MUTOMO SUB-COUNTY KCSE REVISION MOCK EXAMS 2015

233/2
CHEMISTRY
PAPER 2
(THEORY)
TIME: 2 HOURS

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NAME _____ INDEX NO. _____

SCHOOL _____ SIGNATURE _____

DATE _____

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MUTOMO SUB-COUNTY KCSE PACESETTER, 2015

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

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INSTRUCTIONS TO CANDIDATES

- Write your name, school and index number in the spaces provided above.
- Sign and write the date of examination in the space provided above.
- Answer **ALL** the questions in the spaces provided.
- Mathematical tables and silent electronic calculators may be used.
- All working must be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

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

This paper consists of 10 printed pages.
Candidates should check to ensure that all pages are printed as indicated and no questions are missing

1. The following table shows some properties of period three elements and their chlorides. Study it and answer the questions that follow.

Element	Na	Mg	Al	Si	P	S	Cl	Ar
Ionization energy kJ/mol	494	736	577	786	1060	1000	1260	1520
Melting point (°C)	78	649	660	1420	44	114	–101	–189
Formula of chloride					PCl_5	S_2Cl_2	Cl_2	X
Boiling point of chloride (°C)	1465	1418	423	57	164	136	–35	

a) Complete the table by filling in the formula of the missing chlorides. (2 marks)

b) In terms of structure and bonding, explain the following observations:

i) The melting point of aluminium is higher than that of sodium. (1½ marks)

_____

_____

_____

_____

ii) The melting point of chlorine is lower than that of sulphur. (1½ marks)

_____

_____

_____

_____

iii) The melting point of aluminium chloride is lower than that of magnesium chloride. (2 marks)

_____

_____

_____

_____

_____

c) Sodium chloride dissolves in water to form a neutral solution but aluminium chloride dissolves to form an acidic solution. Explain this observation. (2 marks)

_____

_____

_____

_____

d) Generally, the first ionization energy increases across the period. Explain (2 marks)

_____

_____

_____

_____

e) Iron (III) oxide was found to be contaminated with magnesium chloride. Describe how a pure dry sample of iron (III) oxide can be obtained. (3 marks)

_____

_____

_____

_____

_____

2. a) Name the following compounds. (2 marks)

i) $CH_3\ CH_2\ CH\ CH_2\ CH_2$
$\qquad\qquad\ \ |\qquad\ \ |$
$\qquad\qquad\ OH\qquad OH$ _____

ii) CH_3CCCH_3 _____

b) i) Draw the structural formula of all isomers of $C_2H_3Cl_3$ (2 marks)

ii) Describe **one** test that can be used to distinguish between CH_3CH_2COONa and CH_3CH_2OH. (2 marks)

_____

_____

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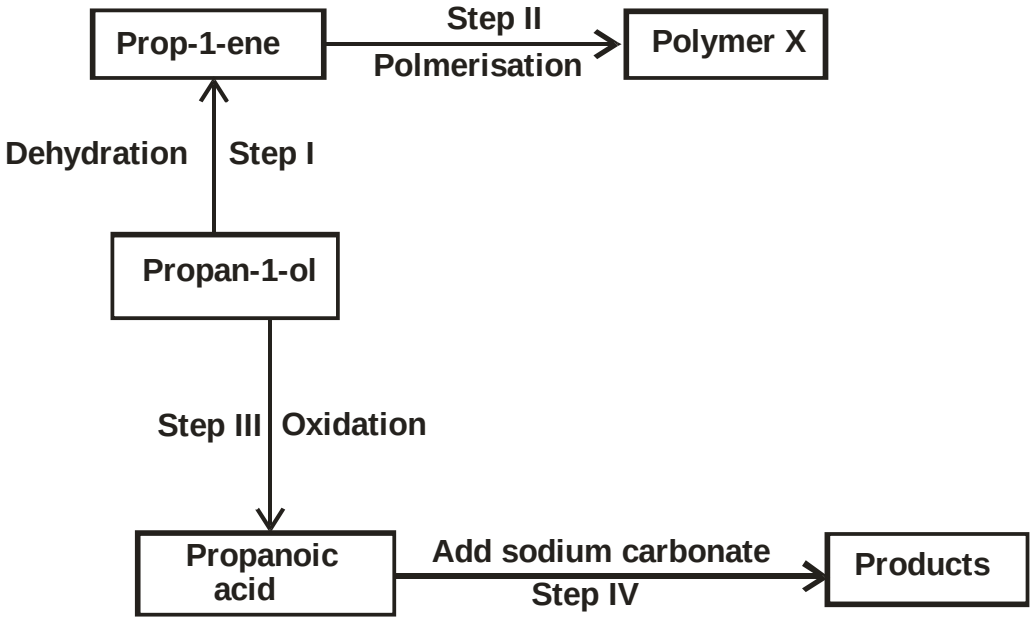
_____

