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MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education

PRE-MOCK EXAMINATIONS 2023

233/1 CHEMISTRY Paper 1

April 2023 – TIME 2 Hours

MARKING GUIDE

Name: ....MARKING GUIDE.....Adm No: .....Stream.....

Candidate's Signature: .....Date: ...../04/2023.

233/1
Paper 1
THEORY
APRIL 2023
Time: 2 Hours

233/1 Chemistry – P1
Monday 10:45 Am – 12:45Pm
10th April, 2023

FORM FOUR PRE-MOCK CHEMISTRY EXAMS 2023

Instructions to Candidates

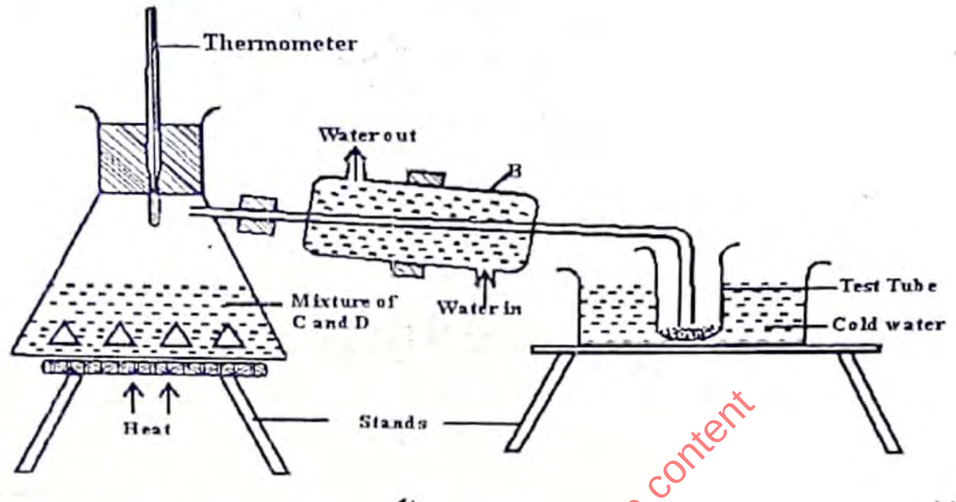
a) *Write your name and Admission number in the spaces provided above.*
b) *Sign and write the date of examination in the spaces provided above*
c) *Answer ALL the questions in the spaces provided below each question.*
d) *Mathematical tables and silent electronic calculators may be used.*
e) *All working MUST be clearly shown where necessary.*
f) *This paper consists of 13 printed pages*

For Examiner's Use Only

Questions	Max. Score	Candidate's Score
1 – 27	80	

Correction
- rekind le / ...
- change not turn

1.The set up below represents the apparatus that may be used to separate a mixture of two miscible liquids C and D whose boiling points are 80^{0}C and 110^{0}C.



a) Name B (1 mark)

✓ Liebig Condenser ✓

b) What is the purpose of the thermometer (1mark)

✓ To measure the temperature ✓ at which the liquids boil.

c) Which liquid was collected in the test tube? (1mark)

C ✓

2. Substances can be classified as either a mixture, compound or pure elements.
Give two reasons why air is classified as a mixture. (2marks)

✓ Components are physically ✓ combined – composition varies
✓ Separated by physical ✓ means
✓ Components retain their physical ✓ and chemical properties

3.Describe how you can extract oil from ground nuts. (3marks)

✓ Crush the ground nuts using pestle and mortar. Add propanone / acetone as you continue crushing. Decant ✓ to obtain oil solution. Leave in the sun for Propanone / acetone to evaporate. Wash in distilled water and separate the mixture using a separating funnel.

4. Study the information in the table below and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Substance	Solubility in water	Electrical conductivity	
		Solid	Molten
A	Insoluble	Good	Good
B	Soluble	Poor	Good
C	Insoluble	Poor	Poor

Mr. GOA

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i) Which of the substances is highly likely to be sodium chloride? Explain (1mark)

B ½ · Conducts in molten state but ½ not in solid state 1

ii) What type of bond exists in substance A? (1mark)

Metallic bond ✓1 1

iii) State a possible structure in substance C? (1mark)

