බස්නාහිර පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව

Department of Education - Western Province

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය - 2023

General Certificate of Education (Advanced Level) Examination - 2023

13 ශ්‍රේණිය - පෙරහුරු ප්‍රශ්න පත්‍රය - 2023 දෙසැම්බර්

Grade 13 – Practice Paper – 2023 December

රසායන විද්‍යාව II
Chemistry II

02 E II

පැය තුනයි
Three hours

අමතර කියවීම් කාලය - මිනිත්තු 10 යි.
Additional Reading Time - 10 minuts

Name: ..... Index No: ..... Grade: .....

- Periodic Table is provided in page 18
- Use of calculators is not allowed.
- Universal gas constant R = $8.314\ JK^{-1}\ mol^{-1}$
- Avogadro constant N_A = $6.022 \times 10^{23}\ mol^{-1}$
- Plank's constant h = $6.626 \times 10^{-34}\ Js$
- Faraday's constant = 96500 C/mol
- Velocity of light C = $3.0 \times 10^{8}\ ms^{-1}$

Part A – Structured Essay (pages 2 – 10)

- Answer all 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 C Essay (pages 11 – 17)

- Answer only four questions in separate papers.
- Choose two questions from each section and answer only 4 questions in all.
- 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 as to take out with you 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		
Percentage		

Paper I	
Paper II	
Total	
Percentage	

Final Marks	

Part A – Structured Essay

- Answer ***all*** questions.

---

1. (a) Arrange the following in the ascending order of the property given in parenthesis.

(i) NO_2, NO_2^+, NO_2^-, NO_3^- (bond angle)

..... < ..... < ..... < .....

(ii) S, C, N, Cl (Electronegativity)

..... < ..... < ..... < .....

(iii) Li, Be, B, C (Second ionization energy)

..... < ..... < ..... < .....

(iv) H_2O, HF, NH_3, HCl (boiling point)

..... < ..... < ..... < .....

(v) electrons (e), protons (p), neutrons (n) and alpha ray particles (α)

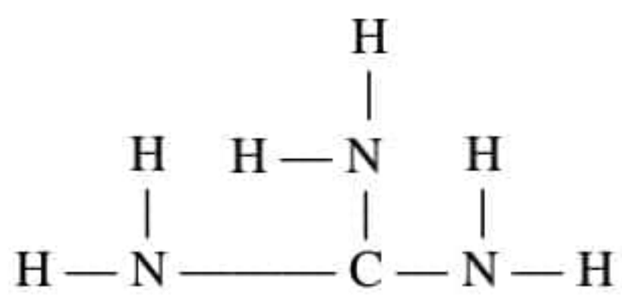
size of the $\frac{\text{charge}}{\text{mass}}$ ratio (regardless of plus or minus).

..... < ..... < ..... < .....

(vi) F, Cl, Br, I (the energy released when an electron is gained)

..... < ..... < ..... < .....

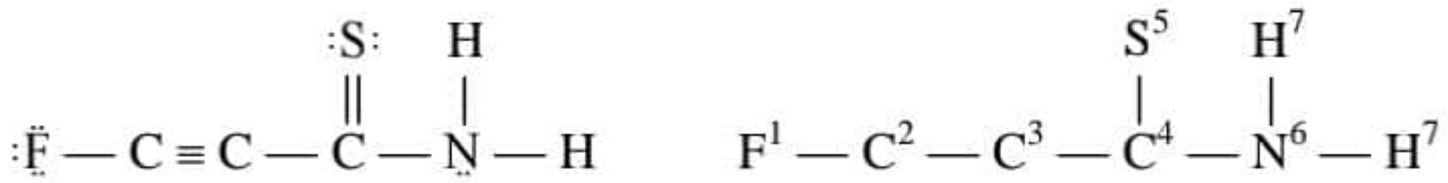
(b) (i) Following states the skeleton of $CH_6N_3^+$ ion.



Draw the Lewis structure of $CH_6N_3^+$ ion.

(ii) Draw resonance structures for $CH_6N_3^+$ ion except the one drawn above and state whether each resonance structure is more stable or less stable or equally stable underneath the each resonance structure compared to the Lewis structure drawn above.

(iii) Following states the Lewis structure of C_3H_2SNF. The labeling of the atoms given next to that for your convenience.



