

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

CLASS: IMSC
BRANCH: CHEMISTRY

SEMESTER : V
SESSION : MO/18

SUBJECT: IMC5007-INORGANIC CHEMISTRY - I

TIME: 3 HOUR

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.
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- Q.1(a) Calculate the number of microstates for the following electronic configurations: d^2, p^3 [2]
Q.1(b) Prove that de Broglie Matter wave is not applicable to macroscopic world. [4]
Q.1(c) Discuss the Quantum Restrictions for the allowed elliptical orbits in Sommerfield's atomic model. [6]
- Q.2(a) Find the ground state Term Symbol for the following electronic configurations: d^3, d^5 [2]
Q.2(b) Explain the term space quantization. [4]
Q.2(c) Prove Heisenberg Uncertainty Principle from Compton Effect. [6]
- Q.3(a) Define Formal Potential. [2]
Q.3(b) Mn^{+2} becomes more reducing at higher pH - Explain [4]
Q.3(c) Construct a Latimer diagram of Manganese. [6]
- Q.4(a) Write the Nernst Equation for the VO_2^+ / VO^{+2} half reaction in acidic medium. [2]
Q.4(b) Explain the trend for the ease of oxidation: $FeS > Ag_2S > HgS$ (K_{sp} : $HgS=10^{-53}$, $Ag_2S=10^{-49}$, $FeS=10^{-22}$) [4]
Q.4(c) Calculate E^0 for the system: ClO_4^- / Cl^- from the following data given below [6]
- | Couple | E^0 (Volt) |
|---------------------|--------------|
| ClO_4^- / ClO_3^- | 1.23 |
| $ClO_3^- / HClO_2$ | 1.21 |
| $HClO_2 / HOCl$ | 1.65 |
| $HOCl / Cl_2$ | 1.63 |
| Cl_2 / Cl^- | 1.36 |
- Q.5(a) Name any two ores of iron? [2]
Q.5(b) Explain Lanthanide Contraction giving its significance? [4]
Q.5(c) What is d-d transition? How does it effect the color of complexes? Explain giving suitable example. [6]
- Q.6(a) Why is Titanium called a wonder metal? [2]
Q.6(b) Explain structure and bonding in Ferrocene. [4]
Q.6(c) Write the 1st and 2nd transition series giving name of elements, their electronic configuration and trends in atomic/ ionic radii. [6]
- Q.7(a) What are Protic and aprotic solvents? [2]
Q.7(b) What is self ionization? Explain with the help of suitable example. [4]
Q.7(c) What are general properties of ionizing solvents? [6]

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