Giant covalent/atomic structure ✓1 / Molecular 1

5. The table below shows behaviour of metals **R, X, Y** and **Z**. Study it and answer the questions that follow.

Metal	Appearance on exposure to air	Reaction in water	Reaction with dilute hydrochloric acid
R	Slowly tarnishes	Slow	Vigorous
X	Slowly turns white	Vigorous	Violent
Y	No change	Does not react	Does not react
Z	No change	No reaction	Reacts moderately

(a) Arrange the metals in the order of reactivity starting with the least reactive. (2 marks)

Y, Z, R, X ✓ / X, R, Z, Y 2

Increasing reactivity

(b) Name a metal which is likely to be **Y**. (1 mark)

Copper ✓1 / Gold / Silver 1

6. The table below gives information about ions of **P** and **Y**

Ion	P^+	Y^{2-}
Electron arrangement	2.8	2.8.8
Number of Neutrons	12	16

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a) Write the electron arrangement for the atom of **Y** (1mark)

2.8.6 ✓ 1 1

b) How many protons are there in the nucleus of (1mark)

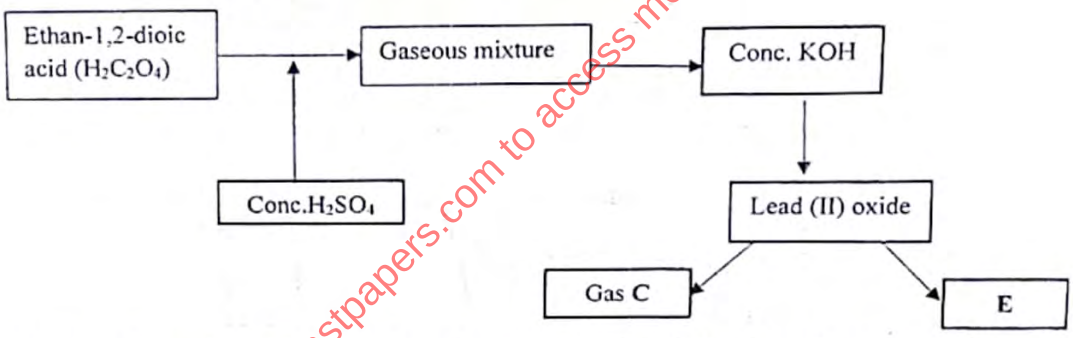
(i) P 11 ½

(ii) Y 16 ½ 1

c) Write the formula of the compound formed when **P** and **Y** reacts (1mark)

P_2Y / Na_2S ✓ 1 reject YP_2 / SNa_2 1

7. Use the scheme below to answer the following questions.



(a) Name the type of reaction which takes place between ethan-1,2-dioic acid and concentrated sulphuric (VI) acid (1mark)

Dehydration ✓ 1 1

(b) Why is the gaseous mixture passed through concentrated **KOH**? (1mark)

Absorb CO_2 ✓ 1 1

(c) Write a chemical equation that produces gas C and E (1mark)

$PbO(s) + CO(g) \longrightarrow Pb(s) + CO_2(g)$ ✓ 1 1

Miss Rose Oduor.

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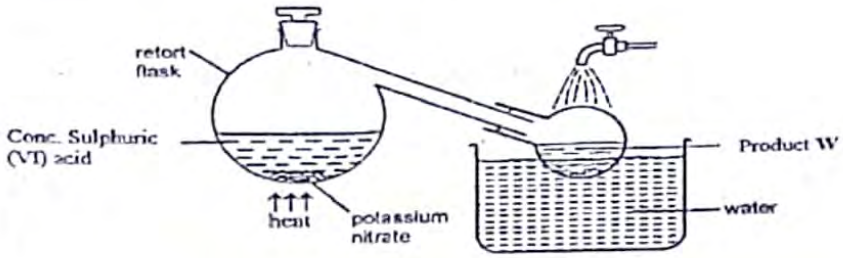
8. The set up below can be used for the laboratory preparation of product W.



