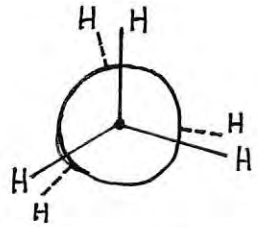
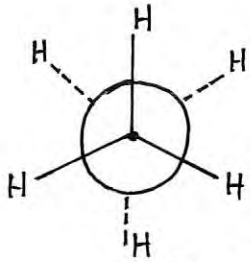
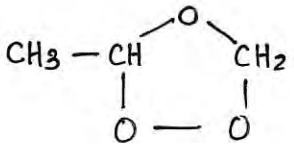
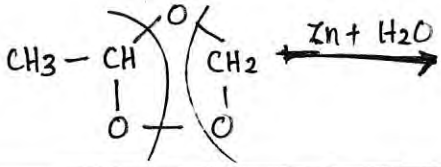
HIGHER SECONDARY EXAMINATION, MARCH 2019

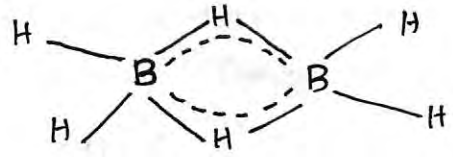
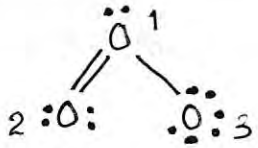
UNOFFICIAL ANSWER KEY

First Year | Part III | CHEMISTRY | CODE: FY25

Exam date: 07/03/2019

Qn No.	Sub Qn.	Value points / scoring Indicators	Split score	Total score.
1.		Absolute Zero (-273°c)	-	1
2.		(b) or NH_3	-	1
3.		3-Ethyl-1,1-dimethylcyclohexane	-	1
4.		Li_2O (Lithium monoxide)	-	1
5.		Zero (0) {Here Volume is assumed to be Constant)	-	1
6.		$h/4\pi$	-	1
7.		0.0525 has 3 Significant figures., On Rounding off, it become, **0.052** (has only 2 Significant figures)	-	1
8.		 Eclipsed Ethane  Staggered Ethane		2
9.		$pH = -\log[H^+]$ $[H^+] = 1 \times 10^{-2} M$ $pH = -\log[1 \times 10^{-2}]$ $= -(-2)\log 10 \quad [\because \log 10 = 1]$ $= 2$ $pH = 2$.	1 1 1	2
10.		Considering Nacl, $BeCl_2$ and $AlCl_3$ ⇒ ions are, Na^+, Be^{2+}, Al^{3+}. Greater the charge of the ion, the greater is the polarising power and greater will be the Covalent charecter. $NaCl < BeCl_2 < AlCl_3$	1 1	2

11.		Heterolytic cleavage: Bond breaks in such a fashion, that the shared pair of e^- remains with one of the fragments → carbocations and carbanions are formed. Homolytic cleavage: Bond breaks in such a fashion that ~~bare~~ one of the shared pair of e^- in the covalent bond goes with each of the bonded atoms.	1 1	2
12.		• photoelectric effect and • Black body Radiation - can't be explained by wave nature of EM Radiations.	1 1	2
13.		Generally the electron grain enthalpy become more negetive as we move lyt to Right in a period. Also adding one more electron to 2p-orbital causes much repulsion than in 3p. Thus chlorine has most negetive Electron grain Enthalpy.	1 1	2
14.		$4NH_3(g) + 5O_2(g) \rightleftharpoons 4NO(g) + 6H_2O_{(g)}$ $K_c = \frac{[H_2O]^2[NO]^4}{[O_2]^5[NH_3]^4}$ or $K_p = \frac{P_{H_2O}^2 P_{NO}^4}{P_{O_2}^5 P_{NH_3}^4}$ If we multiply whole reaction by a factor 2, New $K_c = K_c^2$ or K_p^2.	1 1	2
15.		propene is $CH_3 - CH = CH_2$ $CH_3 - CH = CH_2 + O_3 \longrightarrow$   $\xrightarrow{Zn + H_2O} CH_3CHO + HCHO$	1 1	2
16.		In Diborane (B_2H_6), the B atoms are sp^3 hybridized & and has 4 hybrid orbitals. of these 2 B-H bonds lies in the same plane, one above the plane & one	1	