(I) State the following information regarding to the atoms C^2, C^3, C^4 and N^6 given in the table.

		C^2	C^3	C^4	N^6
(1)	Number of VSEPR pairs				
(2)	Electron pair geometry				
(3)	Shape				
(4)	hybridization				

(II) State the atomic / hybridized orbitals involved in sigma (σ) bond formations between the following atoms regarding to the molecule above.

(1) Among F^1 and C^2 F^1 - ..... C^2 - .....

(2) Among C^2 and C^3 C^2 - ..... C^3 - .....

(3) Among C^3 and C^4 C^3 - ..... C^4 - .....

(4) Among C^4 and S^5 C^4 - ..... S^5 - .....

(5) Among C^4 and N^6 C^5 - ..... N^6 - .....

(6) Among N^6 and H^7 N^6 - ..... H^7 - .....

(III) Identify the atomic orbitals involved in Pi (π) bond formations between following atoms considering the same labeling of above molecule.

(1) Among C^2 and C^3 C^2 - ..... C^3 - .....

(2) Among C^4 and S^5 C^4 - ..... S^5 - .....

(IV) State the approximate bond angles around following atoms.

C^2 = ... C^3 = ... C^4 = ... N^6 = ...

(V) C^2, Arrange the atoms C^2, C^3, C^4 and N^6 in the increasing order of their electronegativities.

..... < ..... < ..... < .....

(c) Consider the following informations.

- The relation among the bond length (d), the radii of two atoms (r_1 and r_2) and the electrionegativity difference (ΔE_N) between two atoms for two heterogenous atoms bound through a sigma (σ) bond is given by;

$$d = r_1 + r_2 - C\,(\Delta E_N)$$

(Here C = 9 pm and the other informations regarding length is given in pm (pico meters) 1 pm = 10^{-12}m)

- Complete ionization of a bond is either gaining or removal of an electron completely and till it's not having, the ionic percentage is given by $\frac{\delta}{e} \times 100\%$. (Here is δ is the charge of a dipole and e is the charge of an electron).
- The dipole moment (μ) between two atoms bound through a single bond is given by;

$$\mu = \delta d$$

The dipole moment could be expressed in D (Debye) and 1 D = 3.34×10^{-30} Cm.

Answer following questions by using the above information.

(i) If the ionic percentage of HF is 43.8% and the charge of an electron 1.6×10^{-19} C. Find out the charge of a dipole in HF.

(ii) If the dipole moment (μ) of HF is 1.91 D, find out the bond length of HF.

(iii) Calculate the radius of H atom if the electro negativity of 'F' is 4.0 and of 'H' is 2.1 and the radius of a 'F' atom is 71 pm.

2. (a) Four unidentified solutions contained in four test tubes which were named as P, Q, R and S. The substances in the solutions need to be $BaCl_2$, $MgCl_2$, NaOH and H_2SO_4.

Those were mixed as in the table below.

Solutions mixed	**Observations**
P and Q	a white precipitate was formed. It was insoluble in acids.
P and R	a clear solution was given. Reaction mixture, was warmed.
R and S	a white precipitate was formed.
Q and S	a clear solution was given.

(i) Identify P, Q, R and S.

P = ... Q = ...

R = ... S = ...

- Write balanced chemical equations for the reactions from (ii) to (iv).

(ii) State the reaction having when P and Q were mixed.

.....

(iii) State the reaction having when P and R were mixed.

.....

(iv) State the reaction having when R and S were mixed.

.....

(b) The colourless, aqueous solution 'A' consists of two anions and one cation. Following tests were carried out to distinguish these ions. It was a new portion of the solution 'A' used for each experiment.

