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மேல் மாகாணக் கல்வித் திணைக்களம்
Department of Education - Western Province



අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය 2026 උපකාරක ප්‍රශ්න පත්‍රය
General Certificate of Education (Adv. Level) Exam

රසායන විද්‍යාව II
Chemistry II

02

E

II

13 ශ්‍රේණිය
Grade 13

පැය තුනයි
Three hours

Index no :

අමතර කියවීමේ කාලය
මිනිත්තු 10

Instructions :-

- * *Periodic Table: A Periodic Table is provided on page 17.*
- * **Calculators: Use of calculators is not allowed.**
- * *Universal gas constant, $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$*
- * *Avogadro constant, $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$*
- * **In answering this paper, you may represent alkyl groups in a condensed manner.**

Example: $\begin{array}{c} \text{H} \quad \text{H} \\ | \quad | \\ \text{H}-\text{C}-\text{C}- \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$ group may be shown as $\text{H}_3\text{C}-\text{CH}_2-$

□ PART A — Structured Essay (pages 2 - 8)

- * *Answer **all** the questions on the question paper itself.*
- * *Write your answer in the space provided for each question.*
- * *Please note that the space provided is sufficient for the answer and that extensive answers are not expected.*

□ PART B and PART C — Essay (pages 9 - 17)

- * *Answer **four** questions selecting **two** questions from each part. Use the papers supplied for this purpose.*
- * *At the end of the time allotted for this paper, tie the answers to the three Parts A, B and C together so that Part A is on top and hand them over to the Supervisor.*
- * *You are permitted to remove only Parts B and C of the question paper from the Examination Hall.*

For examiner's use only

Part	Question No.	Marks.
A	1	
	2	
	3	
	4	
B	5	
	6	
	7	
C	8	
	9	
	10	
Total		

total

In Numbers	
In Letters	

Code numbers

Marking examiner 1	
Marking examiner 2	
Checked by :	
Supervised by :	

Part A - structured essay

1. a) Answer the following questions based on the elements of the **third** period of the periodic table.

- (i) The element that absorbs the **minimum** energy to form a gaseous unipositive ion from a gaseous isolated atom is
- (ii) The element that emits the **highest** amount of heat during the first electron gain is
- (iii) The element that forms the ion with the **largest** radius is,
- (iv) The element possessing the **lowest** boiling point is,
- (v) Among the metallic elements, the one that forms the cation with the **highest** polarizing power is
- (vi) The element that naturally found existing as a covalent atomic lattice is,

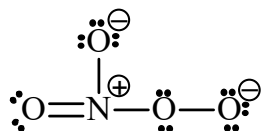
(marks: 24)

- b) (i) Draw the most acceptable Lewis dot-dash structure for the SF_3ClO molecule. State the (I) shape around its central atom and (II) the oxidation number of the central atom.

I. Shape around the central atom:

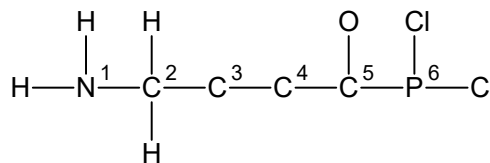
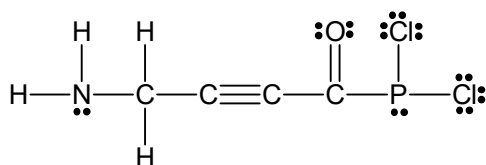
II. Oxidation number of the central atom :
(marks : 08)

- (ii) A stable Lewis structure for the NO_4^- ion is given below. Draw 3 Lewis dot-dash structures (resonance structures) for that ion and Write stable, unstable, or less stable below each structure to indicate its stability.



(marks : 12)

- (iii) Complete the table given below using the structure drawn for the $\text{C}_3\text{H}_4\text{NOCl}_2\text{P}$ molecule and its labeled skeleton.



