M/S

Name: .... Class: ....

Adm.No…………….. Date: ………………

233/1

CHEMISTRY

Paper 1 FORM THREE

END OF TERM TWO EXAM JULY 2019

Time: 2 hours

SUNSHINE SCHOOL

Kenya Certificate to Secondary Education

CHEMISTRY PAPER 1

TIME: 2 HOURS

INSTRUCTIONS

- Write your name and index number in the spaces provided above.
- Sign and write the date.
- Attempt ALL the questions in this paper.
- Electronic non-programmable calculators or mathematical tables may be used.

Name Qn
Aketch - 1-5
Koga - 6-9
Mely - 10-12
Mwagi - 13-15
Oma - 16-19
Rayuya - 20-23
Reile - 24-26
Tim - 27-29

FOR EXAMINER'S USE

QUESTIONS	MAX. SCORE	CANDIDATE'S SCORE
1 – 29	80	

This paper consists of 11 printed pages. Candidates are advised to check and to make sure all pages are as indicated and no question is missing.

2.4

1. Calcium oxide can be used to dry ammonia gas.
(a) Explain why calcium oxide is not used to dry hydrogen chloride gas. (1mark)

HCl is acidic and hence will react with CaO which is basic.

(b) Name one drying agent for hydrogen chloride gas. (1 mark)

Conc. H_2SO_4 ✓ (None)

2. An isotope of **J** has a mass number **34** and has **18** neutrons.
(a) What are isotopes? (1 mark)

Atoms of the same element with same atomic number but different mass number. ✓ (1) Accept same protons but different neutrons.

34
1 F

(b) Write down the electronic configuration of the ion of **J**. (1 mark)

2.8.6 ✓ (1)

3. An organic compound Y was analysed and found to contain carbon, hydrogen and oxygen only. 1.29g of Y on complete combustion gave 2.64g of CO_2 and 0.81g of water.
Find the empirical formula of Y. (3 marks)

Mass of C = $\frac{12}{44} \times 2.64 = 0.72g$

Mass of H = $\frac{2}{18} \times 0.81 = 0.09g$ ✓

Mass of O = $1.29 - (0.72 + 0.81)$
$= 0.48g$

C	H	O
$\frac{0.72}{12}$	$\frac{0.09}{1}$	$\frac{0.48}{16}$ ✓
$\frac{0.06}{0.03}$	$\frac{0.09}{0.03}$	$\frac{0.03}{0.03}$ ✓
2	3	1

EF = C_2H_3O

(3)

4. Sulphur exist in two crystalline forms.
(a) Name one crystalline form of sulphur. (1) (1 mark

Monoclinic ✓ or Rhombic. ✓ any 1

(b) State one use of sulphur. (1 mark)

- Vulcanization of rubber ✓ any 1.
- Manufacture of fungicide
- Manufacture of H_2SO_4 ✓

5. Name the most suitable method you can use to separate;
(a) Xanthophyll and chlorophyll in green leaves. 1 (1 mark)

Chromatography ✓

(b) Oil from simsim seeds. (1 mark)

Solvent extract ✓ 1

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6.Nitrogen gas can be obtained from air and can also be obtained by heating ammonium nitrite as shown below.

$NH_4NO_{2\,(s)} \xrightarrow{\text{Heat}} 2H_2O_{(l)} + N_{2\,(g)}$

(a) Explain why nitrogen gas obtained from air is heavier than that obtained in the above equation. (1mark)

It contains noble gases.

(b) State ~~two~~ one industrial uses of nitrogen gas. (1 marks)

- Manufacture of Ammonia.
- used as a reagent for Semen blood etc

7. Water gas is a mixture or carbon (II) oxide and hydrogen gas while producer gas is a mixture of carbon (II) oxide and nitrogen gas. Using equations, explain why water gas is a better industrial fuel than the producer gas. (3 marks)

(1) Water gas - Both CO & H_2 burn to produce more energy.

