KATHMANDU UNIVERSITY
End Semester Examination
July/August 2024

Level : B.Sc.
Year : II
Time : 2 hrs. 30mins.

20 AUG 2024

Course : CHEM 207
Semester : I
F. M. : 55

SECTION "B"
[55 marks]

Attempt ALL questions.

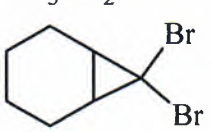
1. a. Give structures of the following compounds. [4]
   i. 2,4-Dihydroxy-1,4-butanedioic acid
   ii. Pentanenitrile
   iii. N, N-Diethylhexamide
   iv. 2-Methyl-1,3-butadiene

   b. Define the following terms with an example of each: ***(ANY TWO)*** [4]
   i. Activating group and deactivating group
   ii. Nucleophile and Electrophile
   iii. Essential and non-essential amino acids

2. a. Give product/s for the following equations: [5]

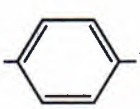
   i. $CH_3CH_2CH_2Cl + NaOH \longrightarrow ?$

   ii. $CH_3CH_2OH + CH_3COOH \overset{H^+}{\rightleftharpoons} ?$

   iii. 

$\xrightarrow{Na,\ CH_3OH}$?

   iv. $CH_3CH_2COOH \xrightarrow{LiAlH_4} ?$

   v. 

$\xrightarrow[0^oC]{HNO_2}$?

   b. Give an example of (***ANY FOUR***). [4]
   i. Williamson ether synthesis.
   ii. Clemmenson reduction.
   iii. Aldol condensation.
   iv. Strecker synthesis of α-amino acid.
   v. Oxymercuration demercuration.

3. Propose general mechanism for the following reactions. [4 × 2.5 = 10]
   i. S_N2 mechanism
   ii. E1 mechanism
   iii. Electrophilic aromatic substitution mechanism
   iv. Free radical substitution mechanism

P.T.O.

4. Give the appropriate reasons. (***ANY SIX***) [6 × 2 = 12]

i. Diethylamine is more basic than ethyl amine.
ii. Ethanal cannot be used to carryout Cannizzaro reaction.
iii. Ethanol boils at lower temperature than ethanoic acid.
iv. Alcohols are soluble in water but ethers are not soluble.
v. Organometallic compounds are the sources of carbon nucleophiles.
vi. For electrophilic aromatic substitution toluene is more reactive than benzene.
vii. Primary alkyl halides undergo substitution reaction by S_N2 mechanism.
viii. Nitration of benzoic acid yields m-nitrobenzoic acid as a major product

5. Write products when the following reaction occurs. [4]

i. sec-Butylmagnesium bromide and formaldehyde
ii. Isobutyl magnesium bromide and acetaldehyde
iii. N-butylmagnesium bromide and acetone
iv. Phenyl magnesium bromide and ethylene oxide

6. Write short notes on: [4 × 3 = 12]

i. Rearrangement of carbocation.
ii. Structure of peptide
iii. Homopolymer and Copolymer.
iv. Hydrolysis of peptide by Chymotrypsin.

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SECTION "A"
[20Q. × 1 = 20 marks]

Choose and encircle the most appropriate option from each set of choices.

1. What is the *IUPAC* name for the structure on the right? $CH_3CH_2CHCON(CH_3)_2$ with C_2H_5 on the CH
[ ] 2-Ethyl-N, N-dimethylbutanamide. [ ] N-thylpropanamide
[ ] N,N-dimethylpropanamide [ ] dimethylbutanamide

2. Markovnikov's addition of HBr to methylcyclohexene yields....
[ ] 1-Bromo-2-methylcyclohexane [ ] 1-Methylcyclohexane
[ ] 1-Bromo-1-methylcyclohexane [ ] 3-Bromomethylcyclohexane

3. Which reagent will react with acetone to yield an oxime?
[ ] NH_2NH_2 [ ] $C_6H_5NHNH_2$ [ ] NH_2OH [ ] $NH_2NHCONH_2$

4. Strongest acid among the following is
[ ] CH_3COOH [ ] $ClCH_2COOH$ [ ] CF_3COOH [ ] Cl_3CCOOH

5. Identify the major organic product for the following reaction

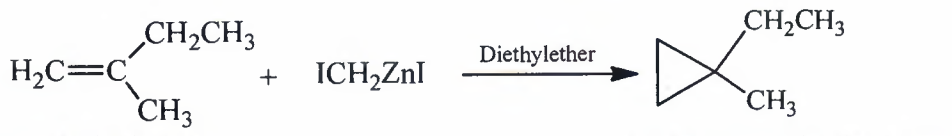
$$CH_3CHO \xrightarrow{NaOH} ?$$

[ ] 3-hydroxybutanal [ ] 3-hydroxybutanoic acid
[ ] 4-hydroxypentanol [ ] 4-hydroxybutanoic acid

6. Propene can be converted into 1-propanol by oxidation indicate which set of reagents amongst the following is ideal to effect this reaction?
[ ] $Hg(OAc)_2/H_2O$; $NaBH_4$ [ ] H_2O/H^+
[ ] $(BH_3)_2THF/H_2O_2,OH^-$ [ ] NH_2NH_2/OH^-

7. Which of the following mechanism shows primary hydrogen isotope effect?
[ ] S_N1 [ ] S_N2 [ ] E1 [ ] E2

8. The reaction given below is an example of _____



2-Methyl-1-butene 1-Ethyl-1-methylcyclopropane

[ ] Simmons-Smith reaction [ ] Grignard reaction
[ ] Wittig reaction [ ] Cannizzaro reaction

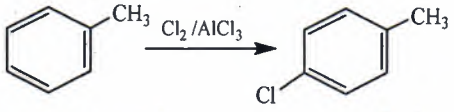
9. Which of the following compounds reacts rapidly with aqueous Br_2 under identical reaction condition?
[ ] Benzene [ ] Nitrobenzene [ ] Benzoic acid [ ] Phenol

10. Which of the following groups is o,p-director?
[ ] $-SO_3H$ [ ] $-NH_2$ [ ] $-NO_2$ [ ] $-COOH$

11. ABS-a copolymer is obtained by chain reaction polymerization of three types of compounds except
[ ] Acrylonitrile [ ] 1,3-butadiene [ ] Isoprene [ ] Styrene

12. Which is an essential amino acid?
[ ] Proline [ ] Serine [ ] Valine [ ] Glycine

13. Classify the following reaction.



[ ] Electrophilic substitution [ ] Nucleophilic substitution
[ ] Electrophilic addition [ ] Nucleophilic addition

14. Which of the following aldehydes cannot give Cannizzaro reaction
[ ] Methanal [ ] Benzaldehyde
[ ] Cyclobutanecarbaldehyde [ ] 2,2-dimethylpropanal

15. Among the given isomers which might have the highest boiling point?
[ ] n-Hexane [ ] 2-Methylpentane
[ ] 2,2-Dimethylbutane [ ] 2,3-Dimethylbutane

Fill in the blanks with appropriate words/ symbols

16. Conversion of globular protein in fibrous protein due to light or heat or change in P^H is called _____ of protein.

17. Nitration of benzoic acid yields _____

18. Tertiary alkyl halides undergoes substitution reaction by _____ mechanism.

19. Structural formula of ethylmethanoate is _____

20. Alcohols react with reactive metals to give metal alkoxide and _____