Reg. No.	R	A	2	2	1	1	0	2	6	0	3	0	0	0	6

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

	Marks	BL	CO	PO

PART – A (20 × 1 = 20Marks)
Answer **ALL** Questions

1. The crystal field splitting energy (Δ_0) is directly proportional to — 1 | 2 | 1 | 1
   (A) Geometry (B) Number of d-Electrons
   (C) Coordination number (D) Oxidation state

2. The effective nuclear charge realised by is electron of helium atom is — 1 | 3 | 1 | 1
   (A) 1.00 (B) 1.20
   (C) 1.70 (D) 1.65

3. The complex [Pt $(NH_3)_2Cl_2$] exhibits — 1 | 3 | 1 | 1
   (A) Linkage isomerism (B) Coordination isomerism
   (C) Geometrical isomerism (D) Optical isomerism

4. The spin only magnetic moment value (In bohr magneton units) of $Cr(CO)_6$ is — 1 | 3 | 1 | 1
   (A) 0 (B) 2.84
   (C) 4.90 (D) 5.92

5. For a reaction that has an equilibrium constant of 3.2×10^{-2}, which of the following statement must be true? — 1 | 4 | 2 | 1
   (A) $\Delta H°$ is negative (B) $\Delta G°$ is positive
   (C) $\Delta G°$ is negative (D) $\Delta S°$ is positive

6. For an isolated system, $\Delta U = 0$, what will be ΔS? — 1 | 2 | 2 | 1
   (A) $\Delta S > 0$ (B) $\Delta S < 0$
   (C) $\Delta S \leq 0$ (D) $\Delta S \geq 0$

7. In the pourbaix diagram, the form of iron that will predominate at pH12 and at potential of 1.86 V is — 1 | 3 | 2 | 1
   (A) Fe (B) Fe^{2+}
   (C) FeO_4^{2-} (D) $Fe(OH)_3$

8. Helmholtz function F is given by — 1 | 1 | 2 | 1
   (A) –U + TS (B) –U – TS
   (C) U + TS (D) U – TS

9. The number of structural isomers for C_6H_{14} is 1 2 3
(A) 6 (B) 5
(C) 4 (D) 3

10. Reactivity order of alkyl halides in S_N^2 reaction is 1 2 3 2
(A) $CH_3 \times 1° > 2° > 3°$ (B) $CH_3 \times > 2° > 3° > 1°$
(C) $3° > 2° > 1° > CH_3 \times$ (D) $3° > 1° > 2° > CH_3 \times$

11. Among the following hex-2-ene reacts fastest with? 1 3 3 2
(A) HCl (B) HF
(C) HI (D) HBr

12. Which of the following has the lowest priority according to the CIP sequence rules? 1 3 3 2
(A) $CH(OH)\,CH_3$ (B) $CH = CH_2$
(C) –CHO (D) $CH_2\,CH_3$

13. Which of the following is a thermo setting polymer? 1 1 4 1
(A) Bakelite (B) Polystyrene
(C) PVC (D) Polyethene

14. Which one of the below is used as an insulator and also as a lubricant? 1 2 4 1
(A) PVC (B) PTFE
(C) SBR (D) Poly propylene

15. Hemodialysis tubes are made with 1 1 4 1
(A) Silicone rubber (B) Polystyrene
(C) Polyurethane intermediate (D) Nylon

16. Which of the below polymers show higher crystallinity? 1 2 4 1
(A) Isotactic (B) Atactic
(C) Random (D) Syndiotactic

17. In fibre reinforced composites which constituent will fail last? 1 2 5 1
(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 1 3 5 1
(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 1 2 5 1
(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 1 3 5 1
(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 × 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.	8	4	1	1
	(OR)				
b.	Demonstrate with proper examples the isomerism exhibited in transition metal complexes.	8	3	1	1
22. a.	With appropriate examples, elucidate how Nernst equation can be applied in a redox reaction and in an acid-base reaction.	8	2	2	1
	(OR)				
b.	Derive Gibbs-Helmholtz equation and given its applications.	8	1	2	1
23. a.	Compare and contrast S_N1 and S_N2 reactions with an example for each.	8	2	3	2
	(OR)				
b.	Sketch the potential energy diagram and explain in detail the conformational analysis of n-butane.	8	1	3	2
24. a.	Provide a conscise note on the synthesis and applications of Teflon and PVC.	8	2	4	1
	(OR)				
b.	Explain in detail n and p-doping in conducting polymers.	8	2	4	1
25. a.	Illustrate with a proper stress-strain plot for the following (i) Elastic region (ii) Plastic region	8	3	5	1
	(OR)				
b.	Explain with an example ceramic matrix composite and metal matrix composite.	8	2	5	1

PART – C (1 × 15 = 15 Marks)

Answer **ANY ONE** Questions

		Marks	BL	CO	PO
26.	With an neat sketch discuss pourbaix diagram for iron.	15	3	2	1
27.i.	Explain E2 mechanism with suitable example.	5	2	3	2
ii.	Discuss about the principle and instrumentation of X-ray photo electron spectroscopy.	10	3	5	1

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