		Experiment	Observation
(1)	(I)	dil HCl was added	a colourless gas liberated.
	(II)	The gas liberated was tested by exposing it to a filter paper moistuned with lead acetate.	no colour change was given.
	(III)	The gas liberated was tested by passing through a filter paper moistuned with acidic potassium dichromate.	the colour was changed from orange to green.
(2)	(I)	A slight portion of aqueous $AgNO_3$ was added.	a pale yellow precipitate (J) was formed.
	(II)	The precipitate was filtered and separated. It was then treated with excess amount of dilute HNO_3.	a yellow coloured precipitate (K) was formed. a gas was liberated.
	(III)	The gas liberated was subjected to the test carried out in (1)(III).	the colour was changed from orange to green.
	(IV)	The yellow precipitate K was filtered, separated, washed and treated with concentrated NH_4OH.	precipitate was not dissolved.
(3)	(I)	Slight portion of the solution was treated with NaOH	a gas was liberated.
	(II)	The liberated gas was tested with a filter paper moistuned with Nesslers re agent	filter paper turned brown

(i) What is / are the gas / gases could be responsible for the observations made in experiment number (1)(I)?

.....

(ii) What are the compounds contain in the pale yellow precipitate (J) formed in the experiment number (2)(I)?

.....

(iii) What are the two anions exist in A?

.....

(iv) What is the cation exists in A?

.....

(v) Write the chemical formulae of the species responsible for the following observations.

1. The yellow precipitate (K) formed in (2)(II).
2. The gas formed in (3)(I).

(vi) Write the balanced chemical equation for the reaction having in (1)(III).

3. (a) (i) Consider the following reaction

$$2ClO_{2(aq)} + 2OH^-_{(aq)} \longrightarrow ClO_3^-{}_{(aq)} + ClO_2^-{}_{(aq)} + H_2O_{(l)}$$

Following table shows. The results obtained for an experiment carried out at temperature T°C to find out the rate of the above reaction.

Experiment	**Initial $[ClO_{2(aq)}]$ / moldm^{-3}**	**Initial $[OH^-_{(aq)}]$ / moldm^{-3}**	**Initial rate moldm^{-3}s^{-1}**
1	0.015	0.025	1.3×10^{-3}
2	0.015	0.050	2.6×10^{-3}
3	0.045	0.025	1.2×10^{-3}

(1) Calculate order of the reaction with respect to $ClO_{2(aq)}$ and $OH^-_{(aq)}$ and the rate constant.

(2) Write the rate law of the reaction.

.....

(ii) $A \longrightarrow B + C$ is a first order reaction. What is the concentration of A after 450 s if the initial concentration of A is 0.4 moldm^{-3}? ($K = 7.7 \times 10^{-3}s^{-1}$)

$\left[\text{For first order reaction its half time given as } (t_{½}) = \frac{0.693}{K}\right]$

(b) Consider the reaction between $NO_{2(g)}$ and $F_{2(g)}$.

Step 1 :- $NO_{2(g)} + F_{2(g)} \longrightarrow NO_2F_{(g)} + F_{(g)}$ (slow)

Step 2 :- $NO_{2(g)} + F_{(g)} \longrightarrow NO_2F_{(g)}$ (fast)

(i) Write the complete reaction for the mechanism given above.

.....

(ii) Identify the intermediate of the above mechanism. State reasons.

.....

.....

(iii) Write the rate law of the reaction above considering the rate constant as K at the temperature T.

.....

(iv) What is the order of the reaction with respect to $F_{2(g)}$?

.....

(v) Show the change of the rate of the reaction against the concentration of $F_{2(g)}$ in the following graph. (Assume that the concentration of $NO_{2(g)}$ is kept constant)

(vi) At the temperature T, the rate of reaction when those were 2.0 moldm^{-3} and 4.0 moldm^{-3} the concentrations of $NO_{2(g)}$ and $F_{2(g)}$ respectively, was 1.44×10^{-3} moldm^{-3}s^{-1}. Calculate the rate constant (K) of the reaction.

(vii) If it is an exothermic reaction, draw the relevant energy profile diagram to show the potential energy of the above reaction between $NO_{2(g)}$ and $F_{2(g)}$ in the following graph

Mark following in the graph.

Ea_1 - Activation energy of the first step

Ea_2 - Activation energy of the second step

TS_1 - First transition state

TS_2 - Second transition state

ΔH - Enthalpy change

(viii) Draw the structure of the first transition state (TS_1).