c) The following scheme represents various reactions starting with propan-1-ol. Use it to answer the questions that follow.



i) Name **one** substance that can be used in step I. (1 mark)

ii) Give the general formula of X and explain why it is an environmental pollutant. (2 marks)

iii) Write an equation for the reaction in step IV. (1 mark)

iv) Calculate the mass of propan-1-ol which when burnt completely in air at room temperature and pressure would produce $18dm^3$ of gas.
(C = 12.0, O = 16.0, H = 1.0, molar gas volume = $24.0dm^3$) (3 marks)

3. a) What is heat of reaction? (1 mark)

b) Use the bond energies in the table below to calculate the heat of reaction for the combustion of methane $CH_{4(g)} + 2O_{2(g)} \longrightarrow CO_{2(g)} + 2H_2O_{(l)}$ (3 marks)

Bond	Bond energy kJ/mol
C – H	435
O – H	464
O = O	497
C = O	803

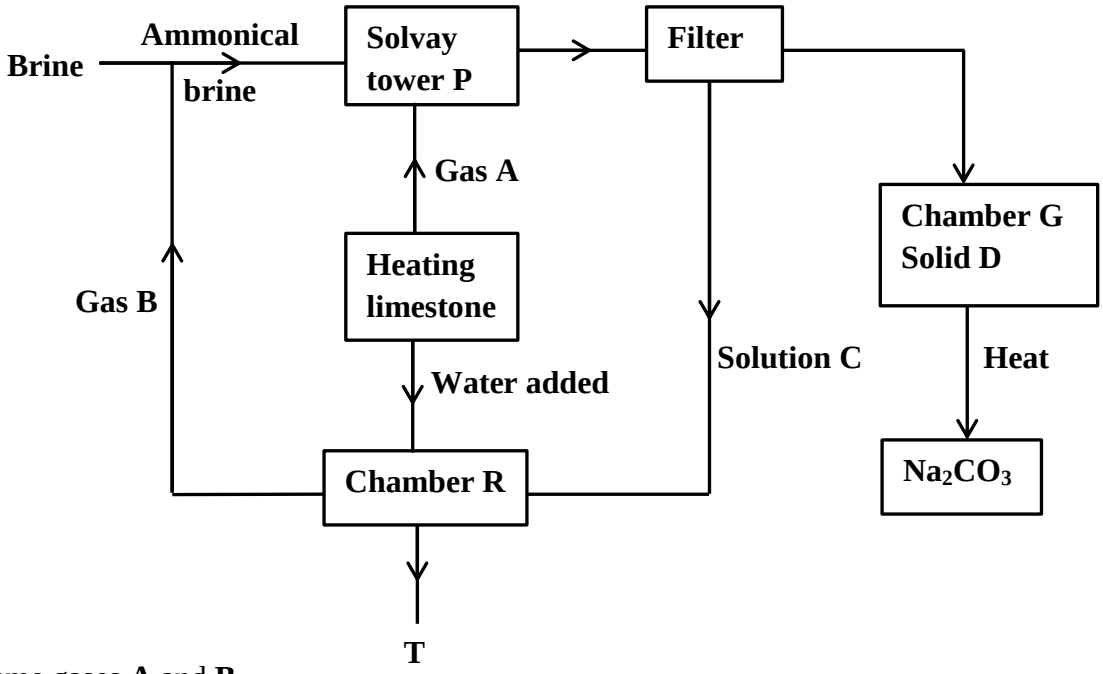
c) If the heat energy evolved in b) above is used to heat 2kg of water at 20°C, what is the final temperature of water? (SHC of water = 4.2kJ/mol) (3 marks)

