

(i) Printed Pages : 4

Roll No.

(ii) Questions : 7

Sub. Code :

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Exam. Code :

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Bachelor of Science (FYUP) 2nd Semester

(2056)

CHEMISTRY

Paper : Chemistry (Old)

Time Allowed : 3 Hours] [Maximum Marks : 60

Note :— Attempt **one** question from each section A to C and the first question is compulsory.

1. (a) Why does para-nitrophenol have a higher boiling point than ortho-nitrophenol?
- (b) Why does NaCl turns yellow when heated with Na metal?
- (c) Name the molecular orbital formed by the combination of the following atomic orbitals:
 - (i) $2p_z$ and $2p_z$
 - (ii) $2p_x$ and $2p_y$
- (d) State the First Law of Thermodynamics.
- (e) Define Root Mean Square Velocity.
- (f) State two postulates that are responsible for the deviation of the behavior of real gases from ideal gas behavior.

- (g) Define:
- (i) Orientation
 - (ii) Chirality.
- (h) Why is the melting point of fumaric acid higher than maleic acid? 1.5×8=12

SECTION—A

2. (a) On the basis of Molecular Orbital Theory (MOT), explain the relative stability of N_2 , N_2^+ and N_2^- .
- (b) Difference between bonding and antibonding molecular orbitals.
- (c) Why is H_2O bent but NH_3 is pyramidal in shape?
- (d) Compare the relative stability of CN and CN^- 4×4=16
3. (a) Difference between Schottky and Frenkel defect.
- (b) Define H-bonding and the conditions for forming H-bonding. Explain why ice floats on the surface of water.
- (c) A cation (X^+) has a radius of 0.97 Å and an anion (Y^-) of radius 2.51 Å will likely to crystallize in NaCl form. Justify the statement.
- (d) Why orthonitrophenol is more volatile than paranitrophenol? 4×4=16

SECTION—B

4. (a) Prepare alkane from the following methods:
- (i) Corey-House reaction
 - (ii) Kolbe method.
- (b) Discuss the mechanism of halogenation of methane. Give evidence in favor of it.
- (c) Why does chlorination of propane yield 1-chloropropane and 2-chloropropane in 45% and 55% respectively?
- (d) Define:
- (i) Cracking
 - (ii) Aromatization. 4×4=16
5. (a) Difference between diastereomers and enantiomers.
- (b) Define:
- (i) Racemization
 - (ii) Resolution.
- (c) Give the conditions for a compound to be optically active.
- (d) Difference between internal compensation and external compensation. 4×4=16

SECTION—C

6. (a) Define heat capacity at constant volume and constant pressure. Also, derive the relationship between the two.
- (b) Using the Van der Waals Equation of State and Joule-Thomson coefficient derive $T_i = 2a/Rb$.

- (c) Derive the relationship between pressure-volume in reversible adiabatic process.
- (d) Compare between isothermal and adiabatic expansion. $4 \times 4 = 16$
7. (a) Using the Van der Waals Equation, derive the correlation between critical constants and Van der Waals constants.
- (b) Why do real gases deviate from ideal gas behavior?
- (c) Deduce the principle of corresponding state.
- (d) At what temperature is the most probable velocity of He equal to the root mean square velocity of Ar at 400 K? $4 \times 4 = 16$