(a) Write chemical equation for the reaction that takes place in the retort flask. (1 mark)

$KNO_3(s) + H_2SO_4(l) \longrightarrow KHSO_4(s) + HNO_3(l)$ 1

rules apply

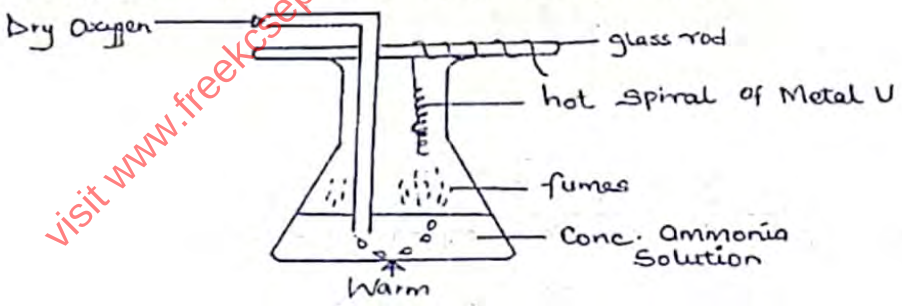
(b) Explain why product W appears yellow in colour. How is the colour removed? (2 marks)

Presence of dissolved NO_2. The yellow colour is removed by passing air/oxygen through the acid 2

9. Starting with 100cm^3 of 2.0M sodium hydroxide solution, describe how to prepare pure sodium sulphate crystals. (3marks)

Add 100cm^3 of 2.0M sodium hydroxide to 100cm^3 of 1.0M/50cm^3 of 2M H_2SO_4 Sulphuric (VI) acid in a beaker and stir. Heat the resultant solution to saturation and allow to cool for sodium sulphate crystals to form. Filter out crystals and dry. 3

10. Study the set up below used to investigate the properties of ammonia gas.



(a) State two observations made in this experiment. (1mark)

- Hot spiral wire glows red
- Brown fumes of NO_2 observed
- Ammonia burns with a green flame

1st 2@ ½mk 1

Joshua

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(b) What is the purpose of using the hot wire in this experiment? (1mark)

Catalyses the reaction/ increase the reaction rate I
accept: Catalyst

(c) State the identity of the hot spiral of metal U. (1mark)

Platinum / Nichrome Accept Cu. I

11. 3.1g of an organic compound containing carbon, hydrogen and oxygen only, produced 4.4g of carbon (IV) oxide and 1.8g of water on complete combustion. Determine its molecular formula if its formula mass is 60. (3marks)

Mass of $H_2 = \frac{2 \times 1.8g}{18} = 0.2g$ ½

Mass of $C = \frac{12}{44} \times 4.4$ ½
$= 1.2g$

Mass of $O_2 = 3.1 - (0.2 + 1.2)$
$= 1.7g$

C	H	O
Moles = $\frac{1.2}{12}$	$\frac{0.2}{1}$	$\frac{1.7}{16}$ ½
Molar ratio = $\frac{0.1}{0.1}$	$\frac{0.2}{0.1}$	$\frac{0.11}{0.1}$
	2	1

E.F is CH_2O ½

$n = \frac{60}{30} = 2$ ½

M.F is $(CH_2O)_2$
$= C_2H_4O_2$ ½

12. A student collected samples of water from two different sources. She measured equal volume of water in two different test-tubes. She added soap solution from a burette until permanent lather was formed. She then boiled another two samples of the same waters and repeated the experiment. She recorded the results in the table below.

Sample of water	Volume of soap used before boiling (cm^3)	Volume of soap used after boiling (cm^3)
A	15	5
B	15	15

(a) Name the type of water hardness in sample A. Explain. (1mark)

Temporary water hardness ½ Softened / removed by boiling ½ 1

(b) Name two salts that cause water hardness in water sample B. (1mark)

– Magnesium chloride / Magnesium sulphate / Calcium chloride
Accept: Nitrates of Mg or Ca
reject: $CaSO_4$

Mr. Obonyo

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(c) Using a chemical equation, show **sodium carbonate** can be used to soften water sample **B**. (1mark)

$MgCl_2(aq) + Na_2CO_3(aq) \longrightarrow MgCO_3(s) + 2NaCl(aq)$

$CaCl_2(aq) + Na_2CO_3(aq) \longrightarrow CaCO_3(s) + 2NaCl(aq)$ Any 1a 1mk

$MgSO_4(aq) + Na_2CO_3(aq) \longrightarrow MgCO_3(s) + Na_2SO_4(aq)$

13. $60cm^3$ of oxygen gas diffused through a porous partition in 40 seconds. If $80cm^3$ of gas **X** diffuses through the same partition under the same conditions is 75.5 seconds, determine the molecular mass of gas **X**. (O=16.0) (3marks)

