VIRAJ INTERNATIONAL ACADEMY

NAME…… **INDEX NO……**

SCHOOL…… **SIGN……**

DATE……

233/1

CHEMISTRY

Paper 1

2 HOURS

Instructions to candidates

(a) *Write your* ***name, index number*** *and the* ***name*** *of your school in the spaces provided above.*
(b) ***Sign*** *and* ***write*** *the* ***date*** *of examination in the spaces provided above.*
(c) *Answer* ***all*** *questions in this question paper.*
(d) *Answers to* ***all*** *questions* ***must*** *be written in the spaces provided in this booklet.*
(e)*All working* ***MUST*** *be clearly shown.*
(f)*KNEC mathematical tables and non-programmable silent electronic calculators* ***may be*** *used.*
(g) Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

For Examiner's Use Only

Question	Maximum score	Candidate's score
1-30	80	

This paper consists of 13 printed pages.

1. (a) State graham's law of diffusion. (1 mark)

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(b) 48cm^3 of an oxide of Nitrogen diffused through a porous plug in the same time it took 159 cm^3 of helium to diffuse through the same plug under similar conditions. What is the molecular mass of the oxide? (He = 4, N = 14) (2 marks)

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2. 3.1 of an organic compound containing Carbon hydrogen and oxygen only produced 4.4g of Carbon (IV) oxide and 2.0g of water on complete combustion.

(a) Calculate its empirical formula. (2 mark)

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(b) Calculate in molecular formula if its formula mass is 62 (1 mark)

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3. Sketch the cooling curve of a pure substance and impure substance in the sane axis. (2 marks)

4. (a) Define the term solubility. (1 mark)

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(b) The mass of a solution of salt of sodium chloride is 70 grams. This solution has 10 grams of sodium chloride dissolved in it. The solubility of this salt is 30 grams / 100 grams of water at 25^0C. 65 grams of sodium chloride salt are added to the solution at 25^0C. How much sodium chloride will remain undissolved. (2 marks)

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5. Study the table for certain properties of substances A, B, C and D.

	Melting point ^{0}c	Solubility in water	Electrical conduct
A	-119^{0}c	Soluble	Solution does not conduct
B	1020^{0}c	Soluble	Solution conducts
C	1740^{0}c	Insoluble	Does not conduct
D	1600^{0}c	Insoluble	Conducts at room temperature

Which of the substances A, B, C and D: (4 marks)

(i) Is a metal …….