d) i) What is heat of neutralization? (1 mark)

ii) Write an ionic equation for the neutralization reaction. (1 mark)

iii) Explain why the heat of neutralization reaction for $NaOH_{(aq)}$ with $HCl_{(aq)}$ is higher than for $NaOH_{(aq)}$ with $CH_3COOH_{(aq)}$. (2 marks)

4. The diagram below shows the process of manufacturing sodium carbonate using ammonium soda process. Study it and answer the questions that follow.



a) Name gases **A** and **B.** (2 marks)

A _____

B _____

b) Name solution C and D. (2 marks)

C _____

D _____

c) Write equations of the reactions in: (2 marks)

Tower P

_____

Chamber R

_____

d) Name the product T formed at chamber R and give one of its uses. (2 marks)

Name: _____

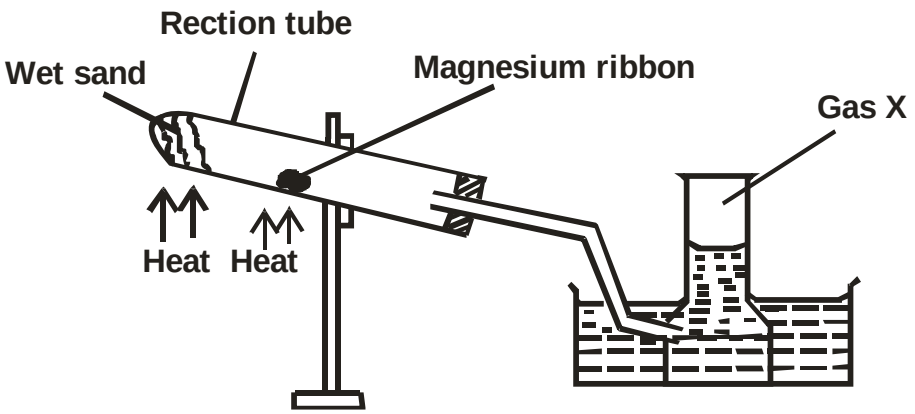
Use: _____

e) Name **two** uses of sodium carbonate produced in the process. (2 marks)

_____

_____

5. The set up below was used to prepare and collect gas X. During the experiment cleaned magnesium ribbon was strongly heated before heating the wet glass wool.



a) Name gas X. (1 mark)

_____

b) Why is magnesium ribbon cleaned before it is used? (1 mark)

_____

_____

c) State **one** observation that would be noted in the reaction tube. (1 mark)

_____

_____

d) Write the equation for the reaction in the reaction tube. (1 mark)

_____

_____

e) State **one** industrial use of solid product formed in the reaction tube. (1 mark)

_____

_____

f) What precaution should be taken at the end of the experiment? Explain. (2 marks)

_____

_____

g) At the end of the experiment 96.0cm^3 of gas X were collected at 10°C and 1 Atmosphere pressure.
(Mg = 24, MGV = 22.4, T = O°C at s.t.p, P = 1 atmosphere at s.t.p)

i) Determine the volume gas X would occupy at s.t.p. (2 marks)

_____

_____

_____

_____

_____

ii) Calculate the mass of magnesium ribbon used (Mg = 24). (2 marks)

