KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2025

Marks Scored:

Level : B.E.
Year : II

Course : CHEM 201
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

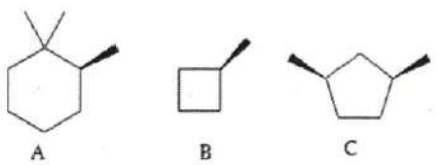
Date : 13 APR 2025

SECTION "A"

[20Q. × 1 = 20 marks]

Choose the most appropriate answer and **mark [X]**.

1. Which of the following compound(s) is/are chiral?



[ ] Only A and B [ ] Only B
[ ] Only B and C [ ] Only A

2. Which of the following statements is true about the stereochemistry of an SN2 reaction?
[ ] It proceeds with retention of configuration.
[ ] It proceeds with racemization.
[ ] It proceeds with inversion of configuration.
[ ] It has no effect on stereochemistry.

3. What is the effect of doubling the concentration of the base in an E2 reaction?
[ ] The rate of the reaction remains the same.
[ ] The rate of the reaction doubles.
[ ] The rate of the reaction quadruples.
[ ] The rate of the reaction halves

4. Which of the following is a correct example of a propagation step in the free radical halogenation of methane?
[ ] $Cl\bullet + CH_4 \rightarrow CH_3\bullet + HCl$ [ ] $Cl\bullet + Cl\bullet \rightarrow Cl_2$
[ ] $CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$ [ ] $CH_3\bullet + CH_3\bullet \rightarrow C_2H_6$

5. What is the directing effect of the -OH group in electrophilic aromatic substitution?
[ ] Meta-directing [ ] Ortho/para-directing
[ ] Deactivating [ ] Non-directing

6. The alkaloid quinine is optically active. An ethanol solution of 16g quinine in 50 mL displays a rotation of -13.6° in a 1dm polarimeter tube. What is the specific rotation of quinine?
[ ] -85° [ ] -170° [ ] -43° [ ] -26°

7. In the Cahn-Ingold-Prelog (CIP) system, what is the priority order for the following groups attached to a chiral center?
[ ] $-OH > -CH_2CH_3 > -CH_3 > -H$ [ ] $-OH > -CH_3 > -CH_2CH_3 > -H$
[ ] $-CH_2CH_3 > -OH > -CH_3 > -H$ [ ] $-CH_3 > -CH_2CH_3 > -OH > -H$

8. Which of the following statements about cyclohexane is true?
[ ] It is a planar molecule [ ] It has sp hybridized carbon atoms
[ ] It undergoes ring flipping [ ] It is aromatic

9. Which of the following substituents increases the reactivity of benzene towards nucleophilic substitution?
[ ] –OH [ ] $-CH_3$ [ ] $-NO_2$ [ ] $-NH_2$

10. Which of the following reactions are favoured by polar aprotic solvent?
[ ] SN1 reactions [ ] SN_2 reactions
[ ] Both SN_1 and SN_1 reactions [ ] None of the mentioned

11. How many monochlorination products are possible in the reaction of 2,2-dimethylbutane with chlorine in the presence of light?
[ ] 2 [ ] 3 [ ] 4 [ ] 5

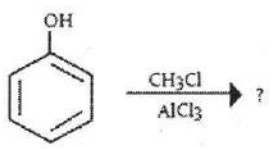
12. CF_3CH_2-OH is_____ solvent.
[ ] polar protic [ ] polar aprotic [ ] non-polar [ ] nonpolar protic

13. Which of the following terms best describes the the reactive nature of a Grignard reagent.
[ ] carbocation [ ] free radical [ ] electrophile [ ] nucleophile

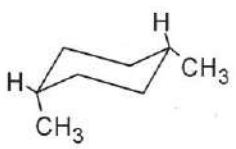
14. _____ is two step reaction in which the major product is alkene
[ ] SN1 [ ] SN2 [ ] E1 [ ] E2

15. Identify the incorrect statement regarding Benzene
[ ] It has sp3 hybridized carbons
[ ] It is aromatic Compound
[ ] It undergoes elecrophilic substitution reactions
[ ] It undergoes nucleophilic substitution reactions

Fill in the blanks

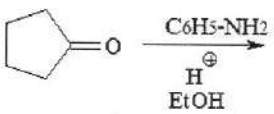
16. The product/s of the reaction 

_____.

17. Name of the molecule 

is_____.

18. The potential energy difference between half-chair and boat confermers is_____.

19. The product of 

the given reaction is_____.

20. Dehydrohalogenation of 2-chloro-2 methyl hexane give major product_____
_____.

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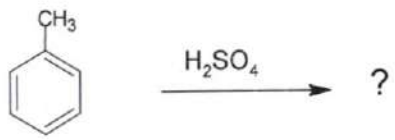
SECTION "B"

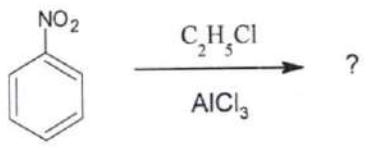
Attempt ALL the questions.

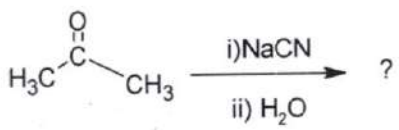
1. Write the mechanism for the following reactions. [5×3=15]

i. $H_3C-CH=CH_2 + HBr \xrightarrow{\text{peroxide}} ?$

ii. 

iii. $C_2H_5MgBr + CH_3COH \xrightarrow{H_2O} ?$

iv. 

v. 

2. Explain with appropriate reasons. [6×3=18]

a. $-NO_2$ is the deactivating and meta directing group during electrophilic aromatic substitution reaction.

b. Tertiary carbcation is more stable than primary carbocation.

c. The order of reactivity of haloalkanes for E1 reaction is Teriary>Secondary>Primary

d. Axial methylcyclohexane is less stable than the equatorial methlcyclohexane

e. Ortho- deuterioflurobenzene is converted into aniline only very slowly but loses its deuterium rapidly to yield flurobenzen.

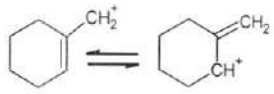
f. SN_2 reaction the order of reactivity of haloalkanes is
Methyl>primary>secondary>tertiary.

P.T.O.

3. Write notes on. [4×2.5=10]
   a. Conformations of cycloalkane.
   b. Resolution of racemic modification
   c. Enantiomer
   d. Mesocompounds

4. Explain the followings with appropriate examples. [3×2=6]
   a. Aromatic character
   b. Hyperconjugation
   c. Conformations of n-Butane

5. [2×3=6]
   a. Which of the following ions is more stable? Explain your answer.



   b. Explain with mechanism that Hydroboration-oxidation reaction fallows the anti – Markovnikov orientation.