(State the broken bonds and forming bonds using dotted lines)

4. (a) A, B, C and D are four constitutional isomers having the molecular formula C_6H_{10}. All of thee form dark brown precipitates with Cu_2Cl_2/NH_3. Only D out of these exhibits optical isomerism. D and A are two chain isomers of C while B is a position isomer of D. E, F and G are formed when A, B and D are hydrogenated with the catalyst $BaSO_4$/Pd poisoned with quinoline. Out of these, H is formed by G when treated with cold concentrated H_2SO_4 and followed dilution of the product given with water and heated. The product I which is formed when H is heated with conc. H_2SO_4 exhibits geometric isomerism.

Draw the structures of A, B, C, D, E, F, G, H and I in the boxes given.

A

B

C

D

E

F

G

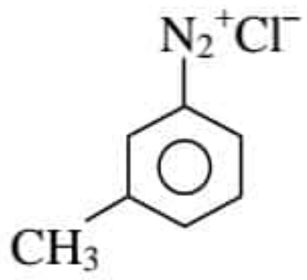
H

I

(b) Draw the structures of J, K, L, M, N, O and P formed by the reactions from (i) to (vi) in the boxes below.

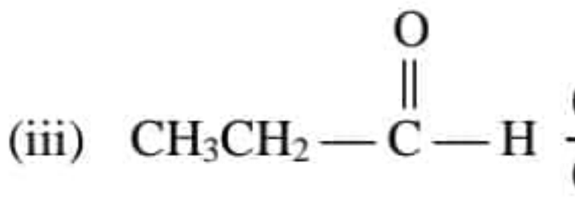
(i) $C_2H_5C \equiv CH \xrightarrow[Hg^{2+}]{\text{dilute } H_2SO_4}$

J

(ii) 

$\xrightarrow{CuBr / HBr}$

K

(iii) 

L

(iv) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{C}} = CH_2 \xrightarrow[\text{Peroxide}]{\text{HBr}}$ 

M

(v) $CH_3 - \overset{\displaystyle O}{\overset{\|}{C}} - CH_3 \xrightarrow[\text{Concentrated HCl}]{\text{Zn(Hg)}}$ 

N

(vi) $CH_3 - C \equiv C - H \xrightarrow[\text{Dry ether}]{C_2H_5MgBr}$  + 

O P

(C) State the structure of the product formed when the compound $CH_3 - \overset{\displaystyle O}{\overset{\|}{C}} - H$ is treated with aqueous NaCN and dilute HCl. Draw a mechanism for this reaction.

Part B – Essay

- Answer ***two*** questions only.

---

5. (a) (i) Define the term 'standard enthalpy change of bond dissociation' of a compound.

- Consider the standard enthalpy and entropy data given for the dissociation of liquid water at 25°C temperature.

$$2H_2O_{(l)} \longrightarrow 2H_{2(g)} + O_{2(g)}$$

Molecule	$\Delta H^{\ominus}_f$ (kJ mol^{-1})	$S^{\ominus}$ (J mol^{-1} K^{-1})
$H_2O_{(l)}$	– 285	70
$H_{2(g)}$	0	131
$O_{2(g)}$	0	205

(ii) Calculate the standard enthalpy change of the above reaction at 25°C.

(iii) Calculate the standard entropy change of the above reaction at 25°C.

(iv) Calculate the standard Gibbs free energy change of the above reaction at 25°C.

(v) State your ideas regarding to the spontaneity of the above reaction at 25°C.

(b) The by product ammonium carbamate ($H_2NCOONH_{4(S)}$) formed in urea synthesis reaches following equilibrium at 300 K temperature in a rigid vessel.

$$H_2N - COONH_{4(S)} \rightleftharpoons 2NH_{3(g)} + CO_{2(g)}$$

(i) Calculate the Kp value of the system if the total pressure at dynamic equilibrium is 6×10^4 Pa.

(ii) Calculate the Kc value standing for the system in (i) above.

- In addition to the above dynamic equilibrium, following equilibrium is reached at 600 K.

$$2NH_{3(g)} \rightleftharpoons N_{2(g)} + 3H_{2(g)}$$

At the equilibrium the partial pressure of N_2 was 1.2×10^4 Pa and total pressure was 1.2×10^5 Pa.

(iii) Find out the partial pressure of each gas.

(iv) Calculate the Kp values of the first and second equilibria at 600 K.

(v) Deduce whether the first equilibrium is endothermic or exothermic.

