



BRAINWARE UNIVERSITY

Term End Examination 2023-2024

Programme – B.Sc.(BT)-Hons-2023

Course Name – Chemistry

Course Code - BBT10103

(Semester I)

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.]

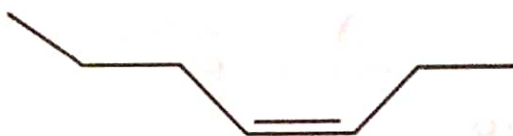
Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

(i) The following pair of molecules can be illustrated as



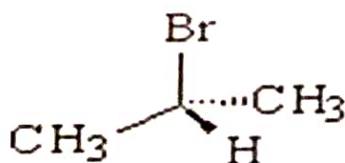
a) Chain isomers

c) Conformational isomers

b) Position isomers

d) Geometrical isomers

(ii) What is the stereochemistry of the following compound:



a) R

c) Meso

b) S

d) Not Chiral

(iii) The correct bond order in the following species is

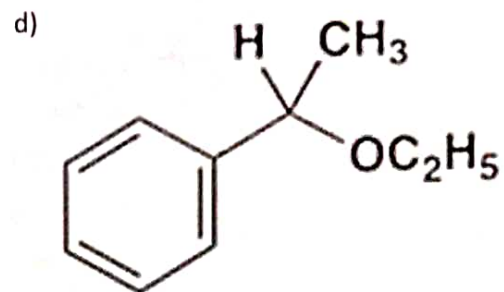
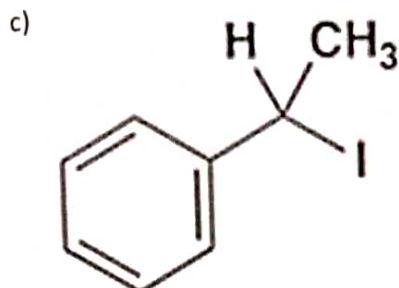
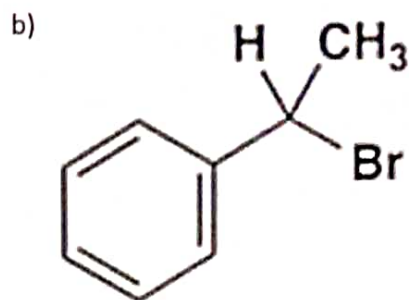
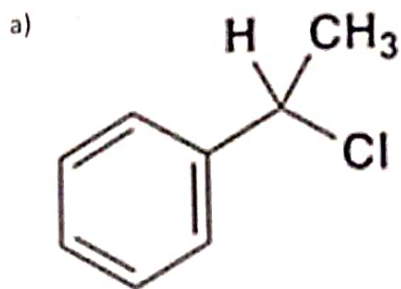
a) $O_2^+ < O_2^- < O_2^{2+}$

c) $O_2^{2+} < O_2^+ < O_2^-$

b) $O_2^- < O_2^+ < O_2^{2+}$

d) $O_2^{2+} < O_2^- < O_2^+$

(iv) Identify the most reactive compound for S_N1 reaction



(v) For a zero order reaction, $A \rightarrow P$, $t_{1/2}$ is: (k is the rate constant)

a) $[A_0] / 2k$

b) $\ln 2 / k$

c) $1 / k [A_0]$

d) $\ln 2 / k [A_0]$

(vi) Hybridization of Acetylene is

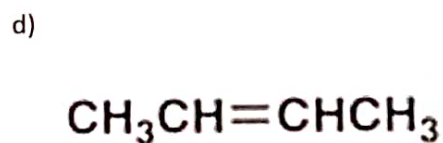
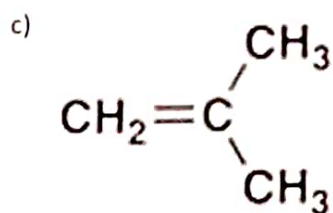
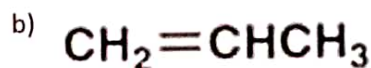
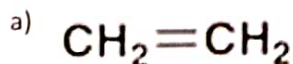
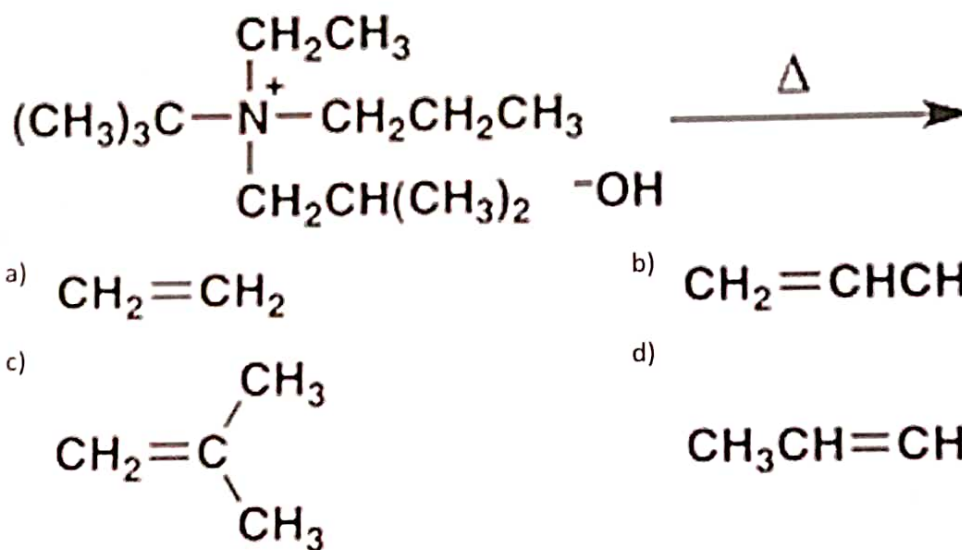
a) sp

b) sp^2

c) sp^3

d) sp^2d

(vii) Which is the main alkene product in the following reaction?



