

KATHMANDU UNIVERSITY
End Semester Examination
May/June, 2022

Marks Scored:

Level : B.Tech.

Course : CHEM 103

Year : I

Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

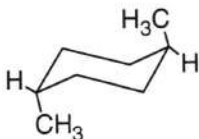
Date :

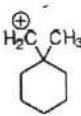
SECTION "A"

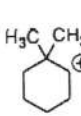
[15Q. × 1 = 15 marks]

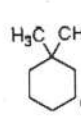
Mark [×] in the appropriate answer box.

- How many optically active stereoisomers are possible for butane-2,3-diol?
 1 2 3 4
- The acid catalyzed dehydration mechanism for alcohol is best described as a/an
 E1 E2 SN1 SN2
- The name of the compound is.....
 Cis-1,4-dimethylcyclohexane
 Trans-1,4-dimethylcyclohexane
 Cis-1,3-dimethylcyclohexane
 Trans-2,4methylcyclohexane


- Which of the following carbocations is likely to undergo rearrangement through a methyl shift?

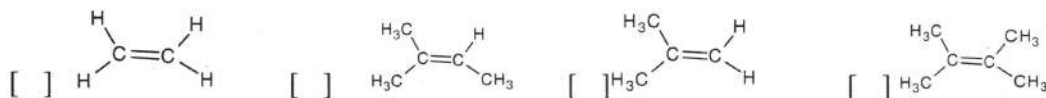

I


II


III

 I II I&II I & III
- Which statement is **TRUE** about SN2 reaction?
 a. It proceeds with complete inversion.
 b. Its reactivity for alky halide is methyl > 1° > 2° > 3°
 c. It proceeds with racemization.
 a. Its reactivity for alky halide is methyl < 1° < 2° < 3°
 ab bc cd ad
- An ethanol solution of 8g quinine in 100mL displays a rotation of -13.6° in a 1dm polarimeter tube. What is the specific rotation of quinine?
 -85° -26° -170° -43°
- CF₃CH₂-OH is.....solvent.
 polar protic polar aprotic non-polar nonpolar protic
- The orientation of free-radical addition doesn't depend on
 Polar factor Steric factor
 Stability of carbocation stability of free radical

9. The most stable alkene among the following is



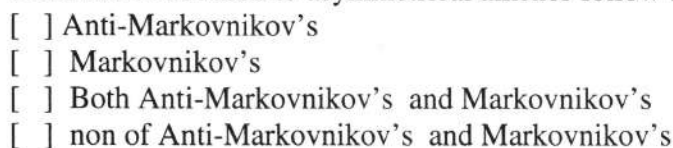
10. When the valence d orbitals of the central metal ion are split in energy in an octahedral ligand field, which orbitals are raised **least** in energy?



11. Which complex cannot ionize in solution?



12. Free radical addition to asymmetrical alkenes follow the..... Orientation.



13. Nitrosyl ligand has the formula as.....



14. Consider the coordination compound, $\text{K}_2[\text{Cu}(\text{CN})_4]$. A coordinate covalent bond exists between



15. The oxidation state of nickel in $[\text{Ni}(\text{CO})_4]$ is



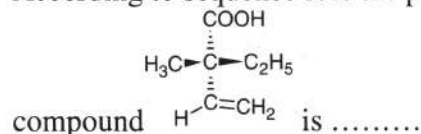
SECTION "B"

[5Q. \times 1 = 5 marks]

Fill in the blanks with most appropriate value or word.

16. The potential energy difference between half-chair and boat conformers is.....

17. According to sequence rule the priority order of the substituents in the chiral



18. The formula of the complex, Tetraamminedinitrocobalt (III) chloride is

19. IUPAC name of the complex, $\text{K}_2[\text{Cr}(\text{CN})_2\text{O}_2(\text{O}_2)\text{NH}_3]$ is

20. Molecule having dsp^2 hybridization has.....geometry.

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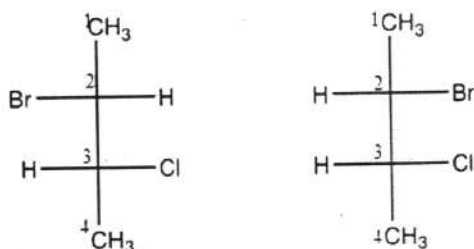
Level : B.Tech.
Year : I
Time : 2 hrs. 30 mins.

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

SECTION "C"

Attempt ALL questions.

1. Explain the Chan-Ingold-Prelog or *R-S* System or Sequence rule and assign the configuration for each chiral center/s. [2 + 2 = 4]



2. Explain the following with examples. [4 × 2 = 8]
- Resolution of racemic modification
 - Conformational analysis of Cyclohexane
 - Baeyer Strain Theory
 - Phase Transfer Catalyst
3. Give the appropriate explanation for the following statements (*ANY FIVE*): [5 × 2 = 10]
- Generation of first Chiral center from achiral molecules
 - The order of reactivity of haloalkanes on $\text{S}_{\text{N}}1$ reaction is in order Methyl < 1° < 2° < 3°
 - $\text{S}_{\text{N}}1$ reaction proceeds with racemization where Inversion is always greater than retention.
 - Polar protic solvent with higher ionizing power is best for $\text{S}_{\text{N}}1$ reactions.
 - Free radical addition to asymmetrical alkenes follow the anti-Markovnikov's Orientation.
 - $\text{E}1$ reactions are accompanied by hydrogen exchange.
4. Give the mechanism for the following reactions. [4 × 2.5 = 10]
- Free radical polymerization of Alkenes
 - Hydroboration-Oxidation
 - Dehydration of Alcohols in presence of Strong acid
 - Hydration reaction on Alkenes
5. Explain the followings with appropriate examples. [4 × 3 = 12]
- Factors affecting the magnitude of Crystal field stabilization Energy (Δ)
 - Jahn-Teller effect
 - Valence Bond Theory to form Square planar complexes
 - Effective Atomic Number Rule

6. a. Draw the structural formulae for the following coordination compounds. $[3 \times 0.5 = 1.5]$
- Potassium amminedicyanodioxoperoxochromate(VI)
 - Triamminechlorocyanonitrocobalt(III)
 - Tetrapyridineplatinum(II) tetrachloroplatinate(II)
- b. Give the IUPAC name for the following molecules: $[3 \times 0.5 = 1.5]$
- $[\text{CuCl}_2(\text{CH}_3\text{NH}_2)_2]$
 - $\text{Na}_2[\text{Fe}(\text{NC})_3\text{Cl}_2(\text{NH}_3)_2]$
 - $\text{K}_3[\text{Fe}(\text{CN})_5\text{NO}]$
7. Explain the following terms: $[4 \times 2 = 8]$
- Coordination Number
 - Ligands
 - Oxidation Number
 - Optical Isomerism in Coordination complexes