

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

CLASS: BETCH/IMSC
BRANCH: BT/CEP&P/CHEM.ENGG/CIVIL/FT/MECH/PROD

SEMESTER : II
SESSION : SP/19

SUBJECT: CH101 CHEMISTRY

TIME: 3 Hours

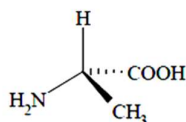
FULL MARKS: 50

INSTRUCTIONS:

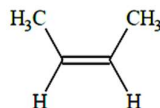
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) Derive Born-Landé equation and write down the significance of Madelung constant. [5]
Q.1(b) Define ambidentate ligand with example. On the basis of Valence Bond theory explain that $[\text{Ni}(\text{CN})_4]^{2-}$ ion with square planar structure is diamagnetic and $[\text{NiCl}_4]^{2-}$ with tetrahedral geometry is paramagnetic (Given atomic number of Ni is 28). [5]

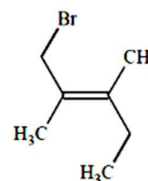
- Q.2(a) Convert the following compound A to Fischer projection and prove that the rotation of the Fischer projection by 90° on the plane changes the configuration to enantiomer. Give the E/Z nomenclature for compounds B and C. [5]



A

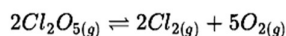


B



C

- Q.2(b) Predict the geometry of ClF_2^- from hybridization and VSEPR theory. Explain the molecular orbital diagram of CO and comment on its bonding. [5]
- Q.3(a) Order and molecularity of a chemical reaction is not being always same-Explain. Derive the rate equation for second order reaction and define the unit of rate constant from the equation. [5]
Q.3(b) Explain the effect of catalyst on equilibrium and pathway of the chemical reaction with diagram. Explain the mechanism and kinetics of acid catalyzed reaction without involvement of water solvent. [5]
- Q.4(a) Show the possible vibration modes of CO_2 molecule. Explain the active mode of vibration for CO_2 in Raman and IR spectra. Justify the statement that auxochromes are chromophores but not vice versa. [5]
Q.4(b) How does the hydrogen bonding affect the FTIR peaks of benzoic acid? Calculate the multiplicity with respective ratios of each ^1H NMR signals for $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$. [5]
- Q.5(a) Draw and explain the arbitrary cooling curve of 50%Pb-50%Ag and 97.4%Pb-2.6%Ag mixture. Calculate the K_p for the following equilibrium at 3 atm. pressure in closed vessel of the following gases with respective mole fraction; $\text{Cl}_2=0.243$, $\text{O}_2=0.274$ and $\text{Cl}_2\text{O}_5=0.483$. From the value comment on the possible direction of the reaction. [5]



- Q.5(b) Briefly discuss about the mechanism of electrochemical corrosion. Write short note on any one type of dry cell. [5]

:::::24/04/2019 M:::::