

DIRECTORATE OF GOVERNMENT EXAMINATIONS, CHENNAI - 6
HIGHER SECONDARY EXAMINATION, MARCH 2013
PART III - CHEMISTRY

Maximum Marks : 150

- Note : 1. For answers in part II, III and IV like reasoning, explaining, describing and listing the points, students may write in their own words but without changing the concepts.
2. Answer written only in Black or Blue ink should be evaluated.

PART I

CHOOSE THE CORRECT ANSWER			30X1=30		
TYPE A			TYPE B		
Q. No.	Option	Answer	Q. No.	Option	Answer
1.	b	Actinides	1.	a	$\Delta G < 0$
2.	a	Cr, Ni, Fe	2.	d	4
3.	c	$K_p = K_c (RT)^1$	3.	c	deBroglie
4.	a	Glycine	4.	c	$C_2H_5 - O - C_2H_5$
5.	a	adsorption	5.	a	F^- is a weaker ligand
6.	a	3 neutrons	6.	d	high Pressure and low Temperature
7.	b	Nitrous Acid	7.	c	True Solution
8.	a	Sn / Hcl	8.	a	Glycine
9.	b	Protonate	9.	a	Sn / Hcl
10.	d	1×10^{-2}	10.	a	Cr, Ni, Fe
11.	c	unpaired electrons	11.	c	Crystallisation of sucrose from solution
12.	d	high Pressure and low Temperature	12.	c	acetaldehyde
13.	d	have stable electronic configuration	13.	c	$K_p = K_c (RT)^1$
14.	c	stabilization of an emulsion	14.	b	Protonate
15.	a	F^- is a weaker ligand	15.	c	Stabilisation of an emulsion
16.	d	4	16.	d	Glucose
17.	c	$ClCH_2COOH$	17.	b	actinides
18.	c	sp^3d	18.	c	sp^3d
19.	a	Sandmeyer's reaction	19.	d	+4
20.	c	Crystallisation of sucrose from solution	20.	d	have stable electronic configuration
21.	b	$C_2H_5NH_2$	21.	d	1×10^{-2}
22.	a	$4.2 \times 10^5 \text{ Sec}^{-1}$	22.	b	Nitrous Acid
23.	d	+4	23.	c	Unpaired Electrons
24.	b	increases	24.	c	$ClCH_2COOH$
25.	a	$\Delta G < 0$	25.	a	adsorption
26.	c	$C_2H_5 - O - C_2H_5$	26.	a	Sandmeyer's reaction
27.	c	deBroglie	27.	b	$C_2H_5NH_2$
28.	c	acetaldehyde	28.	b	increases
29.	c	True Solution	29.	a	3 neutrons
30.	d	Glucose	30.	a	$4.2 \times 10^5 \text{ Sec}^{-1}$

PART - II

ANSWER ANY FIFTEEN QUESTIONS			15 x 3 = 45
31.	<u>Heisenberg's uncertainty principle :</u> Correct Statement Mere Mathematical expression alone 1		3
32.	<u>EA of fluorine is less than that of chlorine :</u> Small size of fluorine addition of extra electron produces high electron density (or) Effective Nuclear Charge decreases (or) electron - electron repulsion	1½ 1½	3
33.	<u>Plumbosolvency :</u> Correct Equation Unbalanced equation2 Mere Statement1		3
34.	<u>H₃PO₄ Triprotic :</u> 3 balanced equations unbalanced equation½+½+½ with NaOH forms three types of salts } (or) formula / name1	3 x 1	3
35.	<u>Variable Oxidation states :</u> Two reasons	2 x 1½	3
36.	<u>Spitting of Silver and Prevention :</u> Correct Explanation Prevention	2 1	3
37.	<u>Average Life time Calculation :</u> $\tau = \frac{t_{1/2}}{0.693}$ $= \frac{140}{0.693}$ $= 202.02 \text{ days}$ answer + unit (or) ½ + ½ $\tau = 1.44 \times t_{1/2}$ $\tau = 1.44 \times 140$ $\tau = 201.6 \text{ days}$ answer ½ + unit ½	1 1 1 (or) 1 1 1	3

