KATHMANDU UNIVERSITY
End Semester Examination
July/August 2023

Marks Scored:

Level : B.Pharm.
Year : I
Course : CHEM 104
Semester: II
Exam Roll No. :
Time: 30 mins.
F.M. : 20
Registration No.:
Date : August-04,

SECTION "A"
[20Q. × 1 = 20 marks]

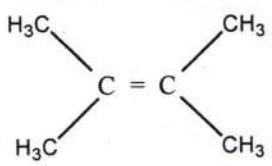
Choose the most appropriate answer and **mark [X]** in the box.

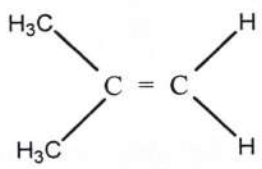
1. Which of the following compound is not aromatic?
[ ] Azulene [ ] Naphthalene [ ] Cycloheptatriene [ ] Pyridine

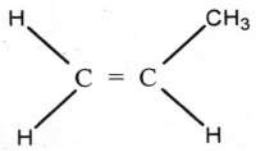
2. Which of the following statement is **CORRECT** about the rate constant of reaction?
[ ] Rate constant is doubled with a rise in temperature by 10 °C
[ ] Rate constant becomes half with a rise in temperature by 10 °C
[ ] Rate constant remains unchanged with a rise in temperature by 10 °C
[ ] None of the above

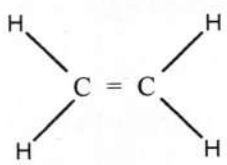
3. Which statement is **WRONG** regarding the cycloaddition of [4+4] reaction?
[ ] Photochemical reaction occurs in supra-supra mode
[ ] Photochemical reaction occurs in supra-antara mode
[ ] Thermal reaction occurs in supra-antara mode
[ ] Thermal reaction occurs in antara-supra mode

4. The stability order of the following alkene is

a. 

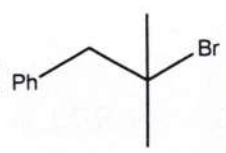
c. 

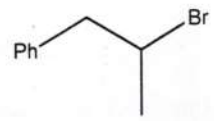
b. 

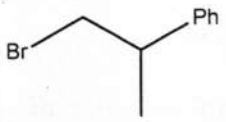
d. 

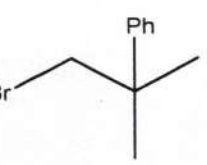
[ ] a > c > b > d [ ] b > c > a > d [ ] d > c > b > a [ ] a > d > b > c

5. Which one is the most reactive alkyl halide for SN_1 reaction?

[ ] 

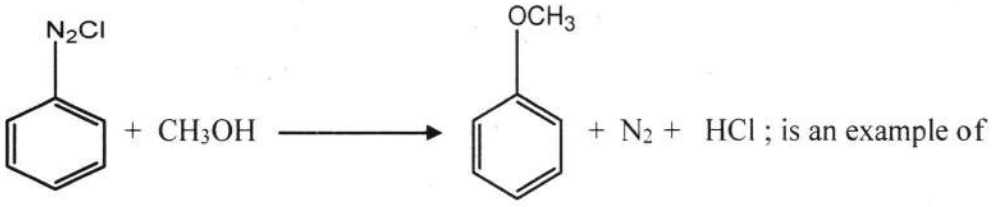
[ ] 

[ ] 

[ ] 

6. Anti-Markonikov's addition of HBr in presence of organic peroxide is not observed in
[ ] Propene [ ] But-1-ene [ ] But-2-ene [ ] Pent-2-ene

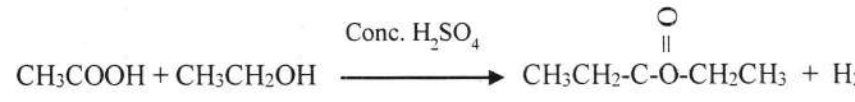
7. Formation of paracetamol by the reaction of para-aminophenol with acetic anhydride is an example of
[ ] Nitration [ ] Sulphonation
[ ] Friedel-Craft alkylation [ ] Friedel-Craft acylation

8. 

