

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

CLASS: BTECH/IMSC  
BRANCH: ALL/PT

SEMESTER: II  
SESSION : SP/2019

SUBJECT : CH101 CHEMISTRY

TIME: 2.00 HOURS

FULL MARKS: 25

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
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. No Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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- Q1 (a) Discuss the metallic bond from band theory and comments on its conducting properties. [2]  
(b) Construct the Born-Haber cycle for  $MX_2$  (where M is metal and X is halogen). From the cycle calculate the lattice energy for  $MX_2$  (Given, sublimation energy of M = 296 KJ/mol; 1<sup>st</sup> ionization energy of M = 378 KJ/mol; 2<sup>nd</sup> ionization energy of M = 555 KJ/mol; bond dissociation enthalpy of  $X_2$  = 310 KJ/mol; electron affinity of X = -427 KJ/mol and heat of formation of  $MX_2$  = -421 KJ/mol). [3]
- Q2 (a) Draw the possible geometrical isomer of  $[Co(NH_2CH_2CH_2NH_2)_2Cl_2]$  ion. Comment on the optical activity of those isomers. [2]  
(b) Explain the crystal field splitting of d-orbital in octahedral and tetrahedral complex. [3]
- Q3 (a) Draw the molecular orbital diagram of the  $N_2$  and explain the stability order of  $N_2^-$ ,  $N_2$ ,  $N_2^+$ . [2]  
(b) Explain the aromatic properties of benzene from molecular orbital theory and define the resonance energy. [3]
- Q4 (a) What is enantiomer? Give example. [2]  
(b) Draw the energy profile diagram for conformational isomer of ethane to explain the fact that the isomers do not exist at room temperature. [3]
- Q5 (a) Show that the half-life of the first order reaction does not depend on the initial concentration of the substrate. [2]  
(b) Derive the rate equation for chain reaction of  $Br_2$  and  $H_2$  in presence of intense light. [3]

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