



## MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : BSCH201 Chemistry-I (Gr-A)

UPID : 002002

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

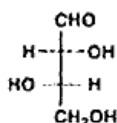
Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (i) What is fingerprint region range in IR spectra?
- (ii) The unit of vander Waal's constant 'a' is \_\_\_\_\_.
- (iii) What is EMF?
- (iv) How does hybridization affect electronegativity?
- (v) Which of the following molecules exhibit optical activity?  
2-methyl propane, 2-methyl butane, 3-methyl pentane, 3-methyl hexane.
- (vi) Write down the time independent 1D Schrödinger's wave equation and mention the terms involved.
- (vii) The reagents for Paracetamol synthesis are \_\_\_\_\_.
- (viii) IR spectra can detects \_\_\_\_\_.
- (ix) Write down the formula of critical volume for Van der Waal's gas.
- (x) Entropy is defined in which law of thermodynamics?
- (xi) Why  $\text{He}_2$  molecule does not exist?
- (xii) What are the correct assignment of chirality at C-2 and C-3 of the following molecule?



## Group-B (Short Answer Type Question)

Answer any three of the following :

[ 5 x 3 = 15 ]

- 2. Explain Vibrational and rotational spectroscopy for diatomic molecules. [5]
- 3. (a) Prove that,  $RT_c/P_cV_c = 8/3$ , where,  $P_c$ ,  $V_c$  and  $T_c$  are critical pressure, critical volume and critical temperature respectively. [5]
- (b) 2 moles of oxygen occupy a volume of 10 litres at 300 K and 9.32 atm. pressure. Calculate the compressibility factor. 1.292
- 4. Show that entropy of mixing of ideal gas  $\Delta S_{\text{mix}} > 0$ . Show that,  $(\partial G/\partial T)_P = -S$ . [5]
- 5. How Electron affinity and Electronegativity changes along with groups and periods in the periodic table? Comment on Electronegativity and Electron affinity of Chlorine and Fluorine. [5]
- 6. Explain role of doping on band structure of solids. [5]

## Group-C (Long Answer Type Question)

Answer any three of the following :

[ 15 x 3 = 45 ]

- 7. (a) Write short note on optical activity. [4]
- (b) What do you mean by chiral carbon? Give example. [3]
- (c) Differentiate enantiomers and diastereomers along with examples. [3]
- (d) Draw all possible stereoisomer(s) of the compound but-2, 3-di-ol with proper stereo-chemical notation (R/S) of the chiral centre. [5]
- 8. (a) Explain with suitable example (a) Wolff-Kishner reduction (b) Cannizzaro reaction [6]
- (b) Halogen are ortho para directing and deactivating: give reason [3]

- (c) Benzoic acid gives benzene on heated with X and phenol gives benzene on heated with Y. Identify X and Y. [ 3 ]
- (d) Write down synthesis of Aspirin along with reaction. [ 3 ]
9. (a) Write vander Waal's equation of a real gas with proper notation. Mention in short the significance of vander Waal's constant 'a' and 'b'. [ 5 ]
- (b) Calculate the Boyle temperature of a gas whose vander Waals constant  $a = 7.18 \text{ L}^2\text{atmM}^{-2}$  and  $b = 0.854 \text{ Mol}^{-1}$  and  $R=0.0821 \text{ LatmMol}^{-1}\text{K}^{-1}$ . [ 3 ]
- (c) Discuss the critical phenomenon of real gas. [ 3 ]
- (d) How does the boiling point of the molecules affected by vander Waals dispersion forces? Explain with examples. [ 4 ]
10. (a) Define EMF. How is it related to entropy and free energy? What is the physical significance of free energy change? [ 5 ]
- (b) Derive Nerst equation and mention its application. [ 5 ]
- (c) What is corrosion? What are the different types of corrosion? [ 5 ]
11. (a) What kind of molecules shows IR spectra? "IR spectra are often characterized as molecular finger prints". Justify statement. [ 5 ]
- (b) Intensity of spectral line depends on which factor? What is Lambert – Beer Law? [ 5 ]
- (c) What do you mean by shielding and deshielding effects involved in NMR spectroscopy? [ 3 ]
- (d) Name of any four surface characterization technique. [ 2 ]

\*\*\* END OF PAPER \*\*\*

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