[ ] Ar-SN_1 reaction [ ] Ar-SN_2 reaction
[ ] SN_1 reaction [ ] SN_2 reaction

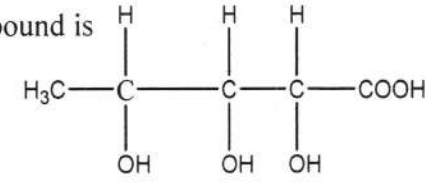
9. Dimethyl sulfoxide (DMSO) is an example of .... solvent.
[ ] Polar protic [ ] Polar aprotic [ ] Non-polar [ ] Non-polar protic

10. Given reaction is an example of..... reaction.



[ ] Nucleophilic acyl substitution [ ] Nucleophilic aromatic substitution
[ ] Electrophilic substitution [ ] Free radical substitution

11. The number of pair of enantiomers of the given compound is
[ ] 1 [ ] 3
[ ] 2 [ ] 4



12. An optically active compound placed in 10 dm tube present 20 g in 200 ml solution rotated the plane polarized light to 30°. What is the specific rotation of the compound?
[ ] 20° [ ] 30° [ ] 40° [ ] 50°

13. Which of the isomer of cyclohexane is most stable?
[ ] Boat [ ] Twist boat [ ] Chair [ ] Half chair

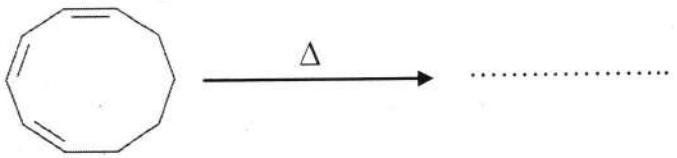
14. Bayer's strain theory is not valid for
[ ] Cyclopropane [ ] Cyclobutane [ ] Cyclopentane [ ] Cyclohexane

Fill in the blanks.

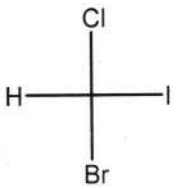
15. The stability order of haloalkane (R_3C-X, R_1CH_2-X, R_2CH-X) in SN_2 reaction is .....

16. When CH_3COOH reacts with ammonia in presence of heat, then ..... is produced as a major product.

17. The major product of the following reaction is



18. The configuration of the given compound is .....



19. The lowest potential energy among the conformers of *n*-butane is .....

20. The commonly used as a nucleophile in Michael addition reaction is .....

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SECTION "B"

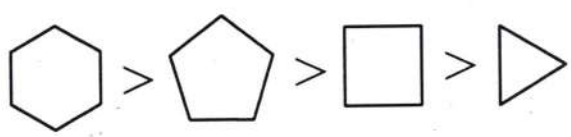
Attempt *ALL* questions.

1. Give the mechanism for the following reactions. [*ANY SIX*] [6Q × 2.5 = 15 marks]

   a. Kolbe reaction
   b. Fries rearrangement reaction
   c. [4+2] Cycloaddition reaction in presence of heat
   d. Friedel-Craft alkylation
   e. $CH_4 + Cl_2 \xrightarrow{h\upsilon}$
   f. $CH_3\text{-}\overset{\overset{O}{\|}}{C}\text{-}CH_3 + CH_3\text{-}MgBr \xrightarrow[H^+/H_2O]{\text{Dry ether}}$
   g. $CH_3\text{-}CO\text{-}NH_2 + Br_2 + NaOH \longrightarrow$

2. Give the reasonable explanation for the following statements. [*ANY FIVE*] [5Q × 2.5 = 12.5 marks]

   a. In SN_1 reaction, the stereochemistry of the product is racemic mixture.
   b. In E_1 reaction, the stability order of alkyl halide is $3^o > 2^o > 1^o$.
   c. Hofmann product is produced in the elimination reaction when the used base is bulky.
   d. Racemic mixture is optically inactive.
   e. Aldehyde having no α-hydrogen is used in Cannizaro reaction.
   f. The stability order of cycloalkane is as follows.



3. Explain the following with examples. [*ANY FIVE*] [5Q × 2 = 10 marks]

   a. Enantiomer and diastereomer
   b. Generation of chiral center
   c. Saytzeff rule
   d. Transition state theory
   e. Optical purity
   f. Huckel's rule

4. Convert the following compounds to the respective products (Give the appropriate reactions). [*ANY FIVE*] [5Q × 2 = 10 marks]

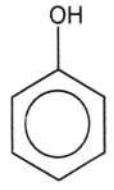
a. Ethanoic acid to ethanamide
b. Ethene to cyclopropane
c. 1,3-Butadiene to 1,5-Cyclooctadiene
d. Ethanal to 2-Hydroxy propanenitrile
e. Benzaldehyde to sodium benzoate and benzyl alcohol
f. Chloropropane to 2-Chloropropane

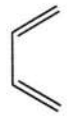
5. Write down the products of the following reactions. [5Q × 1.5 = 7.5 marks]

a. $CH_3\text{-}CH_2\text{-}CH{=}CH\text{-}CH_3 + HBr \xrightarrow{h\upsilon}$

b. $CH_3\text{-}\overset{\overset{O}{\|}}{C}\text{-}NH_2 + Br_2 + NaOH \longrightarrow$

c. $CH_3\text{-}CH_2\text{-}CHF\text{-}CH_3 + KOH \longrightarrow$

d.  $\xrightarrow[\text{Conc. } HNO_3]{\text{Conc. } H_2SO_4}$

e.  $+ SO_2 \xrightarrow{h\upsilon}$