

2020

BIOCHEMISTRY — HONOURS

Paper : CC-2

Full Marks : 50

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

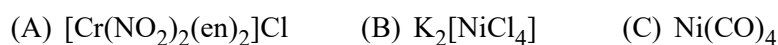
1. Answer **any five** questions : 2×5
- Calculate ground state term symbol for Mn^{2+} ion.
 - What do you mean by solvation energy? How can we predict whether an ionic crystal will be soluble in a particular solvent?
 - Calculate formal charge on each atom of NO_3^- ion.
 - What is ionic potential? How does it affect polarising power?
 - What is the unit of radioactive decay constant? How is it related to the half-life of the element?
 - Write down Saytzeff and Hofmann product of the E2-reaction of $\text{CH}_3 - \underset{\text{Br}}{\text{CH}} - \text{CH}_2\text{CH}_3$.
 - Give an example of neighbouring group participation.
 - Draw gauche and anti-form of $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$.
 - Indicate the suitable solvents for $\text{S}_{\text{N}}2$ reaction with reason : DMSO, Acetone, H_2O , EtOH.
 - Which compound is the most reactive for nucleophilic addition and why : HCHO, CH_3CHO , PhCHO, CH_3COCH_3 ?
2. Answer **any two** questions :
- How does lattice energy of an ionic solid depend on charge of the constituent ions and their size?
 - How many radial and angular nodes are there for a s-orbital of n th principal level? 3+2
 - On the basis of Pauli's exclusion principle work out the maximum number of electrons that might be accommodated in a set of orbitals designated by orbital angular quantum number, l .
 - State major limitations of VSEPR theory with necessary illustrations. 2+3
 - Draw all stereoisomers of Tartaric acid. Explain their optical activity. 3+2
 - Describe the chirotopicity and stereogenicity of C_3 -atom of all stereoisomers of 2, 3, 4-trihydroxy glutaric acid. 5

Please Turn Over

3. Answer **any three** questions :

- (a) (i) The radioactive isotope Indium-111 is often used for diagnosis and imaging in nuclear medicine. Its half-life is 2.8 days. What was the initial mass of the isotope before decay, if the mass in 2 weeks was 5g?
- (ii) What do you mean by mass defect and nuclear binding energy?
- (iii) Lead is common in radioactive mines.— Explain.
- (iv) What is average life for radioactive elements? Work out its relation with radioactive disintegration constant. 3+2+2+3

- (b) (i) Give the IUPAC name of the following compounds :

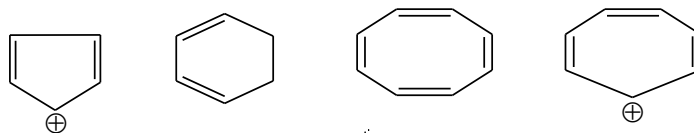


- (ii) Determine the configuration of *cis*- and *trans*- isomers by chemical method.
- (iii) Draw the qualitative molecular orbital energy level diagram with proper label of O_2 molecule and hence comment on its bond order and magnetic properties. 3+3+4
- (c) (i) Draw pictorially the formation of σ and π bonds formed by p-orbitals.
- (ii) On the basis of VSEPR theory workout the structure of (**any two**) :



- (iii) State Hund's rule of maximum multiplicity, hence explain why configuration with half filled and completely filled have greater stability.
- (iv) Dipole moment of NH_3 is greater than that of NF_3 though dipole moment of N-H bond is less than that of N-F bond.— Explain. 2+2+4+2
- (d) Draw the structure of the following molecules :
- (i) 2R, 3R – 2, 3-dihydroxybutanoic acid in Fischer Projection formula.
- (ii) Erythro – 2, 3-dichloropentane in Newman Projection formula.
- (iii) Threo – 2, 3-dibromobutanoic acid in sawhorse projection formula.
- (iv) Syn and Anti $\text{PhCH}=\text{NOH}$.
- (v) E and Z $(\text{CH}_3)(\text{Cl})\text{C}=\text{C}(\text{Br})(\text{Et})$. 2+2+2+2+2

- (e) (i) Indicate the following molecule as aromatic, anti-aromatic and non-aromatic.



- (ii) Explain the stability order of the following carbocation :



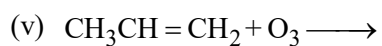
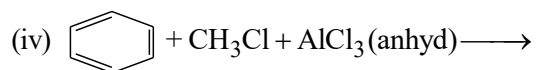
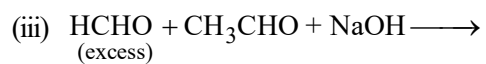
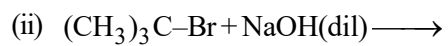
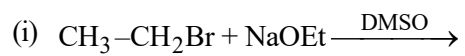
- (iii) Describe the structure of $(\text{CH}_3)_3\overset{-}{\text{C}}$.

4+4+2

(3)

T(1st Sm.)-Biochemistry-H/CC-2/CBCS

(f) Give the mechanism of the following reactions :



2×5