_____

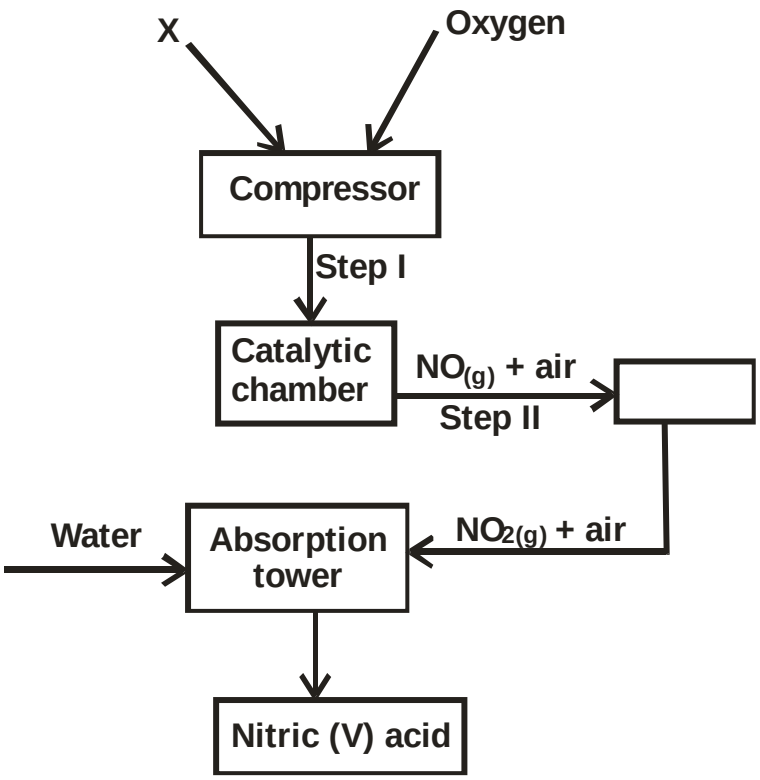
_____

_____

_____

_____

6. The flowchart below shows the large scale manufacture of nitric (V) acid.
Study it and answer the questions below.



a) Name substance X. (1 mark)

b) Identify **one** source of X in this process. (1 mark)

c) Write a balanced equation for the reaction which takes place.

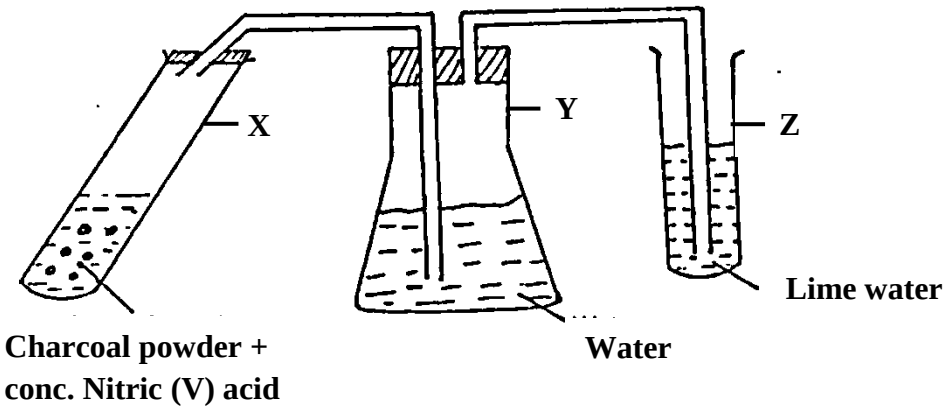
i) At step II. (1 mark)

ii) In the absorption tower (1 mark)

d) Name the catalyst used in this process (1 mark)

e) Why is it not advisable to store nitric (V) acid in a transparent bottle? (1 mark)

f) The apparatus below was arranged to investigate the properties of nitric (V) acid.
Study the set-up and answer the questions that follow:



i) Explain what would be observed when blue and red litmus paper is dropped into flask Y after the experiment. (2 marks)

ii) Write an equation for the reaction in test tube X above. (1 mark)

iii) What gaseous products would be expected if concentrated sulphuric (VI) acid was used in place of conc. nitric (V) acid? (1 mark)