38.	<u>Super Conductors :</u> Correct Statement		3
39.	<u>ΔS_{Trans} Calculation :</u> $\Delta S = \frac{\Delta H}{T}$ $= \frac{2090}{286}$ $= 7.307 JK^{-1}mol^{-1}$ <p style="text-align: right;">answer ½ + unit ½</p>	1 1 1	3
40.	<u>Le - Chatelier's Principle :</u> Correct Statement		3
41.	<u>Three Examples of opposing reactions :</u> Any three Equations	3x1	3
42.	<u>Arrhenius Equation :</u> $k = Ae^{-E_a/RT}$ <p>Explanation of any four Terms (4 x ½)</p>	1 2	3
43.	<u>Electrophoresis :</u> Correct Definition		3
44.	<u>Faraday's Second Law :</u> Correct Statement		3
45.	<u>Mesotartaric acid is an optically inactive compound:</u> One Carbon is dextrorotatory and other carbon atom is laevorotatory (or) The molecule is achiral (or) Internal Compensation (or) Inherent symmetry (or) Plane of symmetry (or) The molecule has configuration which is superimposable on its mirror image (or) structure with plane of symmetry structure alone1		3
46.	<u>Glycerose :</u> Glycerose is a mixture of glyceraldehyde and dihydroxy acetone Equation Any one suitable oxidizing agent	1 1 1	3

47.	<u>Phenol \rightarrow Phenolphthalein</u> Correct equation with conc. H_2SO_4 without mentioning conc. H_2SO_4 Mere Statement alone	2 1	3
48.	<u>IUPAC Names :</u> a. 2 - butenal b. 2 - pentanone c. phenylmethanal	1 1 1	3
49.	<u>Test for Carboxylic acid :</u> Any two tests	$2 \times 1\frac{1}{2}$	3
50.	<u>Problem :</u> A - acetamide (or) CH_3CONH_2 (or) Ethanamide B - methylamine (or) CH_3NH_2 (or) Aminomethane C - Ethyl Amine (or) $\text{C}_2\text{H}_5\text{NH}_2$ (or) Aminoethane	1 1 1	3
51.	<u>Antipyretics :</u> Explanation any one example name (or) formula	2 1	3

PART - III

Answer any seven questions choosing atleast two question from 7 x 5 = 35
each section.

SECTION - A

52.	<u>O₂ Molecular orbital Theory :</u> Electronic Configuration of Oxygen atom (or) 16 electrons Electronic configuration of oxygen molecule M.O diagram Bond Order Calculation	1 1 2 1	5
53.	<u>Silver Extraction :</u> Chief ore Concentration Two balanced equations1 + 1 Anode $\frac{1}{2}$ } Cathode $\frac{1}{2}$ } Electrolyte $\frac{1}{2}$ } Unbalanced equation (or) mere explanation $\frac{1}{2} + \frac{1}{2}$	1 $\frac{1}{2}$ 2 1 $\frac{1}{2}$	5

54.	Consequences of lanthanide contraction - : 5 points	5x1	5
55.	<u>$[Ni(CN)_4]^{2-}$ and $[Ni(NH_3)_4]^{2+}$ - hybridisation, geometry, magnetic property :</u> Electronic configuration of Ni^{2+} Electronic configuration of complexes Hybridisation magnetic property Geometry CN^- is a powerful ligand	$\frac{1}{2}$ 1 1 1 1 $\frac{1}{2}$	5

SECTION - B

56.	Second law of Thermodynamics : 5 correct statements	5x1	5
57.	K_c & K_p Expression for the dissociation of PCl_5 : $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$ $K_c = \frac{[PCl_3][Cl_2]}{[PCl_5]}$ $K_c = \frac{\frac{x}{v} \frac{x}{v}}{(\frac{\alpha - x}{v})}$ $K_c = \frac{x^2}{(\alpha - x)v}$ $x = \frac{\text{Number of Moles dissociated}}{\text{Total number of moles present initially}}$ $k_p = \frac{P_{PCl_3} \cdot P_{Cl_2}}{P_{PCl_5}}$ $K_p = \frac{x^2 p}{1 - x^2}$	$\frac{1}{2}$ 1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1 1	5
58.	Characteristics of order : 5 Characteristics	5x1	5

59.	<u>Emf and free energy calculation :</u> $E_{cell}^{\circ} = E^{\circ}_R - E^{\circ}_L$ $= -0.25 - (-0.76)$ $= +0.51 \text{ v}$ Answer $\frac{1}{2}$ + Unit $\frac{1}{2}$ $\Delta G^{\circ} = -nFE_{cell}^{\circ}$ $= -2 \times 96495 \times 0.51$ $= -98425 \text{ J (or) } -98.425 \text{ KJ (or)}$ Answer in the text Answer $\frac{1}{2}$ + Unit $\frac{1}{2}$	1 $\frac{1}{2}$ 1 1 $\frac{1}{2}$ 1	5
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SECTION - C

