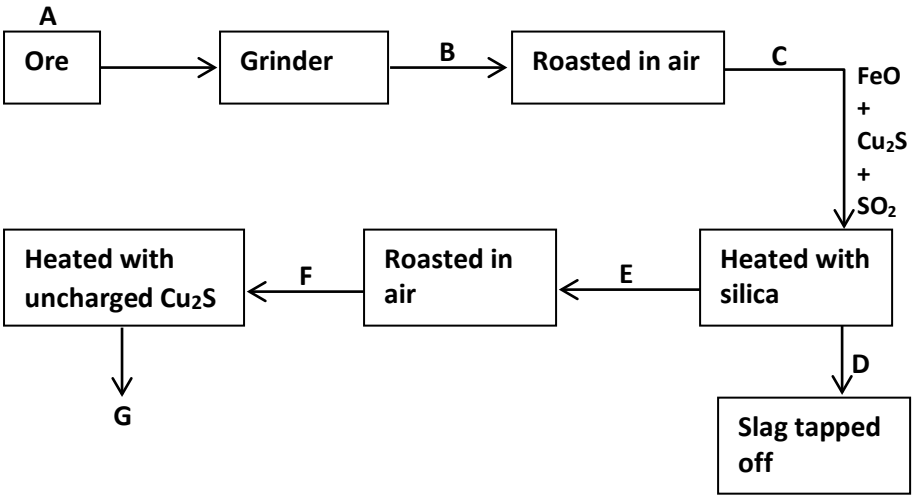
……

……

……

……

5. Study the flow diagram below and answer the questions that follow.



(a) Give the names of the two ores that can be used in the above process in Stage **A**.

…… (1 mark)

(b) What process takes place in Stage **B**? (1 mark)

……

(c) Give the equation for the formation of the slag that is tapped of in Stage **D**.
What is the name of the slag? (2 marks)

……

……

……

(d) What are the names of the products formed in Stage **G**? (1 mark)

……

(e) What are the main impurities that are contained in the copper obtained in Stage **G**. (1 mark)

……

for free past papers visit: www.freekcsepastpapers.com or call 0720502479

(f) Draw a well labelled diagram of the set-up of apparatus that would be used to purify the copper obtained in Stage **G**. (2 marks)

(g) State **two** uses of copper. (1 mark)

……

……

(h) What environmental problems would be associated with copper mining? (1 mark)

……

……

……

6. (a) Methanol is manufactured from carbon (IV) oxide and hydrogen gas according to the equation.

$$CO_{2(g)} + 3H_{2(g)} \rightleftharpoons CH_3OH_{(g)} + H_2O_{(g)} \qquad \Delta H = -ve$$

The reaction is carried out in the presence of a chromium catalyst at 400ºC and 30Kpa under these conditions, an equilibrium is reached when 2% of the carbon (IV) oxide is converted to methanol.

(i) Explain how the yield of methanol would be affected if; the manufacturing process above is carried out at, 200ºC and a pressure of 30Kpa. (2 marks)

……

……

……

……

(ii) A more efficient catalyst is used. (2 marks)

……

……

……

……

for free past papers visit: www.freekcsepastpapers.com or call 0720502479

(b) In an experiment to determine the molar heat of reaction when zinc displaces copper, 0.4g of zinc powder were added to 25.0cm³ of 2.0M copper (II) sulphate solution. The temperature of copper (II) sulphate solution was 24ºC, while that of the mixture was 36ºC.

(i) Other than increase in temperature, state and explain the observations which were made during the reaction. (3 marks)

……

……

……

……

(ii) Calculate the heat change during the reaction. (Specific heat capacity of the solution = $4.2Jg^{-1}K^{-1}$ and the density of the solution = $1g/cm^3$. (1 mark)

……

……

……

(iii) Determine the molar heat of displacement of copper by zinc. (Zn = 65). (2 marks)

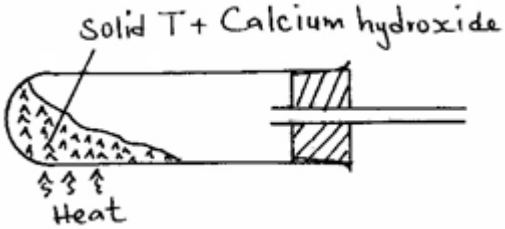
……

……

……

……

7. (a) The diagram below shows an incomplete set-up used to prepare and collect ammonia gas.



for free past papers visit: www.freekcsepastpapers.com or call 0720502479

(i) Name solid **T**. (1 mark)

……

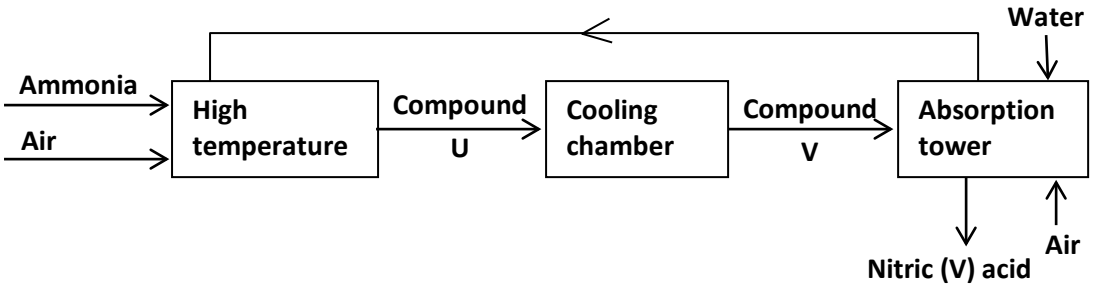
(ii) Write an equation for the reaction that occurred when a mixture of solid **T** and calcium hydroxide was heated. (1 mark)

……

……

(iii) Complete the diagram to show how a dry sample of ammonia gas can be collected. (3 marks)

(b) Ammonia gas is used to manufacture nitric (V) acid as shown below.



(i) Name the catalyst used in the above process. (½ mark)

……

(ii) Identify compound **U**. (½ mark)

……

(iii) Write the equation for the reaction that took place in the absorption tower. (1 mark)

……

……

(iv) Ammonia and nitric (V) acid are used in the manufacture of ammonium nitrate fertilizer, calculate the amount of the fertilizer manufactured per day, if the daily consumption of ammonia is 2400kg. Assume that the factory is 100% efficient. (N = 14, H = 1, O = 16). (3 marks)

……

……

……

……

……

for free past papers visit: www.freekcsepastpapers.com or call 0720502479