BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSc. **SEMESTER: VIII**
BRANCH: CHEMISTRY **SESSION: SP/19**

SUBJECT: SAC2011- ADVANCED INORGANIC CHEMISTRY

TIME: 3 Hours **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a)	A 3d transition metal ion posses the following value of spin-orbit coupling constant ζ= 515 cm^{-1} and λ for strong octahedral and tetrahedral field are -172 cm^{-1} and -515 cm^{-1}. Predict the transition metal ion.	[2]
Q.1(b)	Explain why Sm(III) and Eu(III) have anomalous magnetic moment in comparison to the other lanthanide ions.	[4]
Q.1(c)	Derive the expression of molar magnetic susceptibility for a multi electron system where multiplet width is greater than thermal energy.	[6]
Q.2(a)	Ni(II) in both tetrahedral and octahedral environment have $\mu_{eff} > \mu_{so}$ - Explain.	[2]
Q.2(b)	Magnetic moment of $[(NH_3)_5CrOCr(NH_3)_5]Br_4$ is less than $[(NH_3)_5CrOHCr(NH_3)_5]Br_5$ -Explain.	[4]
Q.2(c)	With example discuss Spin Admixture in magnetochemistry.	[6]
Q.3(a)	What is secular equillibrium in radioactivity?	[2]
Q.3(b)	Write short note on Fission.	[4]
Q.3(c)	Derive the expression for the number of daughter nuclei for a radioactive decay equillibrium.	[6]
Q.4(a)	What is grain boundary?	[2]
Q.4(b)	Discuss volume defects in solid.	[4]
Q.4(c)	Derive the expression for calculation of defect concentration at any given temperature when the energy required for their formation is known.	[6]
Q.5(a)	What is Seeback effect?	[2]
Q.5(b)	Define extrinsic, intrinsic, n-type and p-typr semiconductors.	[4]
Q.5(c)	Draw the band bending diagram at metal-semiconductor (n-type) interface for the case of $\phi_M > \phi_S$ and discuss the phenomena.	[6]
Q.6(a)	Define enantiotrophs and monotrophs.	[2]
Q.6(b)	Name the different polymorphs of SiO_2 and draw the temperature Vs pressure diagram showing the polymorph	[4]
Q.6(c)	What is order-disorder transformations? If the order parameter is J, derive the expression for internal energy U.	[6]
Q.7(a)	What do you mean by single crystal?	[2]
Q.7(b)	Explain vacuum evaporation technique.	[4]
Q.7(c)	Discuss Bridgman and Stockbarger methods with temperature profile.	[6]

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