		below the plane. The 4 equitorial B-H bonds are normal 2centred 2e⁻ bonds and Bridged B-H bonds are 3centred-2e⁻ bonds and are called Banana bonds.  	1	2
17.		process having potential to proceed without the assistance of an external agency is called spontaneous processes. for spontaneity $\Delta G < 0$ or it must be Negetive		2
18.		$d = \frac{Pm}{RT}$ or $d \propto m$ $d_{O_2} \propto m_{O_2}$ $d_{CH_4} \propto m_{CH_4}$ $\frac{d_{O_2}}{d_{CH_4}} = \frac{m_{O_2}}{m_{CH_4}} = \frac{32}{16} 2$ $\frac{d_{O_2}}{d_{CH_4}} = 2 \Rightarrow d_{O_2} = 2d_{CH_4}$		2
19.		 formal charge (FC) on O marked 1 = $6-2-(\frac{1}{2})6 = +1$ FC on O marked 2 = $6-4-(\frac{1}{2})4 = 0$ FC on O marked 3 = $6-6-(\frac{1}{2})2 = -1$	1 1	2
20.		Aluminium belongs to Group 13 elements with a valence of 3 and Sulphur belongs to Group 16 with a valence of 2. (Both have period no. 3) ∴ Formulae of compound is Al_2S_3.	1 1	2
21.		Anomalous behaviour of Li is attributed to its small size, High Ionisation Enthalpy and Large charge to radius ratio.	1	

Similarities;

→ Both Li and Mg are harder and lighter than other elements of the respective group.

→ Both react slowly with H_2O and form nitrides by direct combination with N_2. (Li_3N and Mg_3N_2)

→ Their oxides donot further react with O_2 to form Super Oxides

→ Their Carbonates are highly unstable and decompose readily on heating

→ Both LiCl and $MgCl_2$ are deliquecent and are soluble in Ethane

(Any four is Sufficient)

(½ × 4 = 2) 3

22.

(a) Salt of weak acid and strong base. (Eg: CH_3COONa)

$$CH_3COONa \longrightarrow CH_3COO^- + Na^+$$

The acetate ion undergo hydrolysis with H_2O as;

$$CH_3COO^- + H_2O \rightleftharpoons CH_3COOH + OH^-$$ 1

Since CH_3COOH is a weak acid, Remains Unionised in the solution, increasing conc. of OH^-. Thus sol^n will be more <u>Alkaline</u>

3

(b) Salt of strong acid and weak base (Eg: NH_4Cl)

$$NH_4Cl \longrightarrow NH_4^+ + Cl^-$$

NH_4^+ undergo hydrolysis with H_2O as;

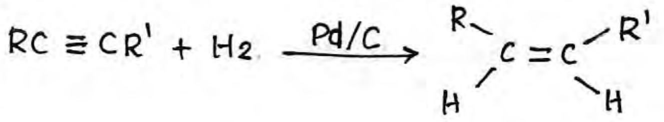
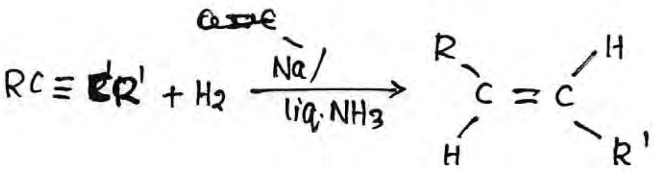
$$NH_4^+ + H_2O \rightleftharpoons NH_4OH + H^+$$ 1

Since NH_4OH is a weak base Remains unionised in the sol^n thereby increasing conc. of H^+. Thus sol^n will be <u>ACIDIC</u>

(c) Salts of weak acid and weak base (Eg: CH_3COONH_4) 1

$$CH_3COONH_4 \longrightarrow CH_3COO^- + NH_4^+ \quad (or)$$

$$CH_3COO^- + NH_4^+ + H_2O \rightleftharpoons CH_3COOH + NH_4OH$$

		$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$ $NH_4OH \rightleftharpoons NH_4^+ + OH^-$ $H_2O \rightleftharpoons H^+ + OH^-$ $pH = 7 + \frac{1}{2}(pK_a - pK_b)$ it may be Greater than 7 or less than 07.		
23.	(a)	when p^H of Rain water falls below 5.6, it is called Acid Rain	1	
	(b)	The reaction of oxides of Nitrogen & sulphur with water after oxidation are Contributors of acid Rain. $2SO_2 + O_2 + 2H_2O \longrightarrow 2H_2SO_4\,(aq)$ $4NO_2 + O_2 + 2H_2O \longrightarrow 4HNO_3\,(aq)$	1	3
	(c)	Acid Rain is harmful for trees, plants. it washes away essential nutrients in soil & there by damages agriculture.	1	
24.		Alkynes on reaction with Linlards' catalyst (partially deactivated palladised charcol) gives cis Alkenes  Cis-alkene Alkynes on reduction with liq. NH3 / Na gives trans alkene  Trans-alkene	1 1/2 1 1/2	3
25.		$N_2 + 3H_2 \longrightarrow 2NH_3$ 28g N_2 needs 6gm H_2 250g N_2 needs $\frac{6}{28} \times 250$ g H_2 = 53.57 gm But we have 50gm H_2.	1	

