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B.Tech DEGREE EXAMINATION, DECEMBER 2023

First Semester

21CYB101J - CHEMISTRY

(For the candidates admitted during the academic year 2022-2023 onwards)

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** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 75**

PART - A (20 × 1 = 20 Marks) — Answer **all** Questions

		Marks	BL	CO
1.	The coordination number for tetrahedral complexes is ---- . (A) 3 (B) 6 (C) 4 (D) 8.59	1	1	1
2.	The crystal field theory considers the metal-ligand bond to be a bond. (A) Covalent (B) Ionic (C) Polar (D) Hydrogen	1	1	1
3.	Transition metals are generally coloured because ----- . (A) they absorb electromagnetic radiation (B) their penultimate d-subshells are fully filled (C) they undergo d-d transition (D) they are diamagnetic in nature	1	2	1
4.	Which of the following complexes has a magnetic moment of 1.73 BM? (A) $[Ni(CN)_4]^{2-}$ (B) $TiCl_4$ (C) $[Cu(NH_3)_4]^{2+}$ (D) $[CoCl_6]^{4-}$	1	3	1
5.	Which of the following is not a thermodynamic function? (A) Internal energy (B) Enthalpy (C) Entropy (D) Frictional energy	1	1	2
6.	In an electrochemical corrosion ------ . (A) anode undergoes oxidation (B) cathode undergoes oxidation (C) both undergo oxidation (D) none undergoes oxidation	1	2	2
7.	The solubility product increases with an increase in ---------- . (A) energy (B) temperature (C) pressure (D) volume	1	2	2
8.	When an equilibrium is reached inside the two half-cells of an electrochemical cell, what is the net voltage across the electrodes? (A) > 1 (B) < 1 (C) = 0 (D) Not defined	1	2	2
9.	Enantiomers are ---- . (A) Molecules that have a mirror image (B) Molecules that have at least one stereogenic center (C) Non-superimposable molecules (D) Non-superimposable molecules that are mirror images of each other	1	2	3
10.	The plane that divides the molecule into two equal parts so that each half is the mirror image of the other half is called as ---- . (A) Centre of symmetry (B) Plane of symmetry (C) Axis of symmetry (D) Angle of symmetry	1	2	3

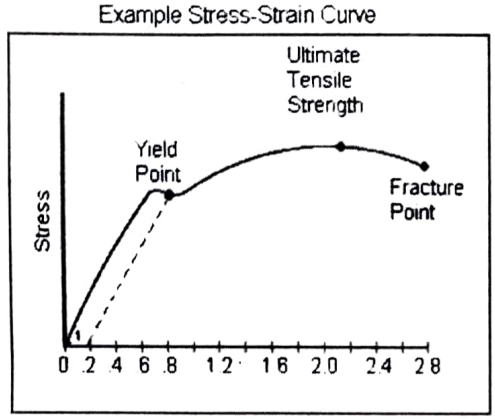
11.	How many optical isomers are possible in a compound with one chiral carbon? (A) 5 (B) 4 (C) 2 (D) 3	1	2	3
12.	The potential energy of n-butane is minimum for ----- conformation. (A) Skew (B) Staggered (C) Eclipsed (D) Gauche	1	2	3
13.	In addition polymers, monomers used are ----- . (A) Unsaturated compounds (B) Saturated compounds (C) Bifunctional saturated compounds (D) Trifunctional saturated compounds	1	1	4
14.	The polymer in which the substituents are sterically arranged in a way to give alternate d and l configuration is known as --- . (A) Isotactic polymer (B) Atactic polymer (C) Syndiotactic polymer (D) Fibres	1	2	4
15.	Which of the following is true for the resultant polymer product formed, when molecules of pthalic acid react with molecules of glycerol? (A) Branch polymer (B) Crosslink polymer (C) Linear polymer (D) Resins	1	2	4
16.	Which among following is a naturally occurring polymer? (A) PVC (B) Acetic acid (C) Protein (D) Polythene	1	1	4
17.	Hooke's law essentially defines ----. (A) Elastic limit (B) Stress (C) Strain (D) Yield point	1	2	5
18.	Composites can be classified based on ------ . (A) Matrix type (B) Reinforcement constituent (C) Neither on matrix type nor on reinforcement constituent type (D) Matrix type and reinforcement constituent	1	1	5
19.	ESCA can identify elements in the periodic table above which of the following? (A) Carbon (B) Boron (C) Helium (D) Potassium	1	2	5
20.	With the help of which of the following equations the interplanar distance can be calculated from a known wavelength of the source and measured angle? (A) Coolidge equation (B) Scherrer equation (C) Debye equation (D) Braggs equation	1	2	5

PART - B (5 × 8 = 40 Marks)

Answer **all** Questions

		Marks	BL	CO
21.	(a) i. With suitable diagrams, discuss the crystal field splitting in the octahedral complex. (6 Marks) ii. How are the crystal field splitting energies for octahedral (Δ_0) and tetrahedral (Δ_t) complexes related? (2 Marks)	8	2	1
	(OR)			
	(b) i. Explain briefly the high spin and low spin complexes with examples. (4 Marks) ii. What is the screening effect? Calculate shielding constant and effective nuclear charge for 4s electron in Mn. (4 Marks)			
22.	(a) Derive Gibb's-Helmoltz equation and explain its applications.	8	2	2
	(OR)			
	(b) i. Corrosion in an electrochemical phenomenon; explain. (6 Marks) ii. What is the purpose of using salt bridge in Galvanic cell. (2 Marks)			

23.	(a) i. Explain Cahn-Ingold Prelog rules to determine R/S configuration on a chiral center, with an example (6 Marks) ii. Write a note on position isomerism in organic compounds. (2 Marks)	8	3	3
	(OR)			
	(b) Explain in detail the conformational analysis of n-butane with a potential energy diagram.			
24.	(a) i. Explain n-doping and p-doping in conducting polymers. (3 Marks) ii. What are the differences between Thermoplastic and Thermosets? Give examples. (5 Marks)	8	2	4
	(OR)			
	(b) i. How are the following plastics synthesized? Give their applications (4 Marks) (1) Nylon 6:6 (2) PTFE ii. Define the degree of polymerization and functionality of monomer.			
25.	(a) i. Explain the points given in the stress-strain curve below: (6 Marks)	8	3	5



ii. Compute the Miller Indices for a plane intersecting at x= ¼, y=1 and z=1/2. (2 Marks)

(OR)

(b) i. Explain Bragg's law with a neat sketch. How it is applied for studying the diffraction of X-rays by atoms in a crystalline structure? (6 Marks)
ii. Mention important characteristics of composite material. (2 Marks)

PART - C (1 × 15 = 15 Marks)	**Marks**	**BL**	**CO**
Answer **any 1** Questions			
26. i. With a neat sketch, explain the Pourbaix diagram for Iron. (10 Marks) ii. Explain the free radical mechanism for addition reaction, with an example (5 Marks)	15	3	3
27. i.Discuss the principle, instrumentation and applications of XPS (10 Marks) ii. Calculate the spin-only magnetic moment for following: (5 Marks) Fe^{+2}. (atomic number of Fe is 26) Cr^{3+} (atomic number of Cr is 24)	15	3	5

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