

**B.Tech DEGREE EXAMINATION, JANUARY 2024**

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 40<sup>th</sup> 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)****Marks BL CO**

Answer all Questions

- |   |  |   |   |   |
|---|--|---|---|---|
| 1. Among the following complexes, the one that shows zero crystal field stabilization energy (CFSE) is<br>(A) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$<br>(C) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$                  | (B) $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$<br>(D) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$                                       | 1 | 3 | 1 |
| 2. Choose the correct statement<br>(A) As shielding effect increases electronegativity decreases<br>(C) As shielding effect increases ionization potential increases  | (B) As shielding effect increases electronegativity increases<br>(D) As positive charge on species increases ionic radii increases | 1 | 1 | 1 |
| 3. Which of the following will prefer to exist as sulphide?<br>(A) $\text{Mg}^{2+}$<br>(C) $\text{Hg}^{2+}$   | (B) $\text{Al}^{3+}$<br>(D) $\text{Ca}^{2+}$   | 1 | 3 | 1 |
| 4. How many unpaired electrons are there in a strong field iron (II) octahedral complex?<br>(A) 0<br>(C) 3  | (B) 1<br>(D) 5   | 1 | 4 | 1 |
| 5. In a reversible process, the system absorbs 600KJ heat and performs 250KJ work on the surroundings. What is the increase in the internal energy of the system?<br>(A) 850KJ<br>(C) 350KJ                             | (B) 600KJ<br>(D) 250KJ   | 1 | 3 | 2 |
| 6. Which thermodynamic function relates both enthalpy and entropy?<br>(A) Helmholtz free energy<br>(C) Work function  | (B) Internal energy<br>(D) Gibbs free energy   | 1 | 2 | 2 |
| 7. Which of the following is the correct criterion for a spontaneous process?<br>(A) $\Delta S_{\text{system}} - \Delta S_{\text{surroundings}}$<br>(C) $\Delta S_{\text{system}} + \Delta S_{\text{surroundings}} > 0$ | (B) $\Delta S_{\text{surroundings}} > 0$ only<br>(D) $\Delta S_{\text{system}} > 0$ only   | 1 | 2 | 2 |
| 8. Volatile oxidation corrosion product of a metal is<br>(A) $\text{Fe}_2\text{O}_3$<br>(C) $\text{Fe}_3\text{O}_4$   | (B) $\text{MoO}_3$<br>(D) $\text{FeO}$   | 1 | 1 | 2 |
| 9. The rate of nucleophilic substitution reactions is higher in the presence of _____<br>(A) Electron withdrawing groups<br>(C) Both electron withdrawing and releasing groups  | (B) Electron releasing groups<br>(D) Initiator   | 1 | 2 | 3 |

10. The product of Dieckmann condensation reaction is (A) Cyclic alcohol (C) Cyclic ketone	(B) $\beta$ keto esters (D) Cyclo alkane	1	1	3
11. Identify the chiral molecule among the following (A) Isopropyl alcohol (C) 1-bromo-3- butene	(B) 2-pentanol (D) Isobutyl alcohol	1	4	3
12. The IUPAC name for paracetamol is (A) 2-Acetoxybenzoic acid (C) N-(4- hydroxyphenyl) acetamide	(B) Monohydroxybenzene (D) Phenyl Salicylate	1	2	3
13. The type of linkage present in poly urethane is (A) Amide linkage (C) Ester linkage	(B) Glycosidic linkage (D) Phospho diester linkage	1	2	3
14. Which of the following is an initiator molecule in the free radical polymerisation? (A) Sulphuric acid (C) Potassium permanganate	(B) Benzoyl peroxide (D) Chromium oxide	1	1	4
15. Which of the following are thermoplastic? (A) Bakelite (C) Polystyrene	(B) Vulcanised rubber (D) Teflon	1	1	4
16. Markovnikov's law is applied in (A) Addition of propylene with $\text{Cl}_2$ (C) Addition of ethylene with $\text{Br}_2$	(B) Addition of propylene with $\text{HBr}$ (D) Addition of ethylene with $\text{H}_2$	1	1	4
17. The continuous phase of a composite material is known as _____ (A) Dispersed phase (C) Matrix phase	(B) Surrounding phase (D) Fiber phase	1	1	5
18. Which of the following does not combine with fibre to give composites? (A) Metals (C) Non-metals	(B) Ceramics (D) Polymers	1	1	5
19. Obtain a Miller indices of a plane whose intercepts are 4,4 and 2 units along the three axes. (A) (122) (C) (121)	(B) (211) (D) (112)	1	3	5
20. Kevlar is a type of material (A) Glass (C) Whisker	(B) Thermoplastic (D) Polymer	1	1	5

**PART - B ( $5 \times 8 = 40$  Marks)**

Answer all Questions

21. (a) Calculate CFSE for high spin Td complexes having $d^5$ , $d^6$ , $d^7$ and $d^8$ configurations. (OR) (b) Describe with suitable examples, the structural isomerism in coordination compounds.	8	3	1
22. (a) What is Electro chemical corrosion? Explain the mechanism involved in Hydrogen evolution corrosion with a neat sketch. (OR) (b) Define the terms Internal energy and Enthalpy. Derive the expression relating enthalpy and internal energy	8	2	2



23. (a) Mention the type of isomerism exhibited by the following pairs
- 1) 3- methyl pentane & 2,2- dimethyl butane
  - 2) Propanone & Propanal
  - 3) d-lactic acid & l- lactic acid
  - 4) Dipropyl amine & Butyl ethyl amine

8      3      3

(OR)

- (b) Give the steps to determine R/S configuration on a Fischer Projection or Cahn Ingold Prelog priority rules to determine R/S configuration on a Fischer Projection

24. (a) Discuss in detail about  $S_N^1$  mechanism in detail with an example.

8      2      4

(OR)

- (b) a) Suggest the products when 1, 3 – butadiene reacts with the following and provide suitable equations:

i. Acrylonitrile ii. Styrene (4marks)

b) How are polymers classified based on the method of synthesis and nomenclature? Explain with an example. (4marks)

25. (a) Give the graphical representation of stress-strain relationship of solids and elaborate it in detail.

8      1      5

(OR)

- (b) Discuss the principle and instrumentation of XPS

### PART - C ( $1 \times 15 = 15$ Marks)

Marks BL CO

Answer any 1 Questions

26. a) Arrange the following complexes in their increasing order of the wavelength of light absorbed and explain.

15      3      1

$[\text{Co}(\text{NH}_3)_6]^{3+}$ ,  $[\text{Co}(\text{CN})_6]^{3-}$  and  $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$   
(7 Marks)

b) Derive of Nernst equation for the redox potential of a reversible reaction and write its advantages. (8 marks)

27. a) Explain with a neat diagram about the conformational analysis of n-butane. (10 marks)

15      3      4

b) Give a brief account on 1. Metamerism 2. Enantiomerism in tartaric acid. (5 marks)

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