		∴ limiting Reagent is H_2. 6 gm H_2 gives 34 g NH_3 1 gm H_2 gives $\frac{34}{6}$ g NH_3 50 g H_2 gives $\frac{34}{6} \times 50 = 283.33$ gm	1 1	3
26.		MO config of O_2 No: of e^- in O_2 molecule = 16. ∴ $\sigma 1s^2\ \sigma^* 1s^2\ \sigma 2s^2\ \sigma^* 2s^2\ \sigma 2p_z^2\ \pi 2p_x^2 = \pi 2p_y^2\ \pi^* 2p_x^1 = \pi^* 2p_y^1$ Bond Order = $\frac{1}{2}(N_b - N_a) = \frac{1}{2}(10 - 6) = 2$ MO config of N_2 No. of e^- in N_2 molecule = 14 $\sigma 1s^2\ \sigma^* 1s^2\ \sigma 2s^2\ \sigma^* 2s^2\ \pi 2p_x^2 = \pi 2p_y^2\ \sigma 2p_z^2$ Bond order = $\frac{1}{2}(N_b - N_a) = \frac{1}{2}(10 - 4) = 6/2 = 3$ N_2 having higher bond order, it is more stable. N_2 have all e^- paired – diamagnetic O_2 have 2 upaired e^- – paramagnetic	1 1 1	3
27.	(a)	It is because two wrong assumptions made in the kinetic theory of gases. i) There is no force of attraction b/w gas molecules. ii) Volume of a single molecule can be neglected Compared to total volume.	(1)	3
	(b)	At High pressure / Low temp.	(1)	
	(c)	Temp. at which real gases behave ideally.	(1)	

28.

Structure : Correct figure in Gas phase / in solid phase (NCERT page. 286) — 1

Preparation : i) Acidifying barium peroxide & removing Excess water

ii) Electrolysis of sulphate solutions followed by Hydrolysis. — 1

iii) Auto-oxidation of 2-Ethyl anthraquinols.

(Any One is Sufficient)

Chemical rect^{n} = $2Fe^{2+} + 2H^{+} + H_2O_2 \longrightarrow 2Fe^{3+} + 2H_2O$

$PbS + 4H_2O_2 \longrightarrow PbSO_4 + 4H_2O$

$HOCl + H_2O_2 \longrightarrow H_3O^{+} + Cl^{-} + O_2$ — 1

(Any one reaction)

3

29.

$P_4 + OH^-_{(aq)} \longrightarrow PH_{3(g)} + HPO_2^-{}_{(aq)}$

→ OH^- indicate Reaction occurs in Basic Medium

$\overset{0}{P_4} + \overset{-2+1}{OH^-} \longrightarrow \overset{-3+1}{PH_3} + \overset{+1\ +2\ -2}{HPO_2^-}$

Oxidation half : $P_4 \longrightarrow HPO_2^-$

$P_4 \longrightarrow 4HPO_2^-$

Oxid^{n} no: of P balanced by adding $8e^-$

$P_4 \longrightarrow 4HPO_2^- + 8e^-$

charge balanced by adding $12OH^-$

$P_4 + 12OH^- \longrightarrow 4HPO_2^- + 8e^-$

H and O are balanced by adding $4H_2O$

Redu $P_4 + 12OH^- \longrightarrow 4HPO_2^- + 8e^- + 4H_2O \longrightarrow (1)$

Reduction half

$P_4 \longrightarrow PH_3$

$P_4 \longrightarrow 4PH_3$

(0) $(-3)\times 4$

$P_4 \longrightarrow 4PH_3$

3

$P_4 + 12e^- \longrightarrow 4PH_3$

charge balanced by adding OH^-

$P_4 + 12e^- \longrightarrow 4PH_3 + 12OH^-$

O and H are balanced by adding $12H_2O$

$P_4 + 12e^- + 12H_2O \longrightarrow 4PH_3 + 12OH^- \longrightarrow (1)$

eqn(1) × 3

$3P_4 + \overset{12OH^-}{\cancel{36OH^-}} \longrightarrow 12HPO_2^- + \cancel{24e^-} + \cancel{12H_2O}$