$2CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)}$, $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(g)}$

(2) Producer gas only CO burns but N_2 can't burn producing less energy

$2CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)}$

8. State and explain what happens to red and blue litmus paper used in a gas jar full or dry ammonia. (1 mark)

Red litmus turns to Blue

Blue litmus remains blue

b)Using Lead (II) nitrate explain how the presence of chloride ions can be tested. (2 marks)

Add $Pb(NO_3)_2$ solution, A white ppt is formed

Warm the ppt dissolves confirming presence of Pb^{2+} Cl^-

9. The table below gives some properties of compounds P, Q , R and S

Compound	B.P. (0C)	M·P.(0C)	Conductivity in water
P	77	-23	Does not conduct
Q	74	-19	Does not conduct
R	-161	-85	Conducts
S	2407	714	Conducts

(a) Which one of the compounds in the table is ionic? Explain. (1mark)

S - High m.p/b.p and conduct electricity in

9

(b) Give the compound that is liquid at room temperature. (1mark)

P & Q ✓ ✓ any 1

10. In an experiment to determine the pH values of various solutions, universal indicator solution was added to solutions A, B, C and D. The table below shows the results obtained.

Solution	Colour obtained
A	Orange
B	Red
C	Purple
D	Green

a) Which solution is likely to be ethanoic acid? (1mk)

A ✓

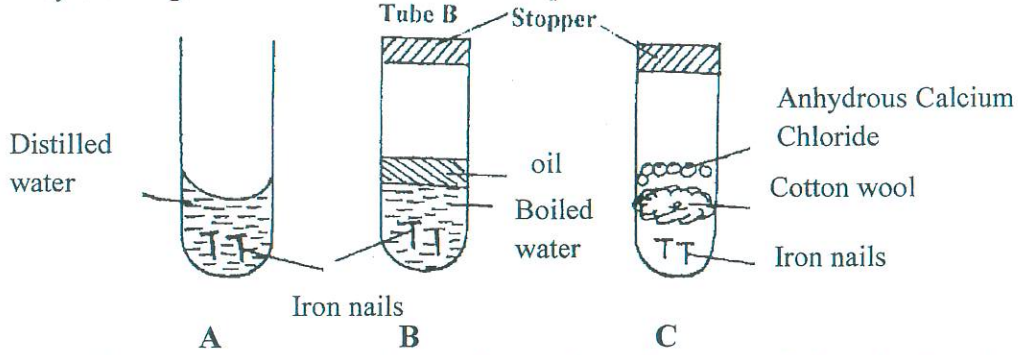
b) Which solution has the highest concentration of hydroxyl ions per unit volume? (1mk)

C ✓

c) Select the solution that is likely to be the oxide of hydrogen. (1mk)

D ✓

11. Study the diagrams below and answer the questions that follow



a) State and explain the observation made on the iron nails in tube B at the end of the experiment. (2mks)

Nails remains grey - Boiling expells dissolved O_2 ✓ and oil prevents O_2 from dissolving and hence lack of O_2 ✓

b) State two ways of preventing rusting. (1mk)

- Galvanizing ½
- Electroplating ½ any 2 @ ½
- Greasing & oiling ½
- Painting ½
- Sacrificial protection ½

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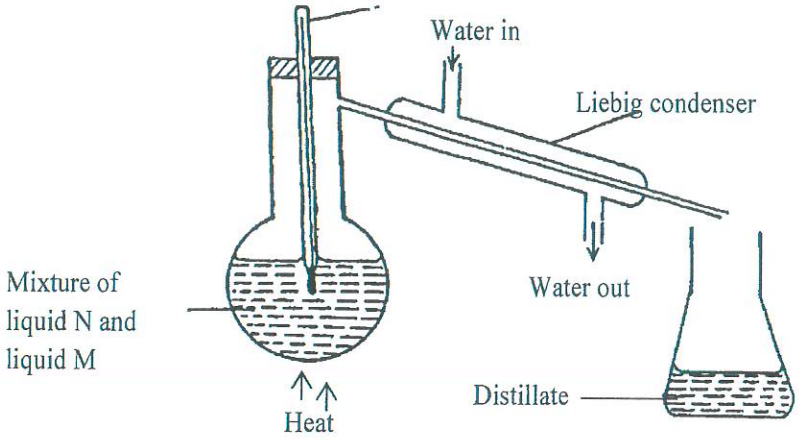
12. The diagram below shows a set up used to separate two organic liquids, liquid **M** (boiling point **56°C**) and liquid **N** (boiling point **118°C**)



a) Identify two mistakes in the above set up. (2mks)