$\left(\frac{\left(\frac{60}{40}\right)}{\left(\frac{80}{75.5}\right)}\right)^2 = \left(\sqrt{\frac{M_x}{32}}\right)^2$ ✓1

$= \frac{2.25}{1.12276} = \frac{M_x}{32}$ ✓✓

$M_x = \frac{2.25 \times 32}{1.12276}$ ✓

$= \frac{58.65}{64.13}$ ✓1

ALT

If $60cm^3 \rightarrow 40s$

$80cm^3 \rightarrow \frac{80 \times 40}{60}$ ✓

$= 53.3333$

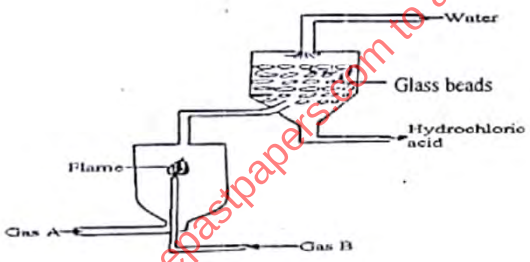
$\left(\frac{75.5}{53.33}\right)^2 = \left(\sqrt{\frac{x}{32}}\right)^2$ ✓½

$\frac{2.004}{1} = \frac{x}{32}$ ✓½

$x = 64.13$

$M_x = 64.13$ ✓1

14. The diagram below represents large scale manufacture of hydrochloric acid. Study it and answer the questions that follow.



(a) State the function of the glass beads. (1mark)

Increase S.A ✓ for absorption of $HCl(g)$ 1

(b) Identify gas **A**. (1mark)

Chlorine / Cl_2 ✓1 1

(c) Explain why gas **B** is ignited as a jet as shown in the diagram. (1mark)

Mixture of H_2 and Cl_2 react explosively ✓ when heated. 1

Dr. Malala

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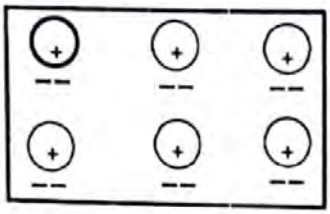
15. Below is a structure of an element **X**. Use it to answer the questions that follow.



(a) Name the chemical family to which element **X** belongs. Give a reason. (2marks)

Alkaline Earth Metals ✓1 Has two valence electrons ✓1 2

(b) State the type of bond illustrated above in the structure of element **X**. (1mark)

Metallic ✓1 1

16. The table below shows information of four elements **A, B, C** and **D**. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	Electronic arrangement	Atomic radius	Ionic radius
A	2.8.2	0.136	0.065
B	2.8.7	0.99	0.181
C	2.8.8.1	0.203	0.133
D	2.8.8.2	0.174	0.099

(a) Which two elements have similar properties? (1 mark)

A and D ✓1 tied 1

(b) Explain why **B** ionic radius is larger than its atomic radius. (2 marks)

Due to increased electron - electron repulsion ✓1 between the incoming electrons and ✓existing electrons Accept shielding effect explained 2

17. a) State the Bronsted – Lowry definition of an acid. (1mark)

✓ An acid is a proton donor. 1

(b) With a reason, identify a base in the equation below. (1mark)

$$Hph_{(aq)} + H_2O_{(l)} \longrightarrow H_3O^+_{(aq)} + Ph^-_{(aq)}$$

$H_2O(l)$ ✓½ Accepts a proton ✓½ I

Mr. Andango. reject lone pair of electron donor.

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(b) Distinguish between strong acid and concentrated acid (1mark)

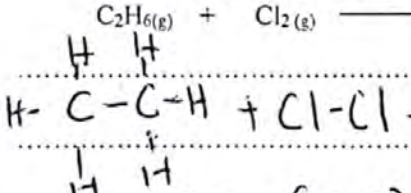
Strong acid is one which ionizes fully in water to give more hydrogen ions while concentrated acid is one which has higher proportion (moles) of I acid as compared to water. (tied)

18. Some average bond energies are given below.

Bond	Energy(kJ/mol)
C-C	348
C-H	414
Cl-Cl	243
C-Cl	432
H-Cl	340

Calculate the energy change for the reaction below: (3marks)

$C_2H_{6(g)} + Cl_{2(g)} \longrightarrow CH_3CH_2Cl_{(g)} + HCl_{(g)}$



BBE = (1x348) + (6x414) + (1x243) = +3075 ✓1

BFE = (1x348) + (5x414) + (1x432) + (1x346) = -3190 ✓1

ΔH = +3075 + -3190 ✓½ = -115kJ/mol ✓½

3

19. The solubility of salt Z at 60°C is 40g/100g of water and 48 g /100g of water at 80°C .

(a) Define the term solubility (1mark)

Maximum mass of solute that can saturate 100g of water at a given temperature. I

(b) 150 g of saturated solution of Z at 80°C is cooled to 60°C. Calculate the mass of Z that crystallizes out. (2marks)

At 60°C

if 140g of sln → 40g of salt

150g → ?

