

B.Tech / M.Tech (Integrated) DEGREE EXAMINATION, JANUARY 2023
First Semester

21CYB101J – CHEMISTRY

(For the candidates admitted from the academic year 2022-2023)

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 = 20Marks)

Answer ALL Questions

- | | Marks | BL | CO | PO |
|---|-------|----|----|----|
| 1. The crystal field splitting energy (Δ_0) is directly proportional to
(A) Geometry (B) Number of d-Electrons
(C) Coordination number (D) Oxidation state | 1 | 2 | 1 | 1 |
| 2. The effective nuclear charge realised by is electron of helium atom is
(A) 1.00 (B) 1.20
(C) 1.70 (D) 1.65 | 1 | 3 | 1 | 1 |
| 3. The complex $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ exhibits
(A) Linkage isomerism (B) Coordination isomerism
(C) Geometrical isomerism (D) Optical isomerism | 1 | 3 | 1 | 1 |
| 4. The spin only magnetic moment value (In bohr magneton units) of $\text{Cr}(\text{CO})_6$ is
(A) 0 (B) 2.84
(C) 4.90 (D) 5.92 | 1 | 3 | 1 | 1 |
| 5. For a reaction that has an equilibrium constant of 3.2×10^{-2} , which of the following statement must be true?
(A) ΔH° is negative (B) ΔG° is positive
(C) ΔG° is negative (D) ΔS° is positive | 1 | 4 | 2 | 1 |
| 6. For an isolated system, $\Delta U = 0$, what will be ΔS ?
(A) $\Delta S > 0$ (B) $\Delta S < 0$
(C) $\Delta S \leq 0$ (D) $\Delta S \geq 0$ | 1 | 2 | 2 | 1 |
| 7. In the pourbaix diagram, the form of iron that will predominate at pH12 and at potential of 1.86 V is
(A) Fe (B) Fe^{2+}
(C) FeO_4^{2-} (D) $\text{Fe}(\text{OH})_3$ | 1 | 3 | 2 | 1 |
| 8. Helmholtz function F is given by
(A) $-U + TS$ (B) $-U - TS$
(C) $U + TS$ (D) $U - TS$ | 1 | 1 | 2 | 1 |

9. The number of structural isomers for C_6H_{14} is
 (A) 6 (B) 5
 (C) 4 (D) 3
10. Reactivity order of alkyl halides in S_N^2 reaction is
 (A) $CH_3 \times 1^\circ > 2^\circ > 3^\circ$ (B) $CH_3 \times > 2^\circ > 3^\circ > 1^\circ$
 (C) $3^\circ > 2^\circ > 1^\circ > CH_3 \times$ (D) $3^\circ > 1^\circ > 2^\circ > CH_3 \times$
11. Among the following hex-2-ene reacts fastest with?
 (A) HCl (B) HF
 (C) HI (D) HBr
12. Which of the following has the lowest priority according to the CIP sequence rules?
 (A) $CH(OH)CH_3$ (B) $CH=CH_2$
 (C) $-CHO$ (D) CH_2CH_3
13. Which of the following is a thermo setting polymer?
 (A) Bakelite (B) Polystyrene
 (C) PVC (D) Polyethylene
14. Which one of the below is used as an insulator and also as a lubricant?
 (A) PVC (B) PTFE
 (C) SBR (D) Poly propylene
15. Hemodialysis tubes are made with
 (A) Silicone rubber (B) Polystyrene
 (C) Polyurethane intermediate (D) Nylon
16. Which of the below polymers show higher crystallinity?
 (A) Isotactic (B) Atactic
 (C) Random (D) Syndiotactic
17. In fibre reinforced composites which constituent will fail last?
 (A) Filler (B) Matrix
 (C) Both fail at same time (D) Need more details on composite
18. After the proportionality limit in the stress-strain curve, we observe
 (A) Lower yield point (B) Upper yield point
 (C) Ultimate point (D) Elastic point
19. Minimum inter planar spacing required for Bragg's diffraction is
 (A) $\lambda/4$ (B) 4λ
 (C) $\lambda/2$ (D) 2λ
20. Determine young's modulus of a material whose elastic stress and strain are 4 N/m^2 and 0.15 respectively
 (A) 26.66 N/m^2 (B) 2.666 N/m^2
 (C) 266.6 N/m^2 (D) 2666 N/m^2

PART – B ($5 \times 8 = 40$ Marks)

Answer ALL Questions

Marks BL CO PO

21. a. Find the number of unpaired electrons in strong and weak octahedral field for a Mn^{2+} complex (d^5) based on CFT. Calculate CFSE and magnetic moment for both the situation with energy level diagrams.

(OR)

- b. Demonstrate with proper examples the isomerism exhibited in transition metal complexes.

22. a. With appropriate examples, elucidate how Nernst equation can be applied in a redox reaction and in an acid-base reaction.

(OR)

- b. Derive Gibbs-Helmholtz equation and given its applications.

23. a. Compare and contrast S_N^1 and S_N^2 reactions with an example for each.

(OR)

- b. Sketch the potential energy diagram and explain in detail the conformational analysis of n-butane.

24. a. Provide a concise note on the synthesis and applications of Teflon and PVC.

(OR)

- b. Explain in detail n and p-doping in conducting polymers.

25. a. Illustrate with a proper stress-strain plot for the following
 (i) Elastic region
 (ii) Plastic region

(OR)

- b. Explain with an example ceramic matrix composite and metal matrix composite.

PART – C ($1 \times 15 = 15$ Marks)

Answer ANY ONE Questions

Marks BL CO PO

26. With an neat sketch discuss pourbaix diagram for iron.

- 27.i. Explain E2 mechanism with suitable example.

- ii. Discuss about the principle and instrumentation of X-ray photo electron spectroscopy.