(c) Use following informations to answer the questions given at 25°C,

- Solubility product of AgCl is 4×10^{-10} mol^{2}dm^{-6}.
- For $Ag^+_{(aq)} + 2NH_{3(aq)} \rightleftharpoons [Ag(NH_3)_2]^+_{(ag)}$

Kc value (formation constant) is 1×10^7 mol^{-2}dm^{-6}.

(i) What is the $Cl^-_{(aq)}$ ion concentration in a saturated AgCl solution prepared dissolving AgCl in pure water?

(ii) Give the $Cl^-_{(aq)}$ ion concentration in the saturated AgCl solution prepared dissolving AgCl in 0.02 moldm^{-3} $AgNO_3$ solution.

(iii) Give the $Cl^-_{(aq)}$ ion concentration in the saturated AgCl solution prepared dissolving AgCl in 0.02 moldm^{-3} aqueous ammonia solution.

6. (a) At 25°C, 25.00 cm^3 volume of 0.10 moldm^{-3} $HCl_{(aq)}$ acid solution was measured to a titration flask and the pH value in the solution was measured using a pH meter continuously while adding $CH_3NH_{2(aq)}$ solution with unknown concentration, filled in a burette and kept above the titration flask. The pH value in the titration flask solution was 10.00 after addition of 30.00 cm^3 volume of the base.

(At 25°C temperature, for $CH_3NH_{2(aq)}$, Kb = 1.0×10^{-4} moldm^{-3} and for water Kw = 1.0×10^{-14} mol^{2}dm^{-6})

(i) Find out the pH value of the solution in the titration flask before the addition of the base.

(ii) What is the OH^- ion concentration of the solution at the titration flask after addition of 30.00 cm^3 of the base solution?

(iii) Find out the ratio $\frac{[CH_3NH_3^+{}_{(aq)}]}{[CH_3NH_{2(aq)}]}$ in the solution after addition of 30.00 cm^3 of the base solution.

(iv) Find out the base volume used to reach the equivalence point.

(v) Calculate the initial concentration of the base solution.

(vi) Calculate the pH value of the solution at the equivalence point.

(b) Benzene and toluene are two volatile liquids. Those are miscible at any proportion giving no volume exopansion or contraction. The enthalpy change standing for mixing of these is zero.

(i) (I) explain the nature of the inter molecular attractions having in liquid benzene and in liquid toluene as well as in the mixture formed by mixing those.

(II) State a suitable name could be used to identify such a mixture.

(ii) At 30°C few mixtures of benzene and toluene are exist at equilibria with vapor phases of those. For one of those mixtures the equilibrium vapor pressure, having 14 mol of benzene and 6 mol of toluene in the liquid phase, is 14.8×10^3 Pa while for another mixture, the equilibrium vapor pressure having 2 mol of benzene and 3 mol toluene in liquid phase is 13.6×10^3 Pa.

(I) Find out the saturated vapor pressures of pure benzene and pure toluene at 30°C.

(II) What is the equilibrium vapor pressure of a system having 50% mole amount of each at the liquid phase in a benzene and toluene mixture?

(III) Give the vapor phase composition of a mixture having the liquid phase molar fraction of benzene as 0.2.

(IV) Draw a rough sketch of composition vapor pressure phase diagram for benzene and toluene mixture at 30°C temperature and mark the following in it.

1. Partial pressure of benzene (P_{Ben})
2. Partial pressure of toluene (P_{Tolu})
3. Total pressure (P_T)
4. Saturated vapor pressure of pure benzene (P^o_{Ben})
5. Saturated vapor pressure of pure toluene (P^o_{Tolu})

7. (a) Following states standard electrode potentials of the two standard metal – metal ion electrodes prepared using Al and Cu at 25°C.

$E^\Theta \quad Al^{3+}_{(aq)} / Al_{(s)} = -1.66\ V$

$E^\Theta \quad Cu^{2+}_{(aq)} / Cu_{(s)} = +0.34\ V$

(i) Write a balanced chemical equations to show the equilibrium of each electrode above.

- It has been required to find out the standard electro motive force of a cell prepared using these two electrodes. You are provided with an electric conductor wires, a volt meter and a salt bridge.

(ii) Draw a rough labeled sketch of the electro-chemical cell set up for the requirement above.

(iii) For the above cell, write the

(I) Anodic reaction

(II) Cathodic reaction

(III) Overall cell reaction

(iv) Find out the electro motive force of the cell above.

