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B.Sc. RNLKWC(A)-/CC9T/22

2022

CHEMISTRY

[Honours]

B.Sc. Fourth Semester End Examination - 2022

PAPER - CC9T

Full Marks : 40

Time : 4 hours

*The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own
words as far as practicable.*

Illustrate the answers wherever necessary.

Group - A

1. Answer any five questions :- 5×2=10
- (i) The experimental hydration energy for Co^{2+} ion is -540 KJ/mol and $\Delta_0 = 12000 \text{ cm}^{-1}$. Calculate hydration energy without CFSE.
- (ii) What is 'Laporte selection rule'?
- (iii) What is the reason behind the color of CrO_3 molecule?

(Turn Over)

(2)

- (iv) MnO_4^- absorbs at 12000 cm^{-1} and 23000 cm^{-1} and show two peaks in its electronic spectrum. Calculate Δt .
- (v) Lanthanoids does not form oxocation but actinods do – why?
- (vi) What is the reason behind the color of Chromophores?
- (vii) What is ground state term symbol of Sm^{3+} ion.
- (viii) Draw the orgal diagram of $d^6(\text{H.S.})$ octahedral complex.

Group-B

Answer any four questions :

4×5=20

2. (i) How f-orbitals split in octahedral crystal field.
- (ii) $(\text{NiCl}_4)^{2-}$ is paramagnetic but $(\text{Ni}(\text{CN})_4)^{2-}$ diamagnetic behaviour – Why?
3. (i) Write schematic representation to separate Np, Pu and Am from Uranium.
- (ii) Why orbitals have poor screening effect than 4f orbitals? 4+1

(3)

4. (i) Arrange the following compounds in order of increasing basicity
 NaOH , $\text{La}(\text{OH})_3$, $\text{Lu}(\text{OH})_3$, $\text{Al}(\text{OH})_3$, $\text{Ca}(\text{OH})_2$
- (ii) ' NiFO_2O_4 forms inverted Spinel' – justify and criticize. $2\frac{1}{2}+2\frac{1}{2}$
5. (i) Write the VBT of $(\text{Cu}(\text{NH}_3)_4)^{2+}$ ion.
- (ii) $(\text{Cu}(\text{NH}_3)_6)^{2+}$ can easily converted to $(\text{Cu}(\text{NH}_3)_4)^{2+}$ –Why? 3+2
6. (i) $(\text{Cu}(\text{en})_3)^{2+}$ unstable but $(\text{Co}(\text{en})_3)^{2+}$ stable – Why?
- (ii) $(\text{CoF}_6)^{4-}$ give only one peak in UV-VIS region and two peaks in IR region – explain. 2+3
7. (i) Copper(II) acetate monohydrate shows subnormal magnetic moment at room temperature – explain.
- (ii) Write factors on which splitting energy depends on. $2\frac{1}{2}+2\frac{1}{2}$

(4)

Group - C

Answer any one questions :

1×10=10

8. (i) Calculate the value of β and Δ for the Cr^{3+} ion in $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ if $\gamma_1=17000 \text{ cm}^{-1}$, $\gamma_2=24000 \text{ cm}^{-1}$ and $\gamma_3=37000 \text{ cm}^{-1}$.
- (ii) What is 'magnetic susceptibility'? How it depends on temperature?
- (iii) Among the following which one show orbital contribution and why?
 d^3 , $d^4(\text{LS})$, $d^4(\text{HS})$, $d^5(\text{HS})$
- (iv) What is 'Nephelauxetic effect'?
9. (i) What is 'antiferromagnetic coupling'?
- (ii) The electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{2+}$ shows two peak in which one is sharp and the other in broad, while for $[\text{V}(\text{H}_2\text{O})_6]^{2+}$, three separate peaks are observed. Explain.
- (iii) Explain why n-acid ligands occupy extreme right position in the spectromhemical series. 2+6+2