



வடமாகாணக் கல்வித் திணைக்களத்துடன் இணைந்து
தொண்டைமானாறு வெளிக்கள நிலையம் நடாத்தும்
முன்றாம் தவணைப் பரீட்சை - 2020
Conducted by Field Work Centre, Thondaimanaru.
In Collaboration with Provincial Department of Education
Northern Province
3rd Term Examination - 2020

இரசாயனவியல் - II A
Chemistry - II A

Two Hours

02

T

II

Gr. 12 (2021)

01) (a)

I. To calculate formal charge (FC) of an atom in Lewis structure, fill in the cages given below with N_G , N_B , N_{NBE} to complete the expression.

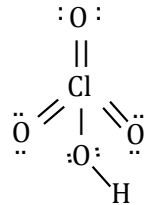
N_G - group number

N_B - number of bonds

N_{NBE} - number of un bonded electrons.

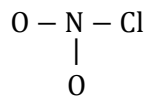
$$FC = \boxed{} - \boxed{} - \boxed{} \quad (02 \times 3 = 06 \text{ Marks})$$

II. By filling the values for N_G , N_B , N_{NBE} in suitable cages, calculate formal charge (F_C) for Cl atom in the structure of HClO_4 given below.



$$FC = \boxed{} - \boxed{} - \boxed{} = \boxed{} \quad (02 \times 4 = 08 \text{ Marks})$$

III. Basic structure of NO_2Cl molecule is given below.



(i) Draw three suitable resonance structures. (05 x 3 = 15 Marks)

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(ii) Identify the unstable structure and name it. (02 Marks)

(iii) State two reasons for the instability of the unstable structure. (02 x 2 = 04 Marks)

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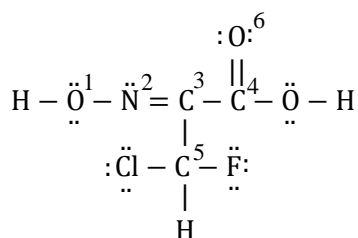
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IV. On the basis of Lewis dot – cross structure given below. Complete the table for the atoms C, N, O

- (i) VESPR around the atom
 (ii) geometry of electron pair around atom
 (iii) hybridisation of atom
 (iv) Shape around the atom.



		O ¹	N ²	C ³	C ⁴	C ⁵
1	VSEPR Pairs					
2	Geometry of electron pair					
3	hybridization					
4	Shape.					

(01 x 20 = 20 Marks)

V. In the Lewis dot – cross structure given in part (iv) above identify the atom / hybrid orbitals related to the formation of the following σ bonds.

- (i) H – O¹ H O¹
- (ii) O¹ – N² O¹ N²
- (iii) N² – C³ N² C³
- (iv) C³ – C⁴ C³ C⁴
- (v) C³ – C⁵ C³ C⁵
- (vi) C⁵ – F C⁵ F

(01 x 12 = 12 Marks)

(iii) Explain why the boiling point of A is higher than that of B? (10 Marks)

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(iv) In the following instances write balanced equations?

I. B as an acid (05 Marks)

II. B as oxidizing agent (05 Marks)

III. B as reducing agent
..... (05 Marks)

(v) State a better test that could be performed in the laboratory to identify B. (10 Marks)

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(b) An aqueous solution A contains four anions. To identify these anions the following tests were done. To every tests from (1) to (4) separate portions of solution A are used.

	Test	Observation
(1)	I. dilute HCl added II. gas evolved was passed through lime water. III. gas evolved was passed through acidified KMnO_4 solution.	This gas was odourless and colourless Solution turned milky. When gas passed through continuously, the solution turned colourless. KMnO_4 solution was not decolourised.
(2)	Mixture heated with Devarda's alloy and aqueous NaOH solution.	A gas which turned Nessler' solution brown was formed.
(3)	Mixture was warmed with conc. HNO_3 and excess of ammonium molybdate.	Yellow precipitate was not obtained.
(4)	I. BaCl_2 Solution added. II. Dilute HCl added to the white precipitate.	White precipitate formed. Precipitate Partially dissolved.

(i) Identify the anions in solution A? (06 x 4 = 24 Marks)

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(ii) In test (i) give the reaction where lime water turned milky and then becomes colourless.

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(15 Marks)

(iii) In test (1) – (3) if purple colour becomes colourless, state three gases which are possible.

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(06 Marks)

(iv) Among these if two gases reacts themselves in aqueous medium to form yellowish turbidity write balanced equation for the reaction.

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(05 Marks)

03) (a) State whether the entropy decrease / increase in the following changes

I. $H_2O_{(l)} \rightarrow H_2O_{(s)}$

II. $NH_4NO_{3(s)} \rightarrow N_2O_{(g)} + 2H_2O_{(g)}$

III. $Na_2CO_{3(s)} + H_2O_{(l)} \rightarrow Na_2CO_{3(aq)}$

IV. $2CH_{4(g)} + 2C_{(s)} \rightarrow 2C_2H_{4(g)}$

V. $NaCl_{(s)} \rightarrow Na^+_{(g)} + Cl^-_{(g)}$

(03 x 5 = 15 Marks)

(b) Consider the chemical reaction, $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$ and the thermo chemical data at $25^{\circ}C$, given below.

Chemical species.	$CaCO_{3(s)}$	$CaO_{(s)}$	$CO_{2(g)}$
Standard enthalpy of formation ($kJmol^{-1}$)	-1207	- 635	- 393
Standard entropy ($Jmol^{-1}K^{-1}$)	93	38	214

(i) At $25^{\circ}C$, calculate ΔH^{θ} for the above reaction.