(v) Write the standard cell notation of the cell above.

(vi) Name a chemical substance could be used in the salt bridge.

(vii) What is the expected function by the salt bridge?

- 200 cm^3 of 1.00 $moldm^{-3}$ $CuSO_{4(aq)}$ solution and 300 cm^3 of 1.00 $moldm^{-3}$ $Al(NO_3)_{3(aq)}$ solution were used in the preparation of electrodes above. After 40 minutes of cell operation, the concentration of $CuSO_{4(aq)}$ solution was found to be 0.875 $moldm^{-3}$.

(viii) Find out the amount of charge discharged during the operation of the cell within the above time.

(ix) Assuming that the above electro-chemical cell produces a uniform current throughout its operation, calculate the current released by the cell.

(x) Calculate the $Al^{3+}_{(aq)}$ concentration in the $Al(NO_3)_{(aq)}$ solution after 40 minutes of cell operation.

(b) Following question is based on the green coloured powder B, formed on the metal A. The results obtained for few tests carried out on B are given below.

- B was not dissolved when it was shaken with water.
- Green coloured solution C was formed by the dissolution of B in dilute H_2SO_4 and no gas liberation was observed there.
- The green coloured precipitate D which was formed when a slight portion of solution C was treated with aqueous NaOH, was insoluble in excess aqueous NaOH.
- Dark blue coloured solution E was formed by dissolution of precipitate D in aqueous ammonia when excess amount of aqueous ammonia was added to the precipitate D in the solution.
- Yellow coloured solution F was formed when another portion of the solution C was treated with concentrated HCl.
- Red colored precipitate G was formed when a slight portion of the solution C was treated with the reagent dimethylglyoxime (DMG)

Answer the following questions based on the observations above.

(i) Identify the metal A.

(ii) Write the electronic configuration of the metal A.

(iii) Identify the species B, C, D, E, F and G responsible for the observations above.

(iv) Write the IUPAC names of the species E and F responsible for the observations above. .

(c) State how would you distinguish between the given set of compounds by using only the given method. (It is not necessary giving chemical reactions for your answers)

(i) $LiNO_{3(s)}$, $NaNO_{3(s)}$, $NH_4NO_{3(s)}$ } by heating

(ii) $Mg(NO_3)_{2(aq)}$, $FeSO_{4(aq)}$, $CuSO_{4(aq)}$ } by addition of aqueous NH_3 solution

(iii) $Na_2CO_{3(aq)}$, $Na_2C_2O_{4(aq)}$, $Na_2S_{(aq)}$ } by addition of acidic $KMnO_4$ solution