(ii) Has a simple molecular structure……

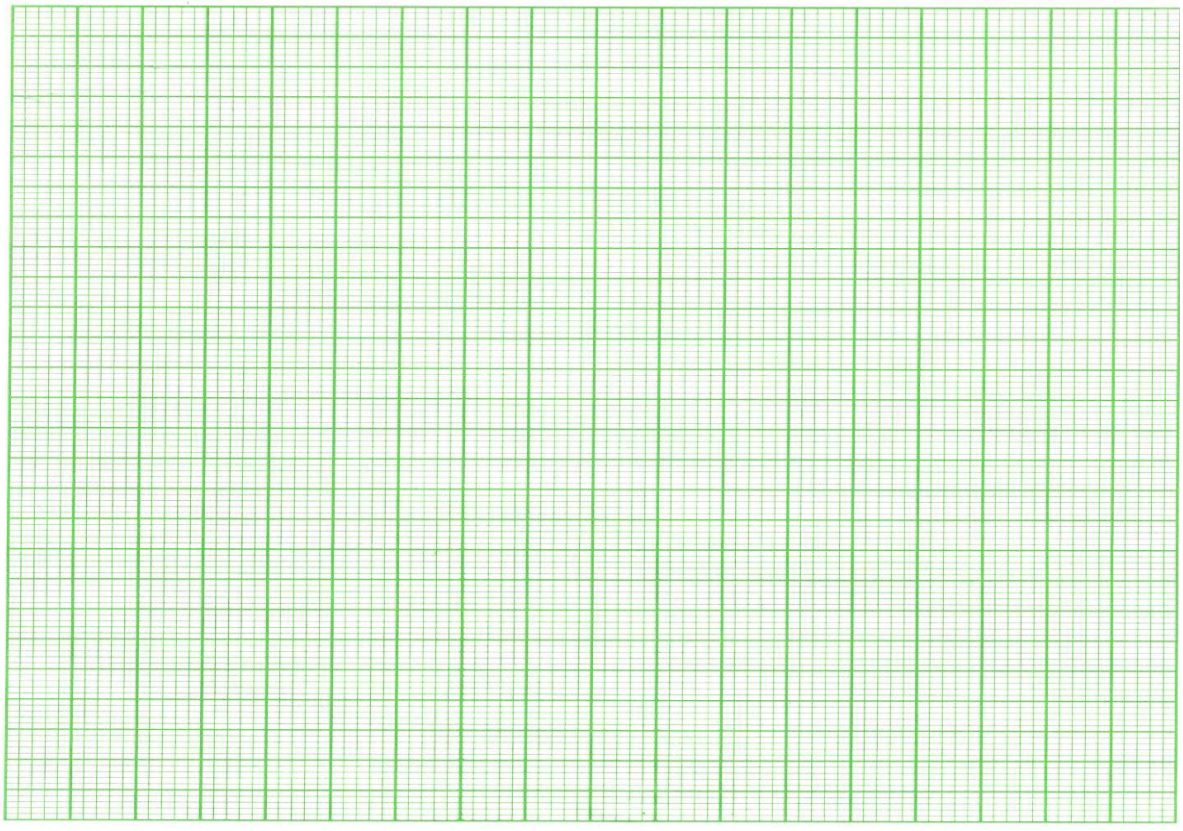
(iii) Has a giant ionic structure……

(iv) Has a giant covalent structure……..

6. The table below gives percentages of a radioactive isotope of Bismuth that remain after decaying at different times.

Time	0	6	12	22	38	62	100
% of Bismuth	100	81	65	46	29	12	13

(i) Plot a graph of the percentage of remaining vertical axis against time. (3 marks)



(ii) Use your graph to determine the half-life of the Bismuth isotope. (1 mark)

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7. An equilibrium exists between the reaction of chromate ion ($cro_4 2^-_{(aq)}$) and dichromate ions ($Cr_2O_7^{2-}$)

$$2cro_4^{2-}{}_{(aq)} + 2H+_{(aq)} \leftrightharpoons Cr_2O_7^{2-} + H_2O$$

Yellow Orange

State and explain observations made when aqueous HCl is added to the above system at equilibrium. (2 marks)

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8. The table below gives factors which affect the rate of the reaction.

Factor	Effect on rate of reaction	Explanation
Using zinc powder instead of zinc granules	½ mark	1 mark
Heating the reaction	½ mark	1 mark

Complete the table to show how the factors given affect the rate of reaction and give an explanation for each effect.

9. (a) Name two cations making water hard. (1 mark)

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(b) By use of an ionic equation, shows how sodium carbonate makes permanent hard water soft. (1 mark)

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10. Describe a chemical test which can be used to differentiate between sodium carbonate and sodium sulphate. (2 marks)

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11. Explain the observation using equation mad when two to three drops of aqueous ammonia are added to zinc ions until in excess. (2 marks)

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12. A gas of mass 1.8g was found to have a density of 1.12g / litre at 25^0C and 745 mmHg. Find its molecular weight at r.t.p. molar gas volume = 24 litres and temperature 25^0C at 760 mmHg. (3 marks)

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13. Hydrogen burns in air to form steam.

(i) Write the chemical equation involved in the reaction. (1 mark)

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(ii) Use the bond energies in the following table to calculate ΔH for the reaction. (2 mark)

Bond	Bond energy Kj mol^{-1}
H – H	436
O = O	489
O – H	464

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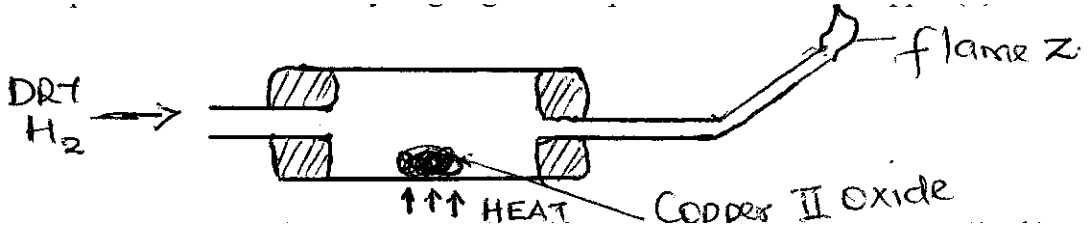
14. The set up below indicate how hydrogen gas I was passed over heated copper (ii) oxide.