eqn(2) × 2

$2P_4 + \cancel{24e^-} + \overset{12H_2O}{\cancel{24H_2O}} \longrightarrow 8PH_3 + \cancel{24OH^-}$

adding, we get

$5P_4 + 12OH^- + 12H_2O \longrightarrow 8PH_3 + 12HPO_2^-$

30. Atomic Orbitals are presisely distinguished by quantum Nos.

i) Principal quantum No. (n) — 1

Determine Size & Energy of Orbital

ii) Azimuthal quantum No. (l) — 1

Identifies subshell and shape of orbitals

iii) Magnetic Quantum No. (m_l) — 1

Orientation of Orbitals in Space.

iv) Spin quantum No. (m_s) — 1

Determines the spin of e^-.

"only two electrons exist in an orbital, but they need to have opposite spin".

(OR)

No two electrons in an atom can have same set of four quantum nos.

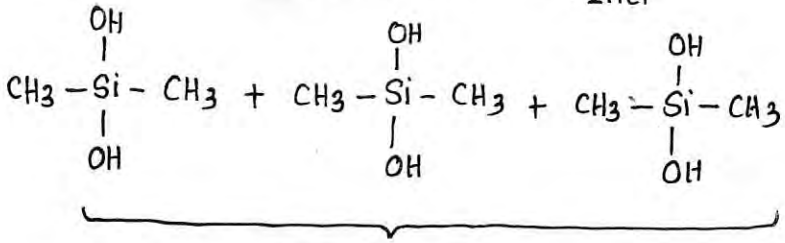
4

31 (a) Group of Organo Silicon polymers which have $+R_2SiO+$ as a repeating unit. — 1

(b)

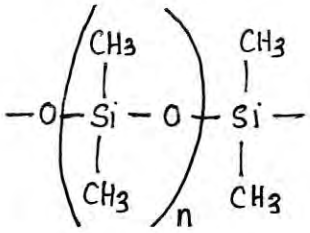
$$2CH_3Cl + Si \xrightarrow[570K]{Cu\ powder} (CH_3)_2SiCl_2$$

$$(CH_3)_2Si(OH)_2 \xleftarrow[-2HCl]{+2H_2O}$$



Polymerisation

$\downarrow -H_2O$



SILICONE

2

(c) Chain length can be controlled by adding $(CH_3)_3SiCl$ which blocks the Ends. / Reaction. 1

4

32

i) Structural Isomerism

a) Chain Isomerism.

Compounds with same molecular formulae but differ in Carbon skeleton.

Eg: Butane and 2-methyl propane.

b) Position Isomerism

Compounds with same molecular formulae but differ in position of function group, double / triple bond.

Eg: pentan-1-ol and pentan-2-ol

c) Functional Isomerism

compounds with molecular formulae but differ in functional group.

Eg: Aldehydes & ketones or propanone & propanal.

		d) Metamerism arises due to difference in alkyl chain on either side of functional group. Eg ; Methoxy propane and Ethoxy Ethane.		
33.	(a)	Hesses' Law if a Reaction takes place in multiple steps, the standard enthalpy of Reaction is the sum of Enthalpy of the intermediate step.	1	
	(b)	Required eqn is ; $C_{(s)} + 2H_2O_{(g)} + \frac{1}{2}O_{2(g)} \longrightarrow CH_3OH(l)$ This eqn can be obtained by ; i) Rewrite eqn (2) of Qn paper. $C + O_2(g) \longrightarrow CO_2$; $\Delta_r H^\ominus = -393\ Jmol^{-1}$ ii) 2 × Equation (3) of Qn paper $2H_{2(g)} + O_2 \longrightarrow 2H_2O$; $\Delta_r H^\ominus = 2\times(-286)Jmol^{-1}$ $= -572\ Jmol^{-1}$ iii) Reverse eqn (1) of qn paper ; $\Delta_r H^\ominus = +726\ Jmol^{-1}$ $\Delta_f H^\ominus_{[CH_3OH]} = -393 - 572 + 726 = -965 + 726$ $= -239\ KJmol^{-1}$ Standard Enthalpy of formation of methanol is **$-239\ KJmol^{-1}$**	3	4
		Prepared By, ANOOP CHANDRAN S anoopchandrac17@gmail.com 7902715940 (whats app)		

TOTAL SCORE : 60