$\frac{150 \times 40}{140}$ ✓½ = 42.86g

At 80°C

if 148g of sln → 48g of salt

150g →

$\frac{150 \times 48}{148}$ ✓½ = 48.65g 2

∴ Mass of Crystals = 48.65 ✓½ − 42.86 = 5.79g ✓½

Edwine.

07

1. 4
2. 2
3. 6
4. 3
5. 1
6. 5

20. Use the table below to answer the questions that follow.

Substance	A	B	C	D	E
Symbol	$R\text{-}COO\text{-}Na^+$	CH_2OH | $CHOH$ | CH_2OH	$\{-CH_2-CH_2-\}_n$	$R\text{-}COOCH_2$ | $R\text{-}COOCH$ | $R\text{-}COOCH_2$	$R\text{-}OSO_3\text{-}Na^+$

(a) Which substances is

(i) A soapless detergent: E / $R-OSO_3^-Na^+$ ✓½ (½mark)

(ii) An ester: D / R-COOCH₂ R-COOCH R-COOCH₂ ✓½ (½mark)

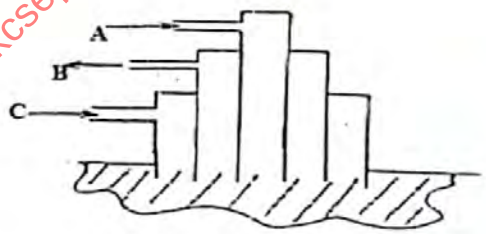
b) Give name to substance B (1mark)

Propan-1,2,3-triol ✓1 Accept Glycerol.

c) Write an equation for the reaction between the structure of substance D and Sodium hydroxide solution. (1mark)

R-COOCH₂ / R-COOCH / R-COOCH₂ + 3NaOH → 3R-COO⁻Na⁺ + CH₂OH / CHOH / CH₂OH ✓

21. The figure below shows a simple extraction process of Sulphur



a) State the name of substances represented by A and B (2marks)

A Hot Compressed air ✓1

B Molten sulphur ✓2 & Water ✓2 2

b) What is the function of the substance represented by C during the extraction process? (1mark)

To melt sulphur ✓1 1

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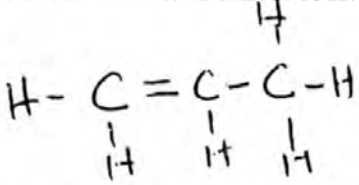
22. A hydrocarbon **X** was found to decolourise acidified potassium manganate (VII) solution. When two moles of **X** were burnt completely in air six moles of carbon (IV) oxide and six moles of water were formed.

(a) Draw the structural formula of **X**. (1mark)



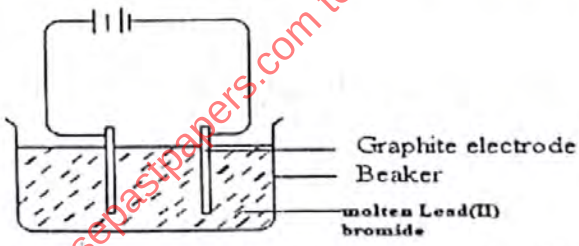
(b) State the homologous series to which **X** belongs. (1mark)

Alkenes ✓1

(c) Name a pair of reagents that can be used to prepare **X** (1mark)

Propanol and Concentrated Sulphuric(VI)acid / Aluminium oxide.

23. The diagram below represents an experiment which was carried out by a student to investigate the effect of passing an electric current on molten Lead(II)bromide.



(i) Molten lead(II) bromide is a binary electrolyte. State the meaning of the term binary electrolyte. (1mark)

✓An electrolyte that contains one kind of cation and one kind of anion

(ii) State the observations made at the anode. (1mark)

Brown fumes of bromine gas observed.