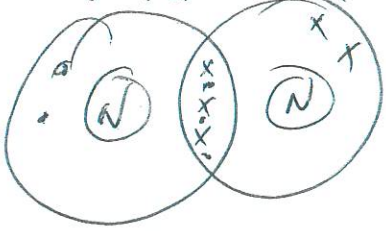
- The thermometer is in contact with the mixture
- Exchange of water in & water out ✓

b) State one large scale application of the method of separation shown above. (1mk)

- Manufacture of alcoholic drinks ✓ any 1
- Separation of crude oil into different fractions
- Separation of liquid air into N_2, O_2 & Ar ✓

Separation of used oil

13.a) Using dots (•) and crosses (X) to represent outer electrons only, draw a diagram to show the structure of a nitrogen (N_2) molecule. (Atomic number **N = 7**) (2mks)



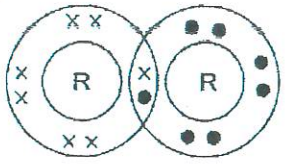
✓ (2)

b) Explain why nitrogen gas is generally inert. (1mk)

✓ (1)

Has a triple bond which is very strong to break.

c) Identity the type of bond represented by substance R shown below, explain your answer. (2 marks)



✓ ✓

Covalent bond - involves sharing of electrons

8

d) Predict the group of the periodic table into which R belongs. (1 mark)

(VII) – Roman letter

14. a) State Charles' law. (1 mark)

At Constant ~~Temperature~~ Pressure, the vol of a gas is directly proportional to absolute temperature.

b) A fixed mass of a gas has a volume of **200cm^3** at **25°C** and at a pressure of **101325 Pascal**. What would be its volume at **-23^{0}C** and at **100,000 Pascal**? (2mks)

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$P_1 = 101325$
$V_1 = 200$
$T_1 = 298$
$P_2 = 100000$
$T_2 = 250$
$V_2 = ?$

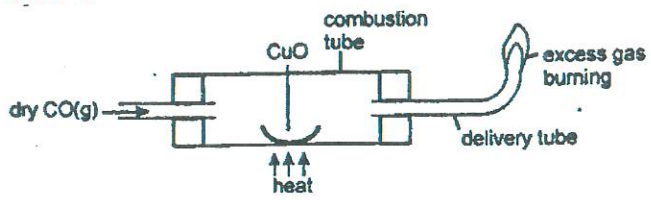
$\frac{101325 \times 200}{298} = \frac{100000 \times V_2}{250}$

$V_2 = 170.008 cm^3$

15. Describe how the following reagents can be used to prepare lead (II) sulphate. Solid potassium sulphate, solid lead (II) carbonate, dilute nitric (V) acid and distilled water (3 marks)

Dissolve K_2SO_4 in distilled water, Add excess $PbCO_3$ to dil HNO_3, filter the excess $PbCO_3$, Add K_2SO_4 soln to $Pb(NO_3)_2$ soln, filter to obtain $PbSO_4$, dry between filter paper.

16. The diagram below is a set-up used to investigate a certain property of carbon (II) oxide. Study it and answer the questions that follow.



a) State the observation made in the combustion tube. (1 mark)

Black CuO changes to brown Cu

b) By use of an equation, explain the observations in (a) above. (1 mark)

$CuO_{(s)} + CO_{(g)} \rightarrow Cu_{(s)} + CO_{2(g)}$

c) Why should excess gas be burnt at the end of the delivery tube? (1 mark)

CO is poisonous.

10

17. Aluminium Chloride sublimes at about **180^{0}C**, while Aluminium Oxide melts at **1800^{0}C**.
a)State the types of bonding in each of the two compounds: Al_2O_3 and $AlCl_3$ (2 mks)

Al_2O_3 – Ionic ✓
$AlCl_3$ – Covalent ✓

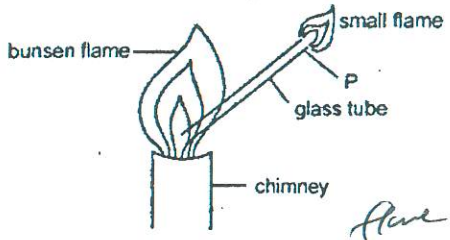
b)Explain why the sublimation temperature of Aluminium Chloride is lower than the melting point of Aluminium Oxide. (1mark)

Al_2O_3 – Ionic bonds are strong to break ✓
$AlCl_3$ – Has dimer molecules with weak Van der waals which are weaker to be broken.

