25 sep CT chemistry

Chemistry (SRM Institute of Science and Technology)

SRM

DEPARTMENT OF CHEMISTRY
College of Engineering and Technology
SRM Institute of Science and Technology
Kattankulathur – 603203

Set-1

INTERNAL ASSESSMENT – I (FJ1)

Program: B.Tech
Course Code & Title: 21CYB101J & Chemistry
Year & Sem: I Year & I Sem

Date: 25-09-2024
Duration: 8.00-8.50am
Max. Marks: 25 marks

Course Articulation Matrix

At the end of this course, learners will be able to:	POs				
Course Outcomes (CO)	1	2	3	4	5
CO1 Rationalize bulk properties using periodic properties of elements, evaluate water quality parameters like hardness and alkalinity	3		3	2	
CO2 Utilize the concepts of thermodynamics in understanding thermodynamically driven chemical reactions, determine acidic strength and redox potentials of aqueous solution	3	3	3		
CO3 Perceive the importance of stereochemistry in synthesizing organic molecules applied in pharmaceutical industries, determine acidic strength and conductance of aqueous solution		3	3	2	
CO4 Utilize the concepts of polymer processing for various technological applications, determine average molecular weight of the polymer	3		3	3	
CO5 Analyze the importance of advanced processing techniques towards engineering applications and measure the acidic strength of aqueous solution	3		3		3

Part – A (5 x 1 = 5 Marks)

Answer ALL The Questions

1 When the valence d orbitals of the central metal ion in octahedral complex are split in energy levels in CFT, which orbitals are raised to higher energy?

(a) d_{xy} and $d_{x^2-y^2}$ (b) d_{xy}, d_{xz} and d_{yz} (c) d_{xz} and d_{yz} (d) $d_{x^2-y^2}$ and d_{z^2}

2 The crystal field splitting energy (Δo) is inversely proportional to

(a) geometry (b) number of d-electrons (c) coordination number (d) oxidation state

3 Which of the following complex is most stable?

(a) $[AlBr_6]^{3-}$ (b) $[AlI_6]^{3-}$ (c) $[AlF_6]^{3-}$ (d) $[AlCl_6]^{3-}$

4 How many geometrical isomers are possible for $[Co(NH_3)_3(NO_2)_3]$ complex?

(a) 2 (b) 3 (c) 4 (d) 0

5 The number of unidentate ligands in the complex ion is called _____

(a) EAN (b) Coordination number (c) Primary valency (d) Oxidation number

Part – B (2 x 10 = 20 Marks)

6. a. i. Calculate the CFSE of d^4 and d^7 in high spin tetrahedral complexes in terms of Δo (6 Marks)

ii. Write short note on linkage and hydrate isomerism in coordination compounds. (4 Marks)

(OR)

b. i. Calculate the energy of the $[Ti(H_2O)_6]^{3+}$ complex with a wave number of 20,000 cm^{-1}. (5 Marks)

ii. Which among the following complexes have large crystal field splitting in each pair with appropriate justification? (5 Marks)

(1) $[Co(H_2O)_6]^{2+}$ and $[Co(H_2O)_6]^{3+}$ (2) $[Co(CN)_6]^{3+}$ and $[Co(NH_3)_6]^{3+}$

7 a. Give the steps for Slater's rule and using it, calculate Z_{eff} for an electron residing in 2p level of F^- ion (Z for Fluorine atom is 9). (10 Marks)

(OR)

b. i. What are the characteristics of hard acids? Give few examples. (5 Marks)

ii. Calculate the magnetic moment of high spin complexes of Fe^{2+} and Co^{3+} [Z for Fe and Co are 26 & 27 respectively]. (5 Marks)

Q.No	BL	CO	PO
1	2	1	4
2	1		1
3	3		3
4	3		3
5	1		1

Q.No	BL	CO	PO
6 a.	3	1	4
	1		1
6b.	3		4
	4		3
7a.	3		3
7b.	2		1
	3		3

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Set-2

INTERNAL ASSESSMENT – I (FJ1)

Program: B.Tech
Course Code & Title: 21CYB101J & Chemistry
Year &Sem: 1 Year &I Sem

Date: 25-09-2024
Duration: 8.00-8.50am
Max. Marks: 25 marks

Course Articulation Matrix

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CO1 Rationalize bulk properties using periodic properties of elements, evaluate water quality parameters like hardness and alkalinity	3		3	2	
CO2 Utilize the concepts of thermodynamics in understanding thermodynamically driven chemical reactions, determine acidic strength and redox potentials of aqueous solution	3	3	3		
CO3 Perceive the importance of stereochemistry in synthesizing organic molecules applied in pharmaceutical industries, determine acidic strength and conductance of aqueous solution		3	3	2	
CO4 Utilize the concepts of polymer processing for various technological applications, determine average molecular weight of the polymer	3		3	3	
CO5 Analyze the importance of advanced processing techniques towards engineering applications and measure the acidic strength of aqueous solution	3		3		3

Part – A (5 x 1 = 5 Marks)

Answer ALL The Questions

1 Among the following base, which one is soft?
(a) NH_3 (b) I^- (c) H_2O (d) OH^-

2 An aqueous solution of Ni^{2+} contains $[Ni(H_2O)_6]^{2+}$ and its magnetic moment is 2.83 BM. When ammonia is added in it the magnetic moment of solution_____

(a) will remain the same
(b) will increase from 2.83 BM
(c) will decrease from 2.83 BM
(d) cannot be predicted theoretically.

3 How many geometrical isomers are possible in $[Al(C_2O_4)_3]^{3-}$?
(a) 0 (b) 2 (c) 3 (d) 4

4 $[Fe(H_2O)_6]^{2+}$ and $[Fe(CN)_6]^{4-}$ differ in:

(a) Geometry and magnetic moment (b) Geometry and hybridization

(c) Magnetic moment and color (d) Hybridization and number of d electrons

5 The electronic configuration of metal atom/ionic octahedral complex with d^4 configuration, if $\Delta_o <$ pairing energy is:

(a) $t_{2g}^4 e_g^0$ (b) $e_g^4 t_{2g}^0$ (c) $t_{2g}^3 e_g^1$ (d) $e_g^2 t_{2g}^2$

Part – B (2 x 10 = 20 Marks)

6. a. i. What are different types of isomerism in coordination compounds? Describe geometrical and optical isomerism with suitable examples.

(10 Marks)

(OR)

b. i. Explain, why the transition metal coordination compounds with strong field ligands are yellow, orange or red in color, whereas with weak field ligands they are often blue-green, blue or indigo in color. (5 Marks)

ii. Draw structures for linkage isomers of $[Co(NH_3)_5NO_2]Cl_2$ and optical isomers of $[CoCl_2(en)_2]^+$ (5 Marks)

7 a. What are the features of crystal field splitting theory? Calculate CFSE values in terms of Δ_o for high spin and low spin octahedral complexes having d^5 and d^7 configuration. (10 Marks)

(OR)

b. i. Explain the factors affecting crystal field splitting with suitable examples. (6 Marks)

ii. With examples, define hard base and soft base. (4 Marks)

Q.No	BL	CO	PO
1	1	1	1
2	3		3
3	2		4
4	3		3
5	2		4

Q.No	BL	CO	PO
6 a.	1	1	1
6b.	3		3
	2		4
7a.	3		3
7b.	2		4
	1		1