Reg. No.															

B.Tech. DEGREE EXAMINATION, MAY 2022

Second Semester

18CYB101J - CHEMISTRY

(For the candidates admitted from the academic year 2018-2019 to 2019-2020)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B** should be answered in answer booklet.

Time: 2½ Hours | Max. Marks: 75

	Marks	BL	CO	PO

PART – A (25 × 1 = 25 Marks)

Answer **ALL** Questions

1. The filling up of molecular orbitals takes place according to — 1 | 1 | 1,6 | 1
   (A) Huckel's rule (B) Hund's rule
   (C) Fajan's rule (D) Cahn Ingold Prelog Rule

2. Which of the following does not exist due to it's zero bond order? — 1 | 2 | 1,6 | 1
   (A) H_2^+ (B) He_2^+
   (C) He_2 (D) H_2^-

3. CO has how many bonding electrons? — 1 | 2 | 1,6 | 1
   (A) 4 (B) 6
   (C) 8 (D) 10

4. According to Heisenberg, the product of uncertainity in the position and momentum of the body is — 1 | 1 | 1,6 | 1
   (A) Equal to h/p (B) $\geq h/4\pi$
   (C) Equal to E-V (D) $\geq$ E- V

5. The CFSE for a high spin d^4 octahedral complex is — 1 | 2 | 1,6 | 1
   (A) -1.8 A_0 (B) -0.6 A_0
   (C) -1.6 A_0 (D) +1.8 A_0

6. Radio frequency region in the electromagnetic spectrum is meant for — 1 | 1 | 2,6 | 1
   (A) Microwave (B) NMR
   (C) IR (D) UV-Visible

7. Which of the following is not IR active? — 1 | 2 | 2,6 | 1
   (A) CH_2-CH_2 (B) OCS
   (C) H_2O (D) CO_2

8. The selection rule for vibrational transition in simple harmonic oscillation is — 1 | 1 | 2,6 | 1
   (A) $\Delta J = \pm 1$ (B) $\Delta J = +1$
   (C) $\Delta V = \pm 1$ (D) $\Delta V = +1$

28. a.i. Comment on the following statements

(i) First ionization energy of Aluminium (Al) is lower than that of Magnesium (Mg). — 5 | 3 | 3,6 | 4

(ii) Ca^{2+} has smaller ionic radius than k^+ — 5 | 3 | 3,6 | 4

(OR)

b. Discuss about the instrumentation and working of XPS with a neat sketch. — 10 | 2 | 3,6 | 1

29. a. Apply Nernst equation in determining the potential of a redox reaction and explain how it is useful in predicting the spontaneity of redox reactions. — 10 | 3 | 4,6 | 2

(OR)

b. Explain centre of symmetry and alternating axis of symmetry with suitable examples. — 10 | 2 | 4,6 | 3

30. a. Construct the different conformations of n-butane and correlate it with potential energy diagram. — 10 | 3 | 5,6 | 4

(OR)

b.i. Find out the mechanism followed for the hydrolysis of tertiary butyl bromide and explain. — 5 | 4 | 5,6 | 2

ii. Explain Dieckmann condensation with an example. — 5 | 2 | 5,6 | 1

* * * * *

9.	The forbidden electronic transition in hydrogen atom spectrum is (A) $1s \rightarrow np$ (B) $1s \rightarrow ns$ (C) $29 \rightarrow ns$ (D) $2p \rightarrow nd$	1	2	2,6	1
10.	$\left[Co(NH_3)_6\right]^{3+}$ ion is (A) Diamagnetic (B) Ferromagnetic (C) Ferrimagnetic (D) Paramagnetic	1	2	2,6	1
11.	Repeatable entity of a crystal structure is known as (A) Crystal (B) Lattice (C) Miller Indices (D) Unit cell	1	1	3,6	1
12.	The correction factor for pressure in modified vanderwaals equation of state is (A) a/b (B) a/v^2 (C) a/v (D) v-nb	1	1	3,6	1
13.	For which of the following species, the ionization energy is maximum? (A) Ne (B) Mg^+ (C) Al^{2+} (D) Li^+	1	2	3,6	1,2
14.	According to Fajan's rule, the covalent bond is favoured by (A) Large cation and small anion (B) Large cation and Large anion (C) Small cation and large anion (D) Small cation and small anion	1	1	3,6	1
15.	The energy responsible to release the electron in XPS is (A) Rotational Energy (B) Gibbs Energy (C) Binding Energy (D) Free Energy	1	1	3,6	1
16.	Which statement is incorrect? (A) At constant pressure $\Delta H = \Delta E + P\Delta V$ (B) The thermodynamic symbol for entropy is S (C) Gibbs free energy is a state function (D) For an endothermic process, ΔH is negative	1	2	4,6	1,3
17.	The entropy of an isolated system is always _____ and reaches _____ when equilibrium is reached (A) Constant, maximum (B) Decreases, minimum (C) Increases, maximum (D) Decreases, constant	1	2	4,6	1,3
18.	In corrosion, as a result of decay, the metals are not converted into (A) Oxides (B) Peroxides (C) Carbonation (D) Hydroxides	1	1	4,6	1,3
19.	Identify the hard acid from the following (A) $AlCl_3$ (B) N_2H_4 (C) H_2O (D) OH^-	1	1	4,6	1,3

20.	The isomers which can be converted through rotation around a single bond are (A) Enantiomers (B) Diastereomers (C) Positional isomers (D) Conformers	1	2	4,6	1
21.	Which of the following compound would show optical isomerism? (A) $H_2N\,CH\,(CH_3)_2$ (B) $H_2N\,CH_2\,COOH$ (C) CH_3-CH (OH) COOH (D) $(CH_3)_2\,CH\,CHO$	1	2	5,6	2,3
22.	The potential energy of n-butane is minimum for (A) Skew conformations (B) Staggared conformations (C) Eclipsed conformations (D) Gauche conformations	1	1	5,6	2
23.	What type of reaction taken place upon treatment of a ketone with HCN to form cyanohydrin? (A) Nucleophilic addition (B) Nucleophilic substitution (C) Electrophilic addition (D) Electrophilic substitution	1	1	5,6	2
24.	$\left[Co(NH_3)_5NO_2\right]Cl_2$ and $\left[Co(NH_3)_5(ONO)\right]Cl_2$ are related to each other as (A) Geometrical Isomers (B) Optical Isomers (C) Linkage Isomers (D) Coordination Isomers	1	2	5,6	2
25.	Identify the reducing agent from the following (A) OsO_4 (B) PCC (C) $LiAlH_4$ (D) $K_2Cr_2O_7$	1	1	5,6	2

PART – B (5 × 10 = 50 Marks)

Answer **ALL** Questions

			Marks	BL	CO	PO
26. a.	Derive Schrodinger equation for one dimensional box and obtain the formula for energy.		10	3	1,6	1
	(OR)					
b.	Sketch the pi molecular orbitals of benzene and explain its bonding and antibonding molecular orbitals.		10	3	1,6	3
27. a.	Draw the energy level diagrams and calculate CFSE for the following configurations.					
	i.	d^5 tetrahedral, high spin	5	3	2,6	3
	ii.	d^8 Octahedral, low spin	5			
	(OR)					
b.i.	Explain in detail, the selection rule for Carbon monoxide (CO) absorbing in IR region.		5	2	2,6	4
ii.	Analyze the NMR spectrum of Ethanol and explain the splitting of signals.		5	4	2,6	4