18. In an experiment, ammonium chloride was heated in a test tube. A moist red litmus paper placed at the mouth of the test tube first changed blue then red. Explain these observations. (2marks) ✓

NH_4Cl decomposes to NH_3 and HCl – NH_3 is less dense and hence diffuses faster while HCl is denser hence diffuses slowly ✓

19. A glass tube was inserted into a flame formed when air hole of the Bunsen burner was fully open as shown in the figure below.



a) When a burning splint was brought near point P, a small ~~name~~ flame lit at this end of the glass tube. Explain. (1mark) ✓ (1)

Almost colourless region contains unburnt gases which burn at P.

b)Give two main reasons why the Bunsen burner flame above is preferred for heating than the flame obtained when air hole is closed. (1 mark) ✓

– Does not produce soot hence do not dirtify apparatus
– Produces more heat hence heats faster ✓2

20 a) A mixture of calcium powder and silver powder was reacted with dilute hydrochloric acid. The solution was filtered. Name
i) The filtrate (1 mark) ✓

$CaCl_2$ – Na

8

ii) The residue (1 mark)

Silver. ✓

b) Write an ionic equation for the reaction that takes place. (1 mark)

$Ca_{(s)} + 2H^+_{(aq)} \rightarrow Ca^{2+}_{(aq)} + H_{2(g)}$

21. Helium, neon and argon are in group (VIII) of the periodic table. (1)

a) Give one use of helium other than filling of air craft tyres. (1 mark)

Mixed with O_2 to be used as breathing aid in hospitals et

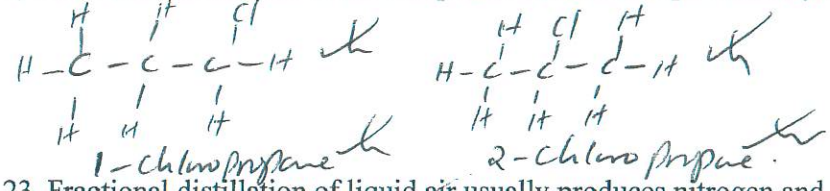
b) Other than density give one reason why helium is used to fill aircraft tyres. (1 mark)

He is inert ✓ (1)

22. a) What do you understand by the term isomers? (1 mark)

Compounds with same molecular mass but different structural formula.

b) Draw two the isomers of the compound C_3H_7Cl and give their systematic names. (2 marks)



1-chloropropane ✓ 2-chloropropane ✓

23. Fractional distillation of liquid air usually produces nitrogen and oxygen as the major products.

i) Name one substance that is used to remove carbon (IV) oxide from the air before it is changed into liquid. (1mark)

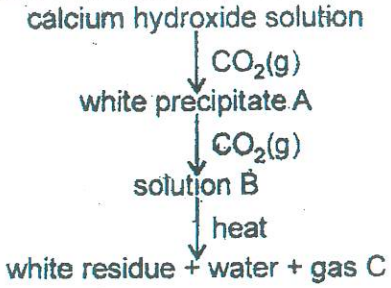
NaOH / KOH - Name.

ii) Describe how nitrogen gas is obtained from the liquid air. (Boiling points of nitrogen = **-196^{0}C**, oxygen = **-183^{0}C**) (2mark)

Heat the liquid gas, Nitrogen boils at -196°C leaving

10

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



Name:

a) White precipitate A. (1mark)

Calcium Carbonate ✓

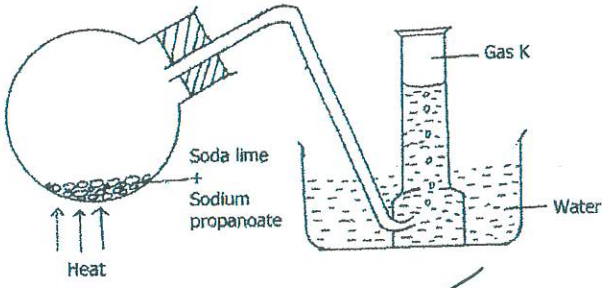
b) Solution B. (1mark)

Calcium Hydrogen Carbonate ✓

c) Gas C. (1mark)

Carbon (IV) Oxide ✓

25. Study the set-up below and answer the questions that follow.



a) Name gas K. (1mk)

Ethane ✓

b) To which homologous series does K belong? (1mk)

Alkanes ✓

c) Write the chemical equation of the reaction in the round bottom flask. (1mk)

