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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) Which type of isomerism is observed in CH_3CH_2OH and CH_3OCH_3?

(II) A nucleophile must possess _____.

(III) Which type of semiconductor is formed when Germenium is doped with Aluminium?

(IV) In UV spectroscopy, shift of λ_{max} towards shorter wavelength is called _____.

(V) Write the expression of critical pressure.

(VI) Give example of a reference electrode.

(VII) Write two types of luminescence.

(VIII) When do real gases behave as ideal gases?

(IX) Write 3 ions which cause alkalinity of water.

(X) Arrange NaF, NaCl, NaBr, NaI in order of increasing melting point.

(XI) Write the criteria for a compound to be aromatic.

(XII) How many NMR signal is obtained for isopropanol [$CH_3CH(OH)CH_3$]

Group-B (Short Answer Type Question)

Answer any three of the following : [5 x 3 = 15]

2. Write the differences between p-type semiconductor and n-type semiconductor. [5]
3. Explain about chromophore and auxochrome with examples. Give the range of UV spectra. [5]
4. What is MRI? State its uses. [5]
5. Explain the following two observations - the boiling point of n-pentane is higher than that of neo-pentane, H_2O is liquid while H_2S is gas. [5]
6. Starting from the expression of free energy G = H - TS, derive Gibbs – Helmholtz equation for constant pressure. [5]

Group-C (Long Answer Type Question)

Answer any three of the following : [15 x 3 = 45]

7. (a) Show the splitting of d-orbitals in a tetrahedral field. [5]
   (b) Low spin complexes are not obtained in tetrahedral crystal field – Give reason. [3]
   (c) On the basis of band theory differentiate between conductors, semiconductors and insulators. [4]
   (d) What are anti-aromatic compounds? Give examples. [3]
8. (a) State Lambert-Beers' Law. Show that absorption is linearly proportional to the concentration of the solution. [5]
   (b) Which molecules are IR inactive? Give example. [3]
   (c) What do you mean by Bathochromic shift and Hypsochromic shift in UV spectroscopy? [4]
   (d) Which shift is observed if conjugation is increased? Give reason. [3]
9. (a) Discuss Fluorescence process with diagram. Explain its uses. [6]
   (b) Which electronic transitions are UV active for formaldehyde? Comment on their intensities of absorption. [3]
   (c) Which atoms are nmr inactive and why? [3]
   (d) What is chemical shift of proton? [3]
10. (a) Write van der Waal equation mentioning the terms involved. Show the form of van der Waal equation at high pressure and at at low pressure. [4]

(b) What is Boyle temperature. Show the relation of Boyle temperature with van der Waal's constants. [3]

(c) What is compressibility factor? What is its value for ideal gas? [3]

(d) Can we liquify a gas by increasing pressure alone? why? [3]

(e) What is van der Waal forces? [2]

11. (a) With the help of a diagram, show the different electronic transitions between the molecular orbitals and comment on their energy differences. [5]

(b) How can you differentiate 1,3-pentadiene and 1, 4-pentadiene by UV spectroscopy? [5]

(c) A heteronuclear molecule of reduced mass 1.63×10^{-24} gm absorbs at 2880 cm^{-1}. Calculate the force constant (k) assuming harmonic oscillator model. [5]

*** END OF PAPER ***