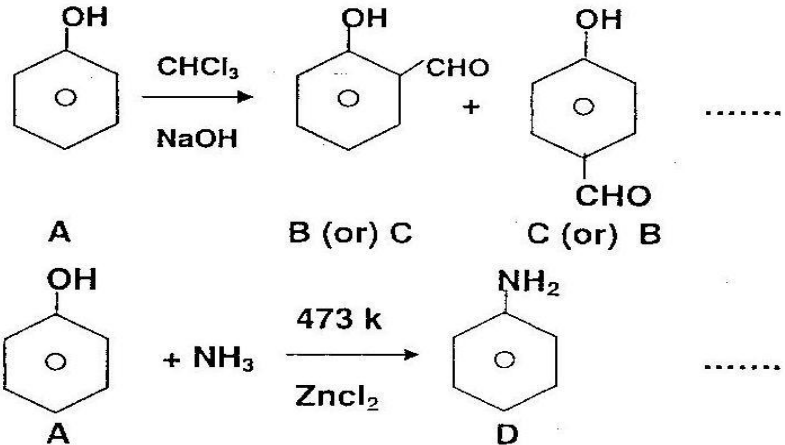
60.	<u>Three methods of preparing diethyl ether :</u> Three methods with correct equations Two methods with correct equations 4 one method with correct equations 2 statement alone (1 + 1 + 1)		5
61.	<u>Differences between acetaldehyde and benzaldehyde :</u> Any five differences	5x1	5
62.	<u>Esterification mechanism :</u> Step I Step II $1\frac{1}{2} + 1\frac{1}{2}$ Mere statement of the two steps $1 + 1$ (or) Esterification reaction alone 2	2 3	5
63.	<u>Buna-S and Nylon-66 :</u> <u>Buna-S</u> Balanced equation Any one use Equation without mentioning Na $1\frac{1}{2}$ Mere Statement 1 <u>Nylon - 66</u> Balanced equation Any one use Mere statement 1	2 $\frac{1}{2}$ 2 $\frac{1}{2}$	5

PART - IV

- (i) Answer Four questions.
(ii) Question number 70 is compulsory and answer any three from the remaining questions.

64.	<u>Pauling Scale of Electronegativity :</u>		
a.	<p>This is based on an empirical relation between the energy of bond and the electro negativities of bonded atoms.</p> $E_{A-B} > \sqrt{E_{A-A} \times E_{B-B}}$ $\Delta = E_{A-B} - \sqrt{E_{A-A} \times E_{B-B}}$ $= (X_A - X_B)^2$ <p>(or)</p> $0.208 \sqrt{\Delta} = (X_A - X_B)$ <p>Disadvantage</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	5
b.	<u>Fluorine differs from other halogens :</u> Any five points	5x1	5
65.	<u>Co-ordination and Ionisation isomerism :</u>		
a.	<p>Explanation $1\frac{1}{2} + 1\frac{1}{2}$</p> <p>Example $1 + 1$</p> <p>formula (or) name</p>	<p>3</p> <p>2</p>	5
b.	<u>Radio Carbon dating :</u> ${}_7^{14}\text{N} + {}_0^1\text{n} \rightarrow {}_6^{14}\text{C} + {}_1^1\text{H}$ ${}_6^{14}\text{C} \rightarrow {}_7^{14}\text{N} + {}_{-1}^0\text{e}$ C^{14} is oxidized to $^{14}\text{CO}_2$ and incorporated in plants as a result of photosynthesis. $t_{1/2}$ of C^{14} is 5700 years $t = \frac{2.303 \times t_{1/2}}{0.693} \log \frac{\text{Amount of } \text{C}^{14} \text{ in fresh wood}}{\text{Amount of } \text{C}^{14} \text{ in dead wood}}$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	5
66.	<u>Schottky and Frenkel defect :</u>		
a.	<p>Cause $1 + 1$</p> <p>Reason for neutrality $\frac{1}{2} + \frac{1}{2}$</p> <p>Comparing the size of the cation and anion $\frac{1}{2} + \frac{1}{2}$</p> <p>Diagram $\frac{1}{2} + \frac{1}{2}$</p>	<p>2</p> <p>1</p> <p>1</p> <p>1</p>	5

