M. Sc. DEGREE EXAMINATION, APRIL 2024
BRANCH IV- CHEMISTRY
SECOND SEMESTER

COURSE   :   MAJOR CORE
PAPER   :   CORDINATION CHEMISTRY
SUBJECT CODE :   23CH/PC/CO24
TIME   :   3 HOURS   MAX. MARKS: 100

Q. No.	SECTION A (10 x 1 = 10 marks) Answer ALL Questions	CO	KL
1	The magnitude of Δ_o value depends on (a) Nature of the ligand (b) Charge of the metal ion (c) Principal quantum number of the d electron (d) All the above	1	1
2	The purple colour of $[Ti(H_2O)_6]^{3+}$ is due to the following transition (a) $t_{2g}^0 e_g^1 \rightarrow t_{2g}^1 e_g^0$ (b) $t_{2g}^3 e_g^0 \rightarrow t_{2g}^2 e_g^1$ (c) $t_{2g}^1 e_g^0 \rightarrow t_{2g}^0 e_g^1$ (d) $t_{2g}^3 e_g^1 \rightarrow t_{2g}^2 e_g^2$	1	1
3	The lowest energy term for the d^5 ion is (a) ^2D (b) ^5D (c) ^3F (d) ^6S	1	1
4	The g value for a free electron is (a) 2.0023 (b) 2.1023 (c) 2.2023 (d) 2.3023	1	1
5	When the unpaired electrons are aligned in antiparallel fashion with unequal numbers in the two orientations and net magnetic moment, the resulting material is said to be (a) Antiferromagnetic (b) Ferromagnetic (c) Ferrimagnetic (d) Paramagnetic	1	1
6	The magnetic moment of a substance containing n unpaired electrons is approximately equal to (a) $\sqrt{n(n+1)}$ (b) $\sqrt{n(n+2)}$ (c) $\sqrt{n(n+3)}$ (d) $\sqrt{n(n+4)}$	1	1
7	Nucleophilicity is a (a) Hypothetical term (b) Inert term (c) Kinetic term (d) Thermodynamic term	1	1

8	Hydrolysis reactions are the reverse of (a) Anation reactions (b) Solvolysis reactions (c) Aquation reactions (d) Cross reactions	1	1
9	Which one of the following is an electron transport protein (a) Cytochrome (b) Ferritin (c) Myoglobin (d) Ceruloplasmin	1	1
10	Which one of the following will function as metallobiomolecule having copper as metal center (a) Plastocyanin (b) Transferrin (c) Hemerythrin (d) Siderophores	1	1

Q. No.	SECTION – B (10 x 1 = 10 marks) Answer ALL Questions	CO	KL
11	The ———— considerations involved in the crystal field theory are identical to those in the molecular orbital approach.	2	2
12	The CFSE for a high spin octahedral complex of d^5 configuration is ————.	2	2
13	In centrosymmetric molecules, the d orbitals have ——— symmetry.	2	2
14	Orgel diagrams are concerned with the ———— field complexes.	2	2
15	The ratio of the density of magnetic force lines in the presence of sample to the same density with no sample is called as ————.	2	2
16	The measure of lines of force passing through a unit area of material is called as ————.	2	2
17	Trans influence is a ———— phenomenon.	2	2
18	The mechanism of intramolecular cis-trans photoisomerization not involving bond rupture are usually called as ————mechanism.	2	2
19	———— is the prosthetic group present in hemoglobin.	2	2
20	The Fe-transport proteins are collectively known as ————.	2	2

Q. No.	SECTION C (4 x 6 = 24 marks) ANSWER ANY FOUR QUESTIONS	CO	KL
21	Illustrate in detail the determination of stability constant of a complex using spectrophotometric method.	3	3
22	Interpret the Orgel diagram for Co^{2+} ion in tetrahedral and octahedral fields.	3	3
23	Write short notes on magnetic moments of tripositive lanthanide ions.	3	3
24	Photo substitution reactions are also possible through CT transition. Demonstrate.	3	3
25	Interpret the structure and biological function of vitamin B_{12}.	3	3

Q. No.	SECTION – D (4 x 8 = 32 marks) ANSWER ANY FOUR QUESTIONS	CO	KL
26	Analyse Jahn-Teller distortion in an octahedral copper(II) complexes.	4	4
27	Examine the ESR spectrum of bis(salicylaldimine)copper(II) complex. Analyse why this complex shows 11 ESR peaks instead of theoretically expected 15 peaks.	4	4
28	Examine the spin-orbit coupling and the term symbol that results from these considerations.	4	4
29	Analyse the mechanism of acid hydrolysis of cobalt(III) complexes with evidences.	4	4
30	Explain the role of iron-sulphur proteins in electron transfer processes.	4	4

Q. No.	SECTION – E (2 x 12 = 24 marks) ANSWER THE FOLLOWING	CO	KL
31 a 31 b	With suitable examples, explain how crystal field factors are used to account for observed site preferences in spinels and stabilization of oxidation states. (or) Appraise the use of Tanabe-Sugano diagram in interpreting the spectra of octahedral Ni(II) complex.	5	5
32 a 32 b	(i) Explain the outer sphere electron transfer reaction between $[Co(NH_3)_5OH_2]^{3+}$ and $[Fe(CN)_6]^{4-}$. (8) (ii) Explain the Marcus theory of electron transfer reaction. (4) (or) Interpret the functioning of hemoglobin and myoglobin in oxygen transport, highlighting the Perutz mechanism.	5	5

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