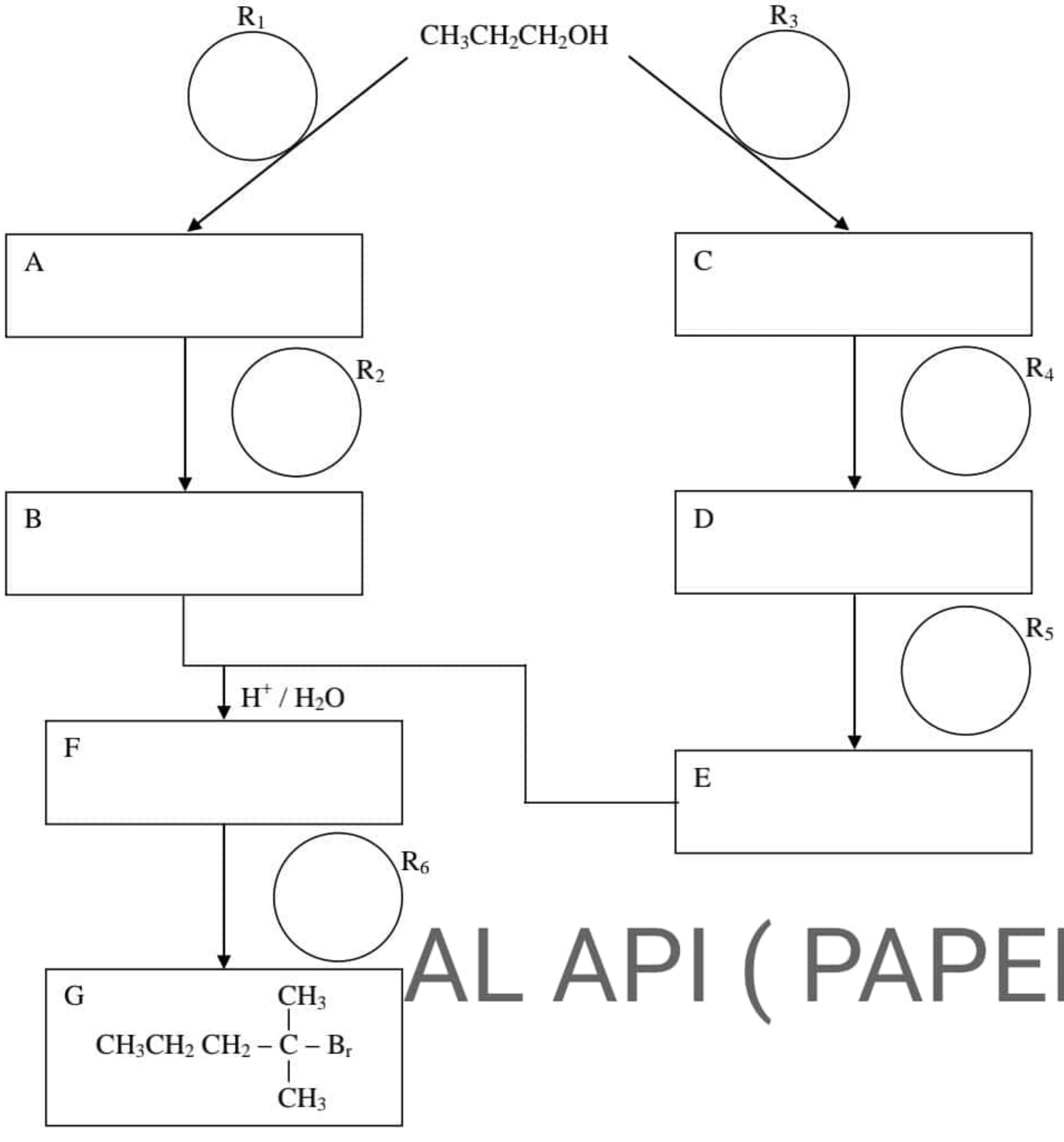
(iv) $Zn(NO_3)_{2(aq)}$, $AgNO_{3(aq)}$, $CuSO_{4(aq)}$ } by addition of aqueous NaOH solution

Part C – Essay

- Answer ***two*** questions only.

---

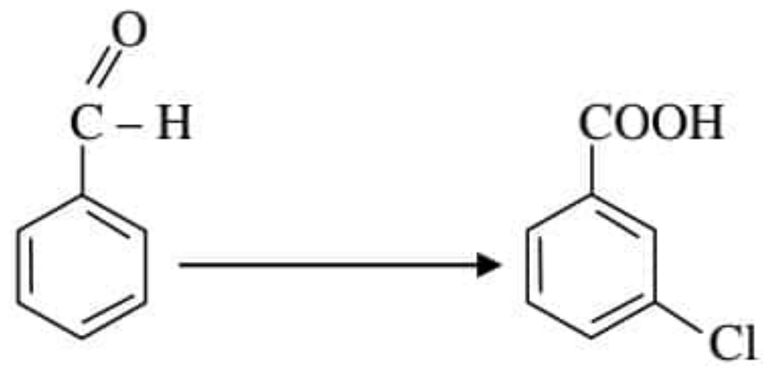
8. (a) Compound G is formed by using $CH_3CH_2CH_2OH$ as the only organic compound according to the following reaction scheme.



Give the structures of the compounds A, B, C, D, E and F and the regents R_1, R_2, R_3, R_4, R_5 and R_6. Use only the reagents in the list of given chemicals as either individually or combinations.

PBr_3, conc. H_2SO_4, Mg, H^+ / $KMnO_4$, Dry ether, H_2O

(b) (i) State how would you do the following convesion in not more than three (03) steps.