b.	<u>Adsorption theory of catalysis :</u> 4 steps with explanation4 x 1 Four Diagrams Mere mentioning the headings 4 x ½ = 2	4 1	5
67. a.	<u>Quinonoid theory of Indicators :</u> i. Colour change is due to Structural change ii. Equilibrium mixture of two tautomeric forms (or) names (or) Structures iii. One form exists in acidic and other in basic solution. iv. One of the tautomers is a weak acid / weak base. v. Two forms posses different colours. vi. pH of the solution changes, change of the colour occurs. (Any four points 4x1 = 4) Phenolphthalein - two structures. (Don't consider intermediate structure)	4x1 1	5
b.	<u>IUPAC convention of a cell :</u> As per book points : 1, 3 , 5 & 6 4 x 1 2 (or) 4 For 6 th point upto E = +1.1 V is enough	4 1	5
68. a.	<u>Cis-trans isomerism :</u> Explanation of cis and trans isomerism1½+1½ Example1 + 1	3 2	5
b.	<u>Reducing nature of HCOOH :</u> It has aldehydic group CHO (or) structure showing aldehydic group } Any two tests with equation1½ + 1½ Any two tests without equation 1 + 1	2 3	5
69. a.	<u>Differences between 1°, 2° & 3° amines :</u> Any five differences (Equations - not necessary)	5x1	5
b.	<u>Structure of Fructose :</u> 8 points (8 x ½) (Equations not necessary) Structure	4 1	5

<p>70. a.</p>	<div style="text-align: center;">  <p>A B (or) C C (or) B</p> <p>A D</p> </div> <p>A - Phenol B (or) C - o- hydroxy benzaldehyde (salicylaldehyde) C (or) B - p-hydroxy benzaldehyde D - aniline Identification of A, B, C, & D Formula (or) name 4 x ½</p>	<p>2</p> <p>1</p> <p>2</p>	<p>5</p>
<p>70. b.</p>	<p>$2Cu + O_2 \xrightarrow{\text{below } 1370\text{ K}} 2CuO$ 1 A B</p> <p>$4Cu + O_2 \xrightarrow{\text{above } 1370\text{ K}} 2Cu_2O$ 1 A C</p> <p>$Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$ 1 A D</p> <p>A- Copper B - Copper (II) Oxide (or) Cupric oxide C - Copper (I) oxide (or) Cuprous oxide D - Copper (II) Nitrate (or) Cupric nitrate (or) Copper Nitrate Identification of A, B, C & D Formula (or) Name 4 x ½ Unbalanced equation ½ + ½ + ½</p>	<p>3</p> <p>2</p>	<p>5</p>

<p>70. c.</p>	<p> $\text{CH}_3\text{CHO} + \text{HCN} \rightarrow \text{CH}_3 - \overset{\text{CN}}{\underset{\text{OH}}{\text{C}}} - \text{H}$ </p> <p> $\begin{array}{ccc} \text{A} & & \text{B} \end{array}$ </p> <p> $\text{CH}_3 - \overset{\text{CN}}{\underset{\text{OH}}{\text{C}}} - \text{H} \xrightarrow[\text{H}^+]{\text{H}_2\text{O}} \text{CH}_3 - \overset{\text{CN}}{\underset{\text{OH}}{\text{CH}}} - \text{COOH}$ </p> <p> $\text{CH}_3 - \text{CHO} \xrightarrow[\text{C}_2\text{H}_5\text{CNa}]{\text{N}_2\text{H}_4} \text{CH}_3 - \text{CH}_3 \text{ (or) } \text{C}_2\text{H}_6$ </p> <p> $\begin{array}{ccc} \text{A} & & \text{D} \end{array}$ </p> <p> A - Acetaldehyde B - Acetaldehyde Cyanohydrin C - Lactic acid D - Ethane Identification of A, B, C & D Name (or) formula 4 x ½ </p>	<p>1</p> <p>1</p> <p>1</p> <p>2</p>	<p>5</p>
<p>70. d.</p>	<p> $\lambda_{\infty} \text{Al}_2(\text{SO}_4)_3 = \frac{1}{3} \lambda_{\infty} \text{Al}^{3+} + \frac{1}{2} \lambda_{\infty} \text{SO}_4^{2-}$ </p> <p> $= \frac{189}{3} + \frac{160}{2}$ </p> <p> $= 143 \text{ mho cm}^2 \text{g equiv}^{-1} \text{ (or) } \text{ohm}^{-1} \text{ cm}^2 \text{g equiv}^{-1}$ </p> <p> answer ½ + unit ½ </p> <p> $\mu_{\infty} \text{Al}_2(\text{SO}_4)_3 = (2 \times 189 - 3 \times 160)$ </p> <p> $= 858 \text{ mho cm}^2 \text{mol}^{-1} \text{ (or) } \text{ohm}^{-1} \text{ cm}^2 \text{mol}^{-1}$ </p> <p> answer ½ + unit - ½ </p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>5</p>