

KATHMANDU UNIVERSITY
End Semester Examination [C]
April/May 2023

Marks Scored:

Level : B.Tech.

Year : I

Exam Roll No. :

Time: 30 mins.

Registration No.:

Course : CHEM 103

Semester : II

F. M. : 20

Date : 28 APR 2023

SECTION "A"

[20Q. \times 1 = 20 marks]

Mark [X] for the most appropriate alternative from each set of choices.

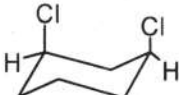
- Which of the following groups has the second highest priority in the Cahn-Ingold-Prelog sequence rules?
 CH_2OH CH_2OCH_3 $\text{CH}=\text{O}$ CO_2H
- An ethanol solution of 1g quinine in 10mL displays a rotation of -13.6° in a 1dm polarimeter tube. What is the specific rotation of quinine?
 -85° -26° -170° -43°
- How many asymmetric centers are present in a molecule of 2,4,6-trimethylheptane?
 0 1 2 3
- Addition of HCl to 3-methyl-1-pentene gives two products. One of these is 2-chloro-3-methylpentane. What is the other product?
 1-Chloro-3-methylpentane 3-Chloro-3-methylpentane
 3-Chloro-2-methylpentane 2-Chloro-2-methylpentane
- Which of the following factors has no effect on the rate of $\text{S}_\text{N}1$ reactions?
 the nature of the alkyl halide the nature of the leaving group
 the concentration of the alkyl halide the concentration of the nucleophile
- If the specific rotation of (+)-Fucitol is $+50^\circ$, and the rotation of a sample of Fucitol is measured to be -10° , what is the per-cent composition of (+)-Fucitol and (-)-Fucitol in the sample?
 60% (-)-Fucitol, 40% (+)-Fucitol 40% (-)-Fucitol, 40% (+)-Fucitol
 40% (-)-Fucitol, 60% (+)-Fucitol 60% (-)-Fucitol, 60% (+)-Fucitol
- Which of the following statements regarding mechanisms of elimination reaction is wrong?
 The E_1 mechanism does not require a base.
 The E_2 mechanism generally occurs under highly basic conditions.
 The E_2 mechanism is single step.
 The E_1 is two step.
- Which of the following statements is wrong?
 $\text{S}_\text{N}1$ reactions undergo partial inversion of configuration.
 $\text{S}_\text{N}2$ reactions undergo complete inversion of configuration.
 The rate constant of an $\text{S}_\text{N}1$ reaction depends on concentration of nucleophile.
 The rate constant of an $\text{S}_\text{N}2$ reaction depends concentration of nucleophile.

9. Which one of the following complexes can exhibit geometrical isomerism?
 [Pt(NH₃)₂Cl₂] (square planar) [Zn(NH₃)₂Cl₂] (tetrahedral)
 [Cu(NH₃)₄]²⁺ (square planar) [Co(NH₃)₅Cl]²⁺ (octahedral)
10. Crystal Field Theory) Strong field ligands such as CN⁻
 usually produce high spin complexes and small crystal field splittings
 usually produce low spin complexes and small crystal field splittings
 usually produce low spin complexes and high crystal field splittings
 usually produce high spin complexes and high crystal field splittings
11. The hybridisation and geometry of XeF₄ are
 sp³d², square planar sp³d², octahedral
 sp³d³, triangular planar sp³d, trigonal bipyramidal
12. Find the paramagnetic species
 CN⁻ NO⁺ CO O₂⁻
13. Consider the SN₂ reaction of tert-butyl chloride with iodide ion:
 (CH₃)₃C-Cl + I⁻ → (CH₃)₃C-I + Cl⁻
- If the concentration of iodide ion is doubled, the rate of forming tert-butyl iodide will
 Double Increase 4 times
 Remain the same Decrease
14. The orientation of free-radical addition doesn't depend on
 Polar factor Steric factor
 Stability of carbocation stability of free radical
15. How many optically active stereoisomers are possible for butane-2,3-diol?
 1 2 3 4

Fill in the blanks.

16. The final product of the reaction
- $$\begin{array}{c} \text{H}_3\text{C} \quad \text{CH}_3 \\ \diagdown \quad / \\ \text{C} = \text{C} \\ / \quad \diagdown \\ \text{H}_3\text{C} \quad \text{H} \end{array} \xrightarrow[\text{Peroxide}]{\text{HBr}}$$

is.....

17. The name of the  compound is

18.  is the product.

19. [Ni(CO)₄] name of this compound is.....

20. The molecular formula of Tetraamminediaquacobalt (III) chloride is.....

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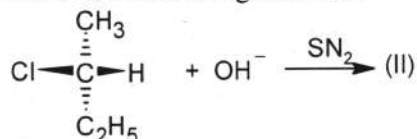
Level : B.Tech.
Year : I
Time : 2 hrs. 30 mins.

Course : CHEM 103
Semester : II
F. M. : 55

SECTION "B"

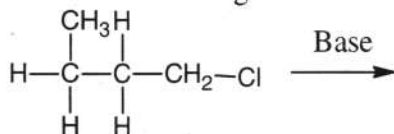
Attempt ALL questions.

1. A. Consider the following reaction.



- Write the mechanism and give the structure for (II). [2+1=3]
- Discuss the role of solvent in the above reaction. [2]
- Predict the stereochemistry of the products with explanation [2]

- B. Consider the following reaction.



- Give the mechanism E1 for the reaction. [2]
- Predict the product/s. [2]
- Is this reaction is affected when the alpha-H are replaced by Deuterium? Explain. [2]

2. Write notes on: [4Q × 3 = 12]

- Phase transfer catalyst.
- Conformations of cyclohexane.
- Orientation of free radical addition reaction
- Rules of molecular orbital theory

3. Give the appropriate reasons for the following facts. [4Q × 3 = 12]

- Dehydration of alcohol is acid catalyzed where as dehydrohalogenation required base.
- Generation of first chiral center yield the racemic mixture
- Equatorial methylcyclohexane is more stable than and axial methylcyclohexane.
- Tertiary carbocation is the most stable carbocation.

4. Give the mechanism for the following: [2Q × 3 = 6]

- Reaction of But-1-ene with Sulphuric acid
- Dehydration reaction of Propylalcohol

5. Explain the following: [4Q × 3 = 12]

- Werner's theory
- Crystal Field theory
- Geometric Isomerism:
- Factors affecting the crystal field stabilization energy