State one mistake in the set up and rectify. (1 mark)

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(i) Write the chemical equation for the reaction taking place in the combustion table. (1 mark)

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(ii) Before heating is stopped, a stream of hydrogen gas is passed continuously through the combustion tube until it has cooled explain why. (1 mark)

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15. Musau was stung by a wasp while on his way to the market, he felt a lot of pain. How would you treat Musau to relieve him of the pain? (2 marks)

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16. (a) Hydrogen Sulphide is a strong reducing agent. Explain the observations made when this gas is bubbled through a solution of Iron (iii) chloride. (2 marks)

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(b) Write the chemical equation involved in the reaction. (1 mark)

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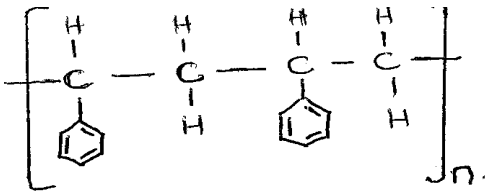
17. The formula given represents a position of a polymer.



(a) Give the name of the polymer. (1 mark)

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(b) One disadvantage of continued use of this polymer. (1 mark)

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18. Describe how the percentage of mass of copper in copper carbonate can be determined. (3 mark)

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19. Copper is listed on the periodic table as having a relative atomic mass of 63.55. Reference books indicate two isotopes of copper, with relative masses of 62.93 and 64.93. Find the percent abundance of each isotope (2marks)

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20. A form 4 student of Supamo High school was told to prepare a pure sample of Copper (II) Carbonate salt starting with Copper metal. Describe how the student prepared the salt in the laboratory. (3marks)

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21. How many cubic centimeters of hydrogen chloride gas at s.t.p would be required to precipitate all silver ions from $32cm^3$ of 0.08M silver nitrate solution? (Molar Gas Volume at s.t.p $=24dm^3$) (3marks)

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22. The following half equations refer to half-cells A and B and their electrode potentials measured at standard states.

A: $2H^{+}_{(aq)} + O_{2(g)} + 2e^{-} \longrightarrow H_2O_{2\,(l)}$ $E^{\theta} = 0.68V$

B: $Ag^{+} + e \longrightarrow Ag_{(s)} + Ag_{(s)}$ $E^{+} = +0.80V$

a) Calculate the e.m.f. of the cell formed from A and B. (2marks)

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b) Explain why potassium chloride is not suitable salt for the bridge of this cell (1mark)

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23. Compound Q was reacted with hydrogen chloride to produce compound R whose structural formula is shown below

$CH_3CH_2CH(CH_3)CHClCH_3$

a) Give the structural formula of Q (1mark)

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b) Which type of reaction takes place in the reaction above? (1mark)

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c) The boiling point of R is slightly higher than that of Q. Explain (1mark)

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24. State and explain one effect of sulphur (IV) oxide causes environmental pollution. (2marks)

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25. A mixture contains sodium chloride, sugar and camphor. The table below shows the solubility of these solids in different liquids.

Liquid / Solid	Water	Ethanol	Ether
Sodium chloride	Soluble	Insoluble	Insoluble
Camphor	Soluble	Insoluble	Very soluble
Sugar	Soluble	Soluble	Insoluble

Explain how sugar can be obtained from a mixture of sodium chloride, camphor and sugar. (3 marks)

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26. The table below gives the first ionization energies of the alkali metals.

Element	1st ionization energy kJ mol^{-1}
A	494
B	418
C	519

a) Define the term ionization energy. (1mark)

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b) Which of the three metals is the least reactive? Give a reason. (2marks)

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27. Nitrates of metals A, B, C were heated and the products of the reactions recorded in the table below.

Nitrate of metal	Products
A	Metal nitrate and oxygen
B	Free metal, nitrogen (IV) Oxide and oxygen gas
C	Metal oxide, nitrogen (IV) oxide and oxygen gas

a) Name two possible identities of metal A. (1mark)

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b) Name the two possible identity of metal B (1mark)

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c) Calcium nitrate is one of the nitrates which forms the products in C. Using chemical equation show how the products are formed. (1mark)

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28. When magnesium ribbon is burnt in air two possible products are formed and when the products are dissolved in distilled water and warmed slightly, smell of ammonia gas is observed.

(i) Write the formulae of the product responsible for the production of ammonia. (1 mark)

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(ii) Write a balanced chemical equation which occurs when the product is dissolve in distilled water. (1 mark)

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29. Explain why iron III chloride is fairly soluble in methylbenzene while Magnesium chloride is insoluble. (2 marks)

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30. In the industrial preparation of oxygen, state:
    (a) How dust particles are removed from air. (1 mark)

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    (b) Why CO_2 is removed before the mixture is cooled to -25^0C. (1 mark)

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