		N ¹	C ³	C ⁵	P ⁶
I.	Number of VSEPR pairs around the atom				
III.	Electron pair geometry around the atom				
III.	Shape around the atom				
IV.	Hybridization				

(marks : 16)

- Answer questions (iv) to (vii) below based on the Lewis structure in (iii) above and its skeleton.

(iv) Name the atomic/hybrid orbitals participating in the formation of each σ bond below.

- | | | |
|------------------|-------------|-------------|
| I. $N^1 - C^2$ | N^1 | C^2 |
| II. $C^2 - C^3$ | C^2 | C^3 |
| III. $C^3 - C^4$ | C^3 | C^4 |
| IV. $C^4 - C^5$ | C^4 | C^5 |
| V. $P^6 - Cl$ | P^6 | Cl |

(marks : 10)

(v) Name the orbitals participating in the formation of each π bond below.

- | | | |
|----------------|-------------|-------------|
| I. $C^3 - C^4$ | C^3 | C^4 |
| | C^3 | C^4 |
| II. $C^5 - O$ | C^5 | O |

(marks : 06)

(vi) Write the bond angles around the atoms N^1 , C^2 , C^3 and C^5 approximately.

N^1 C^2 C^3 C^5

(marks : 04)

(vii) Arrange the atoms N^1 , C^2 , C^3 and C^5 in increasing order of their electronegativity.

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(marks : 02)

- c) (i) A researcher exposed a gaseous Br_2 sample to a monochromatic radiation with a wavelength of 331 nm. If the $Br-Br$ bond dissociation energy is 193 kJ mol^{-1} , show by calculation whether this radiation is capable of dissociating the Br_2 molecule. ($h = 6.62 \times 10^{-34} \text{ J s}$)

.....

(marks : 08)

(ii) State whether the following statement is true or false and briefly explain.

- I. The boiling point of ICl is higher than that of Br_2 . ($Br = 80$, $I = 127$, $Cl = 35.5$)

.....

(marks : 10)

2. a) 1. A, B, C, D and E are five inorganic compounds. All the compounds react with diluted HCl and form colorless, tri atomic, linear and odorless gas F.

- (i) Among these compounds, only A forms a white precipitate, G, when dilute HCl is added. G dissolves in dilute NH_3 to give H. Identify A, G, and H.

A : G :

H :

- (ii) When solid B is heated, no decomposition occurs. When the solution formed by dissolving B in dilute HCl is subjected to a flame test, it gives a yellow color. Identify B.

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- (iii) When C is heated, it decomposes leaving no solid residue. Identify C.

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- (iv) When the white solid residue obtained from the thermal decomposition of D is dissolved in water and gas F is passed through it, a milky white precipitate is formed in the solution. When the gas is passed further, the solution becomes colorless. Identify D.

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- (v) When E is reacted with dilute HCl, a pale green colored solution is obtained. When dimethylglyoxime (DMG) is added to that solution, a red precipitate is obtained. Identify E.

.....

2. Write the balanced chemical equations for the thermal decomposition of A, C, D, and E.

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(marks : 70)

- b) • P, Q, and R are three ionic compounds containing the sodium ion.

- (i) P forms a white precipitate in the presence of dilute HCl while evolving a colorless, foul-smelling gas which changes the color of a filter paper soaked in acidic KMnO_4 .

I. Identify P.

II. Write the balanced equation for the reaction of P with dilute HCl.

.....

- (ii) Q does not yield a precipitate in the presence of dilute HCl. However, it gives off the exact same gas evolved by P in (i) above.

I. Identify Q.

II. Write the balanced equation for the reaction of Q with dilute HCl.

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(iii) R does not react with dilute HCl. But R, in the presence of Al powder and concentrated NaOH, evolves a colorless, alkaline gas with a strong odor.

I. Identify R.

II. Write the relevant balanced ionic equation for the above reaction.

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(marks : 30)

100

3. a) A volume of 25.00 cm^3 of 0.1 mol dm^{-3} solution of a weak acid HA was mixed with 12.50 cm^3 of 0.1 mol dm^{-3} NaOH solution. The pH of the final solution was 5.

