BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – B.Sc.(BT)-Hons-2022
Course Name – Chemistry - I
Course Code - BBTC306
(Semester III)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Compound which gives acetone on ozonolysis is
a) C_6H_5-CH=CH_2 b) $(CH_3)_2C=C(CH_3)_2$
c) CH_3-CH=CH-CH_3 d) CH_3-CH=CH_2

(ii) In the H-spectrum the series lies in the ultraviolet region is
a) Lyman series b) Balmer series
c) Paschen series d) Brackett series

(iii) Which of the following is an application of mesomeric effect?
a) dipole moment b) strength of acid and bases
c) bond length d) all of these

(iv) Due to unsymmetrical structure, the molecules having sp^3d hybridization are
a) more stable and more reactive b) less stable and more reactive
c) more stable and less reactive d) less stable and less reactive

(v) According to the Bohr model, when an electron moves from a higher energy level to a lower energy level:
a) It absorbs energy. b) It emits energy.
c) Its energy remains constant. d) Its mass changes.

(vi) Ammonia (NH_3), adopts a tetrahedral geometry. However, the non-bonding pair on the central nitrogen atom distorts the bond angle away from the expected 109.5°. Which of the following statements correctly describes how the bond angle is distorted?
a) The actual bond angle is reduced and it is less than 109.5° b) The actual bond angle is increased and it is more than 109.5°
c) The actual bond angle is reduced and it is less than 90° d) The actual bond angle is increased and it is more than 120°

(vii) Homolysis takes place by formation of
a) Free radicals b) Carbocations
c) Carbanions d) All of these

(viii) According to the Heisenberg Uncertainty Principle, as the uncertainty in position decreases, what happens to the uncertainty in momentum?
a) It also decreases b) It remains constant
c) It increases d) It becomes infinite

(ix) Predict the shape of the H_2O compound based upon concepts of hybridization.
a) tetrahedral b) angular or bent structure
c) trigonal planar d) pyramidal

(x) The hybridization of Be in BeF_2 is
a) sp^3 b) sp
c) sp^2 d) d^2sp^3

(xi) Identify the electron configuration of nitrogen (atomic number 7)
a) $1s^2\ 2s^2\ 2p^3$ b) $1s^2\ 2s^2\ 2p^4$
c) $1s^2\ 2s^2\ 2p^5$ d) $1s^2\ 2s^1\ 2p^4$

(xii) In NO_3^- ion, the number of bond pairs and lone pairs of electrons on nitrogen atom is
a) 2, 2 b) 3, 1
c) 1, 3 d) 4, 0

(xiii) The energy of a particle in a 1-D box remaining on the 3rd energy level will be

a) $9h^2/8ml^2$ b) $9h^2/4ml^2$
c) $3h^2/4ml^2$ d) $6h^2/4ml^2$

(xiv) -I effect is maximum for which group?

a) $-CH_2-CH_2-Br$ b) $-CH_2-Br$
c) $-CH_2-CH_2-CH_2-Br$ d) $-CH_2-CH_2-CH_2-CH_2-Br$

(xv) Wavefunction (ψ) of a particle in a 1-D box (length 'L') will be zero, when

a) $x <$ infinity b) $0 \leq x \leq L$
c) $x \leq 0$ and $x \geq L$ d) none of the options

Group-B
(Short Answer Type Questions) 3 x 5=15

2. i) Comment on the existence of the following sets of quantum numbers (3)
   a) $n = 2, l = 0, m_l = -1, s = -1/2$
   b) $n = 3, l = 1, m_l = 0, s = -1/2$.

   ii) Examine the trend in the change in energy of the orbitals with increase of principle quantum number.

3. Explain why (3)

   a) $LiClO_4$ forms hydrated salt
   b) BeSO4 is less stable than CaSO4
   c) BeCl2 is linear

4. Convert (3)

5. (3)
   Among $SnCl_2$ and $SnCl_4$ which one having higher covalent character? Explain your answer.

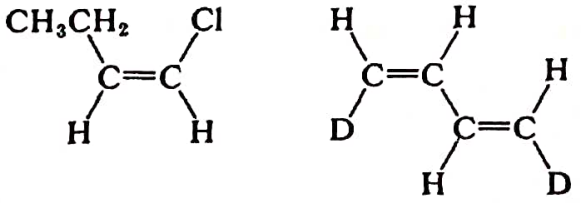
   Also name the rule which is used to predict the answer.

6. Why is staggered form of n-butane more stable than gauche form? (3)

OR

(3)

Assign E/Z nomenclature



Group-C
(Long Answer Type Questions) 5 x 6=30

7. Pka2 of maleic acid is greater than fumaric acid but pka1 of fumaric acid is greater than maleic acid. Explain why? (5)

8. Draw all the isomers of tartaric acid. Designate them as enantiomers, diasteroisomers (5)

9. Describe the mathematical formulation of the Heisenberg Uncertainty Principle. Are there any macroscopic or everyday scenarios where the Heisenberg Uncertainty Principle becomes noticeable? 3 + 2 (5)

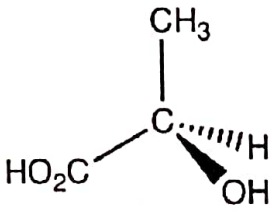
10. Predict the hybridization and shape of the following molecules: (5)

i) BCl_3 ii) H_2S

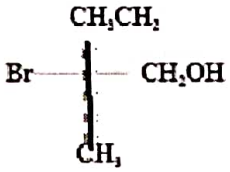
11. (5)

Assign R/S configuration for

a)



b)



What do you mean by diasteroisomer?

12. Justify the statement from the M.O theory that "CO exhibits synergic bonding". (5)

OR

Justify the statements by constructing the M.O diagram. 2.5 + 2.5 (5)

i) Be2 molecule does not exist.

ii) Li_2^+ is paramagnetic

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