$CH_3CH_2COONa_{(s)} + NaOH_{(s)} \rightarrow C_2H_{6(g)} + Na_2CO_{3(s)}$ ✓

26. **7cm^3** of a dibasic acid **H_2A** required **25cm^3** of **0.1M** Sodium hydroxide for complete neutralization.

a) How many moles of Sodium hydroxide are contained in **25cm^3**? (1mk)

$\frac{25 \times 0.1}{1000} = 0.0025$ moles ✓

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b) Calculate the molarity of the dibasic acid. (2mks)

$H_2X + 2NaOH \rightarrow Na_2X + 2H_2O$

0.0025

Mole of $H_2X = \frac{0.0025}{2}$

$= 0.00125$ mole

$\frac{1000}{7} \times 0.00125$

$= 0.17857M$ at least 3dp Penalise $\frac{1}{2}$ for any dp.

27. Oxygen can be prepared in the laboratory by decomposition of hydrogen peroxide.

(a) Write an equation for the reaction. (1mark)

$2H_2O_{2(aq)} \xrightarrow{MnO_2} 2H_2O_{(l)} + O_{2(g)}$

(b) State a suitable catalyst for the reaction. (1mark)

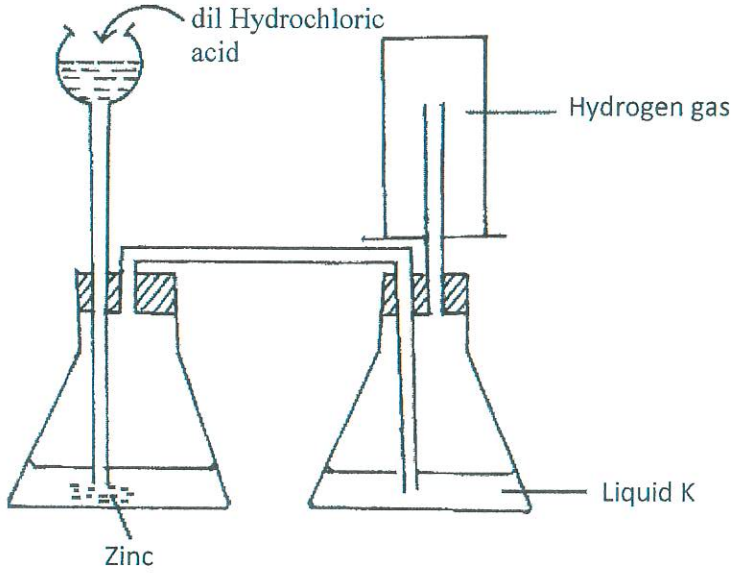
MnO_2

(c) State one use of oxygen gas. (1mark)

- Breathing aid in hospitals, Mountain climbing etc
- Mixed with acetylene / H_2 to produce flame used in welding & cutting metals etc

any 1

28. The diagram below represents an arrangement for preparing and collecting dry hydrogen. Study it and answer the questions that follow.



(a) Write the equation for the reaction that produces hydrogen gas. (1mark)

$Zn_{(s)} + 2HCl_{(aq)} \rightarrow ZnCl_{2(aq)} + H_{2(g)}$

(b) Name a suitable substance that liquid K is likely to be. (1 mark)

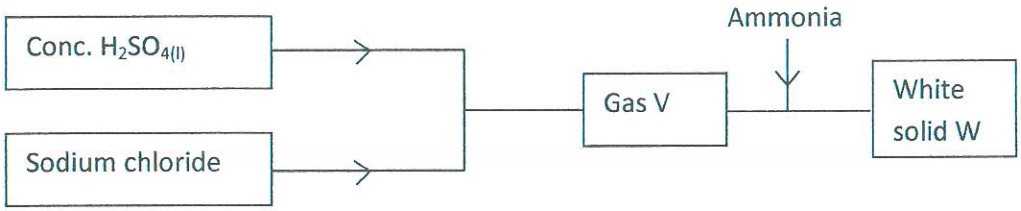
Conc. H_2SO_4 — None

7

c) Explain why it is not advisable to use nitric (V) acid as an alternative to hydrochloric acid in this preparation experiment. (1 mark)

HNO_3 is a strong acid here oxidises H_2 to H_2O

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



(a) Name

(i) gas V (1 mark)

Hydrogen chloride.

(ii) Solid W (1 mark)

Ammonium Chloride

3