(viii) Number of chlorine atoms which form equatorial bonds in PCl_5 molecule are

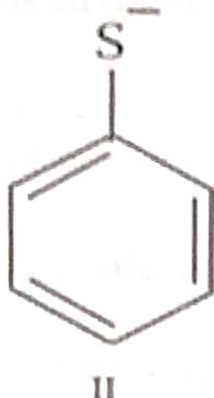
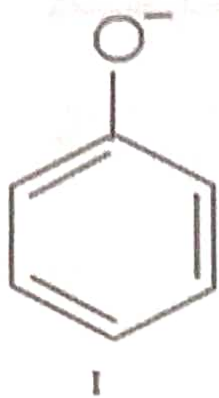
a) 5

b) 4

c) 3

d) 2

(ix) Which of the following statements is true about the following two anionic molecules?



- a) I is more basic and more nucleophilic than II b) I is less basic and less nucleophilic than II
- c) I is more basic but less nucleophilic than II d) I is less basic but more nucleophilic than II
- (x) Predict the shape of the molecule I^-_3 is
- a) octahedral b) trigonal bipyramid
- c) linear d) tetrahedral
- (xi) What is the acidity order of following molecules?
- FCH_2COOH , ClCH_2COOH , BrCH_2COOH , ICH_2COOH
- a) $\text{ICH}_2\text{COOH} > \text{BrCH}_2\text{COOH} > \text{ClCH}_2\text{COOH} > \text{FCH}_2\text{COOH}$ b) $\text{FCH}_2\text{COOH} > \text{ClCH}_2\text{COOH} > \text{BrCH}_2\text{COOH} > \text{ICH}_2\text{COOH}$
- c) $\text{FCH}_2\text{COOH} > \text{ClCH}_2\text{COOH} > \text{ICH}_2\text{COOH} > \text{BrCH}_2\text{COOH}$ d) $\text{ICH}_2\text{COOH} > \text{BrCH}_2\text{COOH} > \text{FCH}_2\text{COOH} > \text{ClCH}_2\text{COOH}$
- (xii) Which is more basic?
- a) Pyrrole b) Furan
- c) Pyridine d) Thiophene
- (xiii) Alkaloid, Terpenoid, Steroid are
- a) Menthol, Morphine, Cortisol b) Cortisol, Menthol, Morphine
- c) Morphine, Menthol, Cortisol d) Morphine, Cortisol, Menthol
- (xiv) Which statement is true
- a) All the hybridized orbitals are not equal in energy and shape b) All the hybridized orbitals are equal in energy and shape
- c) All the hybridized orbitals are equal in energy but not in shape d) All the hybridized orbitals are not equal in shape but not in energy
- (xv) Identify the stability order of carbanion
- a) Primary carbanion > Secondary carbanion > Tertiary carbanion b) Secondary carbanion > Primary carbanion > Tertiary carbanion
- c) Tertiary carbanion > Primary carbanion > Secondary carbanion d) Tertiary carbanion > Secondary carbanion > Primary carbanion

Group-B

(Short Answer Type Questions)

3 x 5 = 15

2. Explain the following fact:

(3)

CH_4 has a bond angle of $109^\circ 28'$ but the bond angles of NH_3 and H_2O are found to be $107^\circ 48'$ and $104^\circ 28'$, respectively.

3. Write the fisher projection formulae of 2-bromopropan 1-al and convert it into flying wedge projection formulae. (3)

4. Which is more stable and why?
Allylic carbocation and Benzylic carbocation. (3)

5. Determine the units of rate constant for zero, first and second order reactions. (3)

6. What is the difference between a Diene and a Dienophile? (3)

OR

What is the purpose of the Diels Alder reaction? Is it syn or anti addition? (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. In a consecutive reaction $A \rightarrow B \rightarrow C$, the rates are k_1 and k_2 , respectively. (5)

i. Find the concentrations of the given species A, B, and C at any time t.

ii. Estimate the time required for maximum accumulation of B.

8. Establish the mechanism of Skraup synthesis for Quinoline. (5)

9. Distinguish between Aldol condensation and Cannizzaro reaction with suitable example. (5)

10. Construct the Born-Haber cycle for the formation of $MgBr_2$ (s) using the following data. (5)

$$\Delta H_f(MgBr_2) = -524 \text{ kCal mol}^{-1}$$

$$E.A. (Br) = -331 \text{ kCal mol}^{-1}$$

$$\Delta H_{\text{sub}}(Mg) = +153 \text{ kCal mol}^{-1}$$

$$I.E. (Mg) = +2187 \text{ kCal mol}^{-1}$$

$$\Delta H_{\text{diss}}(Br_2) = +193 \text{ kCal mol}^{-1}$$

$$\Delta H_{\text{vap}}(Br_2) = +31 \text{ kCal mol}^{-1}$$

Calculate the lattice energy of MgBr_2 (s).

11. Deduce the MO diagram of B_2 molecule. Calculate the number of unpaired electrons present in the molecule and comment on the magnetic behaviour of the molecule. (5)
12. Draw the reaction mechanism and energy profile diagram of Tertiary butyl bromide and sodium hydroxide. (5)

OR

Draw the reaction mechanism and energy profile diagram of Butyl bromide and sodium hydroxide. (5)