(iii) Write an equation to show what happens at the cathode. (1 mark)

$Pb^{2+}(l) + 2e^- \longrightarrow Pb(s)$ ✓1

Nevine

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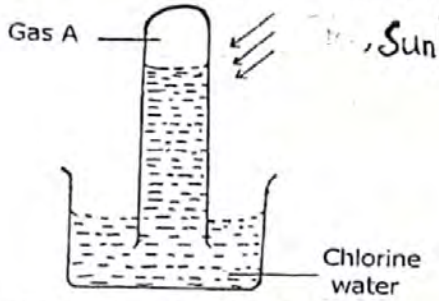
24. The diagram below shows an experiment involving chlorine water.



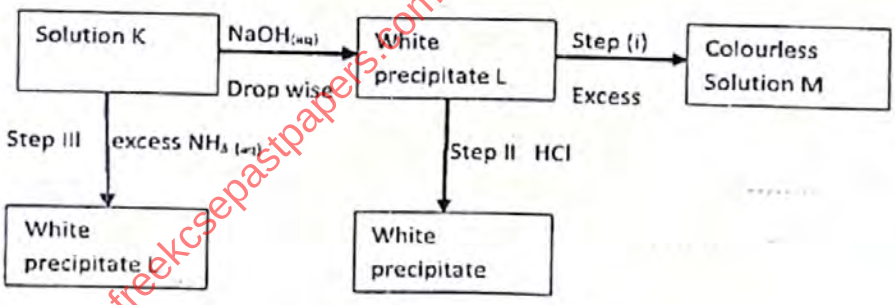
a) Describe the confirmatory test for Gas A. (2marks)

Lower / introduce a glowing splint into a gas jar containing gas A; the glowing splint is relit / rekindled ✓1 2

b) Write an equation to show the formation of gas A. (1mark)

$2HOCl(aq) \xrightarrow{Sunlight} 2HCl(aq) + O_2(g)$ ✓1 1

25. Study the flow chart below and answer the questions that follow:



(a) Identify

(i) The cation present in solution K (1mark)

Pb^{2+} ✓1 1

(ii) The white precipitate L (1mark)

Lead (II) hydroxide / $Pb(OH)_2$ ✓1 1

(b) Write down the formula of the complex ion present in the colourless solution M (1mark)

$[Pb(OH)_4]^{2-}$ ✓1 1

Mr. Okumu Jared.

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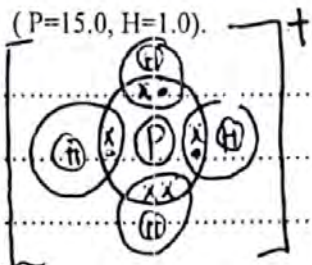
26.Using dot (•) and cross (x) diagram, show the bonding in ;

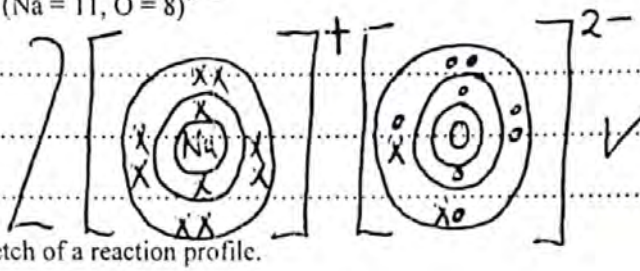
(a)Phosphonium ion PH^+_4 (P=15.0, H=1.0). (2marks)



electron distribution – 1

Charge – 1 2

(b) Sodium oxide (Na = 11, O = 8) (1 mark)



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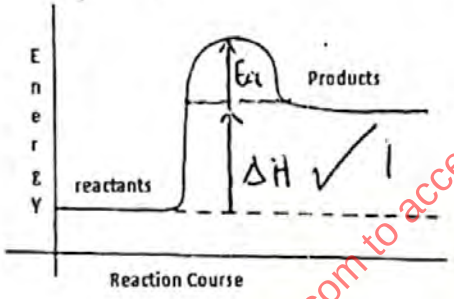
27.Below is a sketch of a reaction profile.



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(a)On the diagram show the heat of reaction ΔH (1mark)

(b)State and explain the type of reaction represented by the profile (2marks)

Endothermic ✓ Products have more energy / higher energy compared to reactants 2

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