7. I. 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 elements)

	Elements	**E^{θ} (V)**
i)	$A_{2(aq)} + 2e^- \rightarrow 2A^-_{(aq)}$	+ 1.09
ii)	$Q^{2+}_{(aq)} + 2e^- \rightarrow Q_{(s)}$	– 0.13
iii)	$R^{2+}_{(aq)} + 2e^- \rightarrow R_{(s)}$	– 2.37
iv)	$Y^{2+}_{(aq)} + 2e^- \rightarrow Y_{(s)}$	+ 0.34
v)	$2S^+_{(aq)} + 2e^- \rightarrow S_{2(s)}$	0.00

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

_____

_____

b) Which half-cell is likely to be hydrogen? (1 mark)

_____

_____

c) Write an equation for the reaction between two half cells in (ii) and (iv) . (1 mark)

_____

_____

d) Calculate the e.m.f of the cell in c) above . (1 mark)

_____

_____

_____

_____

_____

e) Explain why you should not use concentrated sulphuric (VI) acid in lead acid accumulators. (1 mark)

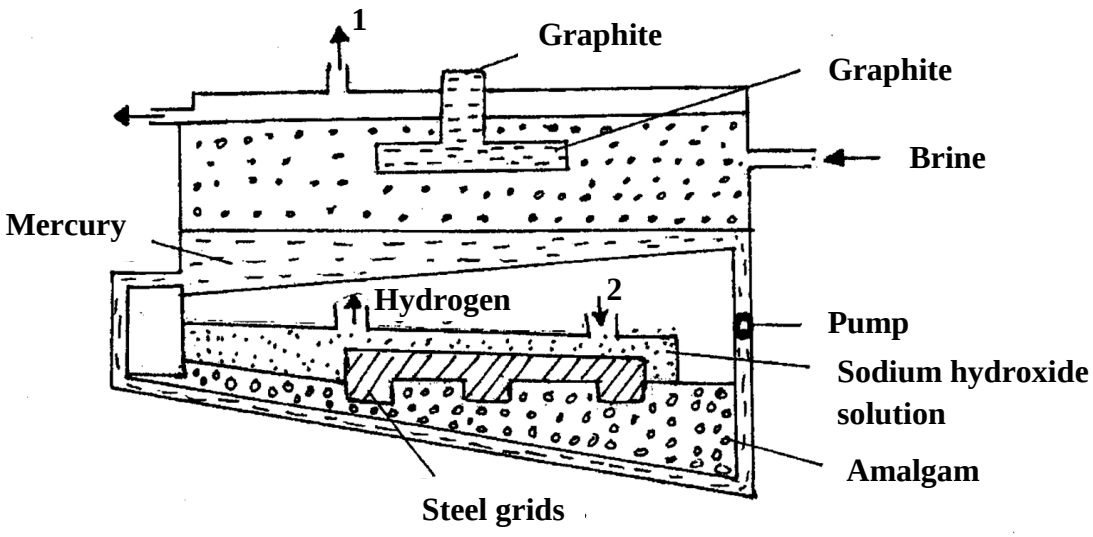
_____

_____

_____

_____

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



a) Name:

i) Raw material introduced at 2. (½ mark)

_____

ii) Another substance that can be used in the cell instead of graphite. (½ mark)

_____

b) Identify the by-product that comes out at 1. (1 mark)

_____

c) Write an equation for the reaction:

i) That occurred at the anode. (1 mark)

_____

_____

ii) In which sodium hydroxide was produced. (1 mark)

_____

_____

d) Give **two** reasons why mercury is recycled. (2 marks)

_____

_____

_____

_____