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(08 Marks)

(ii) At 25° , Calculate ΔS^{θ} for the above reaction.

(08 Marks)

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(iii) (I) Write the expression that relates ΔG of a chemical reaction with ΔH and ΔS (03 Marks)

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(II) Calculate ΔG^θ for the above reaction at 25°C . (11 Marks)

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(III) State about the feasibility of the reaction with reason. (05 Marks)

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(IV) Calculate the decomposition temperature of CaCO_3 (12 Marks)

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(V) What is the assumption you had used in question (iv) above. (03 Marks)

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(c) The following question is related to molar volume of oxygen

(i) What do you understand by molar volume? (03 Marks)

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(ii) In the laboratory (KMnO_4) potassium permanganate is used state two reasons for choosing KMnO_4

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(04 Marks)

(iii) Write balanced equation for the thermal decomposition of $KMnO_4$. (04 Marks)

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(iv) Using the following data, calculate the molar volume of oxygen in STP.

Volume of water displaced is 280 ml

Total loss of mass of the system containing $KMnO_4$ is 0.4 g room temperature $28^\circ C$

Saturated vapour pressure of water at $28^\circ C$ is 28.3 mmHg

Atmospheric pressure 760 mmHg

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(20 Marks)

(v) State 2 reasons for not obtaining 22.4 dm^3 as the molar volume of oxygen in STP. (04 Marks)

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04) (a) A, B, C, D, E and F are isomeric alcohols with $C_5H_{12}O$ as their molecular formula Among them only A, B and C show optical isomerism.

(i) Draw possible structures of D, E and F.



(ii) Among D, E and F, when heated with acidified KMnO_4 , if D did not undergo any reaction, draw the structure of D.



D

(iii) When heated with concentrated H_2SO_4 , while A and D produced the same product G, B and F produced the same product H. If G does not show enantiomers. Draw the structures of A and G.

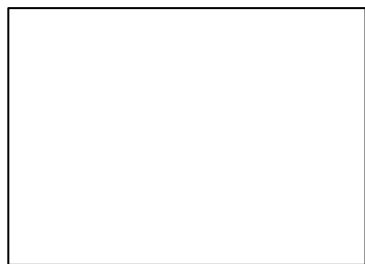


A

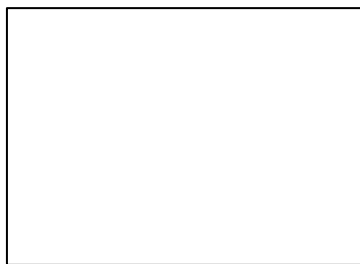


G

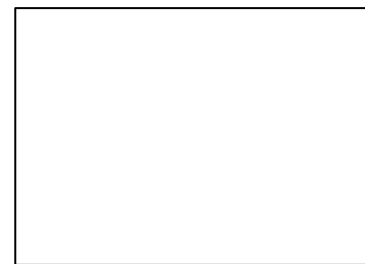
(iv) If H shows enantiomers draw the structures of B, F and H.



B



F



H

(v) E has doesn't dehydrated by heated con H_2SO_4 . Draw the structure of E.

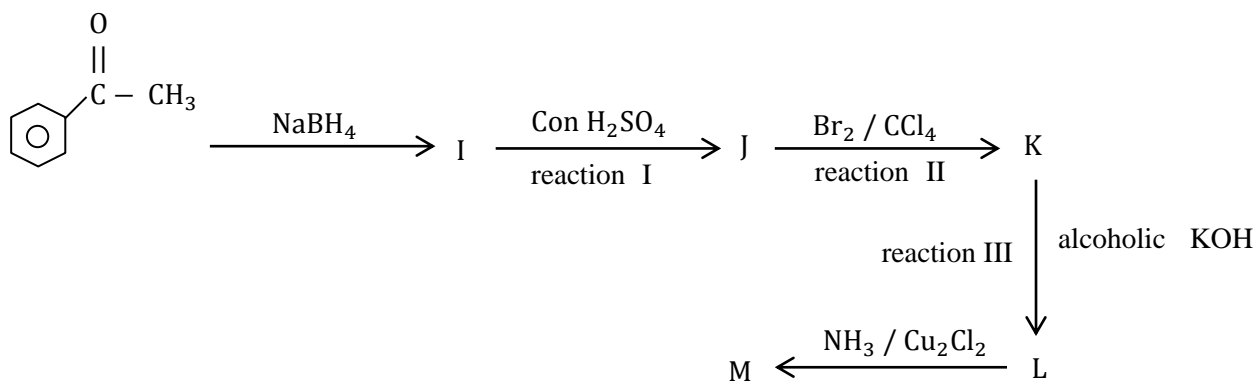


E

(05 x 10 = 50 Marks)

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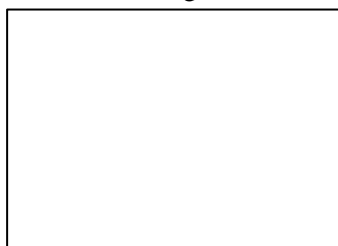
(b) (i) Consider the following reaction sequence.



Draw the structures I, J, K, L and M in the boxes given below.



I



J



K



L



M

(05 x 2 = 25 Marks)

(ii)

Electrophilic substitution, Electrophilic addition, Nucleophilic substitution,
Nucleophilic addition, Elimination.

From the list given below select and write the type of reactions of I, II and III

Reaction I

Reaction II

Reaction III (05 x 3 = 15 Marks)

(iii) Write the mechanism of the reaction to produce CH_2Cl_2 from CH_4 with $\text{Cl}_2(g)$ in diffused sun light.

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(02 x 5 = 10 Marks)