(i) Write the balanced ionic equation for the dissociation of the acid HA(aq) in water.

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(ii) Write the expression for the dissociation constant (K_a) of the acid.

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(iii) Write the balanced chemical equation for the reaction between HA(aq) and NaOH(aq).

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(iv) Show that the concentrations of the remaining acid and the salt in the final solution are equal.

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(v) Calculate the dissociation constant (K_a) of the weak acid.

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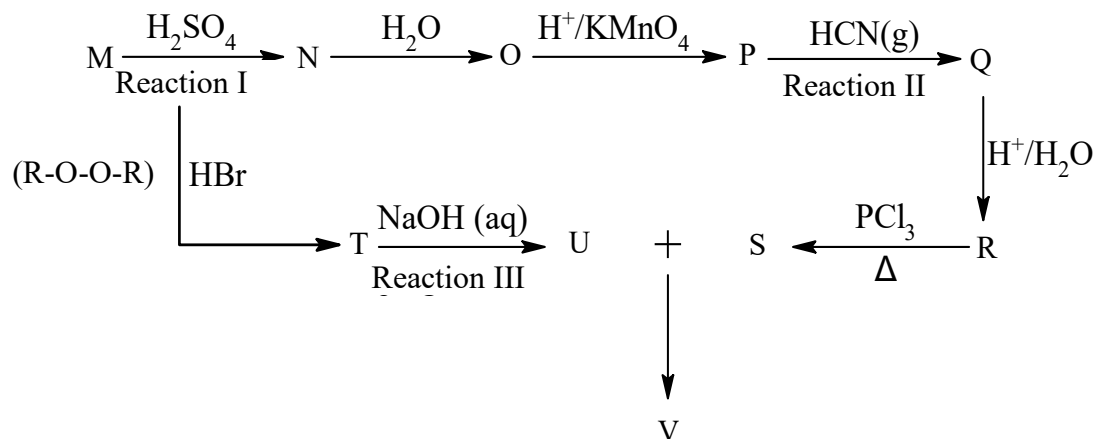


100

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(marks : 30)

4. a) Compound M with the formula C_4H_8 decolorizes liquid Br_2 but does not exhibit geometric isomerism. Compound O and as well as Q and R are optically active.

Consider the following chain of reactions.



- (i) Identify and write the structures of M, N, O, P, Q, R, S, T, U, V



M



N



O



P



Q



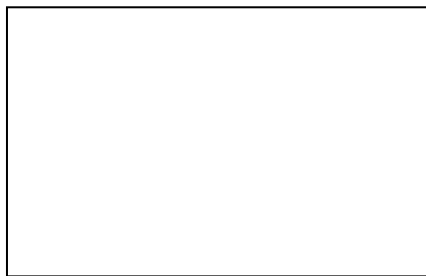
R



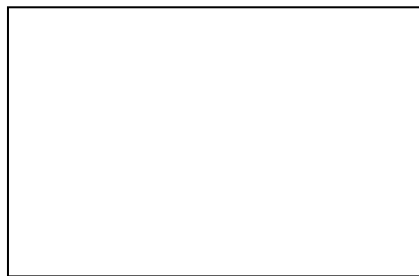
S



T



U



V

- (ii) U was reacted with V $\xrightarrow[\text{Reaction IV}]{\begin{matrix} (1.) 2 \times \text{C}_6\text{H}_5\text{MgCl} \\ (2.) \text{dil: HCl} \end{matrix}}$ Indicate the products in the boxes below.



(marks : 60)

- (iii) Identify the reactions I to IV above. Identify their mechanism type and the initially attacking species.

(A_N - Nucleophilic addition, S_N - Nucleophilic substitution,
 A_E - electrophilic addition, S_E - electrophilic substitution, E - elimination reaction
 A \ B - acid / base reaction)

Reaction number	Type of the mechanism	Initially attacking species
I		
II		
III		
IV		

- (iv) Consider the reaction between $\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{Cl}$ and H_2O , draw the mechanism indicating the major product.