(ii) State how would you do the following covesion in not more than four (04) steps.

$$CH_3CH = CH_2 \longrightarrow CH_3CH_2 - \underset{\displaystyle OH}{\underset{|}{CH}} - \underset{\displaystyle CH_3}{\underset{|}{CH}} - \overset{\displaystyle O}{\overset{\|}{C}} - H$$

(c) (i) State the reaction between  and $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}} - Cl$ with the reagents required.

(ii) State the mechanism of the above reaction.

9. (a) 3d metal M forms two oxianions N and P having same oxidation state but two different colours. Out of these, N is stable in basic media while P is stable in acidic media. In addition, M shows two other stable oxidation states. An aqueous solution having lower oxidation state (X) of M takes bluish purple colour. When this solution is treated with dilute NaOH green coloured precipitate (Y) is formed with slight amount of NaOH which is dissolved in excess NaOH giving a green colored solution (Z). Purple colour solution W is formed when Y precipitate is treated with excess amount of concentrated NH_3 and left for some time to settle.

(i) Identify M.

(ii) Write the electronic configuration of M.

(iii) Write the molecular formulae of the compounds / ions X, Y, Z and W.

(iv) Write the chemical formulae of the two Oxianions P and N above and give the colours of those.

(v) Write the balanced chemical equation for the transformation of N to P.

(vi) A yellow coloured solution is given when aqueous solution X is treated with H_2O_2. Write a balanced chemical equation for this reaction.

(b) Following procedure was followed to determine the concentrations of ions Fe^{2+} and Fe^{3+} in the solution X.

15.8 cm^3 of an acidic solution of 0.05 $moldm^{-3}$ $KMnO_4$ was required to oxidize 25 cm^3 of X completely. Another 27.8 cm^3 of initial $KMnO_4$ solution was required to react completely with 25 cm^3 portion of X solution after reduction completely with atomic hydrogen.

Calculate the concentration of Fe^{2+} and Fe^{3+} ions in gdm^{-3}, in the solution X (Fe = 56)

(c) The decrement of the mass when 10 g of a mixture having $CaCO_3$, K_2CO_3 and MgO only was thoroughly heated, was 2.20 g. The mass was further reduced by 0.80 g when the resultant mixture was added to a solution having excess amount of HCl (as a result of liberation of CO_2).

(i) Find out the mass percentage of each species in the mixture.

(ii) State assumptions you make here if there is/are any.

(K = 39, C = 12, O = 16, Mg = 24, Ca = 40)

10. (a) Following questions from (i) to (vii) are based on the Dow process regarding to the extraction of Mg.

(i) What are the raw materials used for extraction of Mg?

(ii) State the reactions having in each step of Mg extraction.

(iii) Outline a strategy that could be used to increase the efficiency in first step of Mg extraction.

(iv) Explain the reactions having in step 2 using the solubility product concept.

(v) State two uses of Mg.

(vi) State two possible ways that the environment could be harmed during Mg extraction.

(b) Ozone layer performs an important mission by preventing the entry of UV radiation from sun to the earth's surface.

(i) Name four possible harms to organism and the environment caused by exposure to UV radiation.

(ii) Explain with suitable reactions how does the ozone layer prevents ultraviolet radiation from reaching the earth's surface.

(iii) Depletion of the ozone layer is caused by natural factors and human activities. Explain this statement and explain with reactions how does the ozone layer is depleted due to human activities.

(iv) Explain the measures that can be taken to protect the ozone layer.

(c) Following questions are based on polymers.

(i) Name three addition polymers.

(ii) Name two condensation polymers.

(iii) Name two linear polymers an two of three dimensional network polymers.

(iv) Name three thermoplastin polymers.

(v) Name two thermosetting polymers.

(vi) Name an elastomer and a plastomer.

(vii) State the monomer of polystyrene.

(viii) State the repeating unit of polystyrene.

(ix) State two properties of polystyrene and give an application regarding to the each property.

Periodic Table

	1																2
1	H																He
	3	4											5	6	7	8	9	10
2	Li	Be											B	C	N	O	F	Ne
	11	12											13	14	15	16	17	18
3	Na	Mg											Al	Si	P	S	Cl	Ar
	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
	55	56	La-	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
6	Cs	Ba	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
	87	88	Ac-	104	105	106	107	108	109	110	111	112	113					
7	Fr	Ra	Lr	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub	Uut	...				

57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

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