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Paper Code : BS-CH101/BSCH101 Chemistry I(Gr B)

UPID : 001034

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) Write name of a molecule which have infrared active vibrations.

(ii) The strength of van der Waals forces depends upon which factor?

(iii) Write one process where entropy decreases.

(iv) What is the shape of XeF_4 molecule?

(v) For n – butane which type of conformation is the least stable?

(vi) In SN1 type reaction which type of solvent is used?

(vii) If uncertainty in position and momentum are equal then what will be the uncertainty in velocity?

(viii) Which is detected by IR spectra?

(ix) Which interaction is the strongest interaction?

(x) What is the internal energy change for a cyclic process?

(xi) Write the increasing order of effective nuclear charge in Na, Al, Mg and Si?

(xii) Give one example of ambidentate ligand.

Group-B (Short Answer Type Question)

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

2. Define Van der Waals forces. Discuss their nature. [5]

3. (a) Explain the term chemical potential. [5]
(b) Derive the relation of EMF of cell with ΔG and ΔH.

4. State the reason for the presence of only one electron in the 4s subshell of chromium? [5]
Which of the following has larger size and why? (i) Mg^{2+} (ii) N^{3-}

5. (a) Distinguish between constitutional isomers and stereo isomers. [5]
(b) What is chirality?
(c) Does presence of two chiral carbon atoms always make the molecule optically active? Explain.

6. 'All adiabatic reversions lead to a fall of temperature.' – Comment or justify. [5]

Group-C (Long Answer Type Question)

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

7. (a) Phenol on treatment with Br_2 in CS_2 at low teamperature gives two isomeric monobromophenols X and Y. But phenol on treatment with bromine water gives a white precipitate Z. Identify the products X, Y and Z with chemical reactions. [6]

(b) What do you mean by enantiomer and diastereomer? Differentiate them with examples. [4]

(c) Explain the difference between a meso – isomer and a recimic mixture. What characteristics do they have in compound? [5]

8. (a) Draw the π– molecular orbital diagram of Benzene. Predict whether the following compounds are aromatic, anti – aromatic or anti – aromatic: (i) Furan (ii) Cyclopentadienyl cation. [5]

(b) Write notes on Synthesis of paracetamol. [5]

(c) Nitration is also in absence of H_2SO_4 yet H_2SO_4 has no effect on benzene under the conditions employed. Show the mechanism of nitration of benzene. [5]

9. (a) Set up the Schrodinger equation for a partical in a one - dimensional box. [5]

(b) Show how the model of particle in a box can be applied to calculate the energy spectra of polyene. [4]

(c) What is zero point energy of a particle in one dimensional box? Why the energy of this particle cannot be zero at zero point energy? If the zero point energy of the particle in one dimensional box [6]

is 2.5 eV, what is the next higher energy value?

10. (a) What is the difference between ionization energy and election affinity? The first ionization energy of carbon is greater than that of boron whereas the reverse is true for the second ionization energy. [5]

    (b) Why does Mn (II) is $3d^5$? Would you classify Zn as a transition element? Give reasons for your answer. [5]

    (c) Expain that ionisation energy of neon is more than any other element of the second period? Why do the transition elements from complexes readily? [3]

11. (a) What would have happened to the gas if the molecular collisions were not elastic? [3]

    (b) CO_2 is heavier then O_2 and N_2 gases present inthe air but it does not form the lower layer of the atmosphere. Why? [3]

    (c) Why in case of hydrogen and helium, the compressibility factor is always greater than 1 and increases with increase in pressure? [3]

    (d) Why gases can be liquefied by cooling? [3]

    (e) Which type of liquids will have higher boiling points? 'Polar or Non – polar liquids" – Give reason for your answer [3]

*** END OF PAPER ***