Duration: 3 hours **Total marks: 75**

N.B: 1. All questions are compulsory.

2. **Figures to right indicate full marks**

QI. Choose the appropriate option from the following: **(20)**

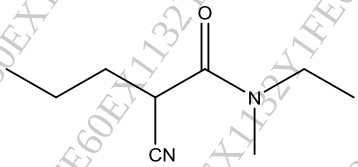
1. Propanoic acid and methyl acetate are the type of _____ isomerism.

A. Geometrical B. Positional C. Chain D. Functional group

2. _____ does not exhibit keto-enol tautomerism.

A. Benzaldehyde
B. Cyclopentanone
C. Butanal
D. But-2-en-2-ol

3. Choose the correct IUPAC nomenclature for the given structure below:



A. 5-Cyano-N-ethyl-N-methylpentanamide
B. 2-Cyano-N-ethyl-N-methyl-hexanamide
C. 3-Cyano-1-ethy-2-keto-1-methyl-hexane
D. 2-Cyano-N-ethyl-N-methylpentanamide

4. Which of the following synthesis will lead to the formation of n-butane from ethyl chloride?

A. Reduction of alkyl halide
B. Hydrolysis of Grignard reagent
C. Corey-House synthesis
D. Decarboxylation of carboxylic acid

5. Benzaldehyde reacts with one mole of methanol in alkaline conditions to form _____.

A. Acetal
B. Benzoic acid
C. Hemiacetal
D. Benzyl alcohol

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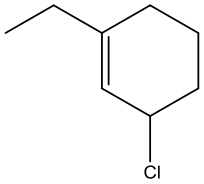
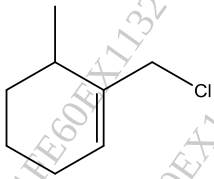
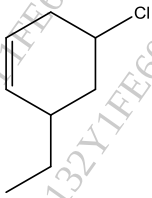
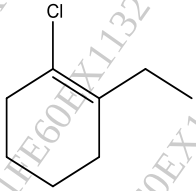
6. Identify the correct structure for 1-Chloro-2-ethylcyclohex-1-ene

A. 

B. 

C. 

D. 

7. Carbonation of ethyl magnesium bromide gives _____.

A. Propanol
B. Glycerol
C. Cetosteryl alcohol
D. Propanoic acid

8. Predict compounds A and B in the given reaction.

$$\text{Isopropyl alcohol} \xrightarrow[\Delta]{\text{Conc. } H_2SO4} A \xrightarrow[\text{Hydrogen peroxide}]{\text{Diborane}} B$$

A. Propene, n-Propyl alcohol
B. Propene, 2-Propanol
C. Propane, 2-Propanol
D. Propane, n-Propyl alcohol

9. Which of the following alkyl halides most substituted alkenes upon dehydrohalogenation.
i. 2-bromo-2,3-dimethylbutane ii. 3-bromo-2,2-dimethylbutane
iii. 1- bromo butane iv. 2-bromo-3-methylbutane.

A. ii, iv B. ii, iii C. i, ii D. i, iv

10. The reaction of methyl iodide and aqueous potassium hydroxide is favorable in _____ s olvent.

A. Ethanol
B. Water
C. DMSO
D. Acetic acid

11. Propanol can be oxidized by pyridinium-1-chlorochromate to produce

A. Propanal
B. Propionic acid
C. Propanone
D. No product

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12. Identify the use of carbon tetrachloride.

    A. Antiseptic
    B. Local anesthetic
    C. Fire extinguisher
    D. Anti-inflammatory

13. Which statement best describes the mechanism of S_N1 reaction?

    A. Concerted reaction with partial racemization
    B. Carbocation formation with retention in configuration
    C. Carbocation formation with partial racemization
    D. Concerted reaction with retention

14. The test to distinguish between 2-hexanone and 3-hexanone is _____.

    A. Fehling's test
    B. Tollens' test
    C. Iodoform test
    D. 2,4-DNP test

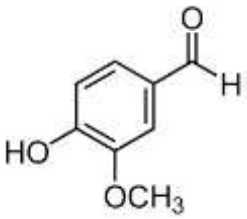
15. Acetaldehyde and acetone in presence of alcoholic NaOH give _____.

    A. 3-hydroxybutanal
    B. 3-hydroxy-3-methyl pentanal
    C. 4-hydroxy-4-methyl-butane-2-one
    D. Pent-3-en-2-one

16. Addition of hydrogen bromide to 1-butene in presence of peroxide gives _____.

    A. 2-Bromobutane
    B. 1-Bromobutane
    C. 2-Bromo-2-methylpropane
    D. 1-Butanol

17 Identify the structure of the following compound?



    A. Paraldehyde
    B. Cinnamaldehyde
    C. Vanillin
    D. Methyl salicylate

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18. Identify the strongest acid amongst the following.

A. $ClCH_2COOH$ B. CF_3COOH C. $HOCH_2COOH$ D. CH_3COOH

19. Predict the product of Hell-Volhard-Zelinsky reaction on propanoic acid.

A. 3-Bromo propanoic acid
B. 2-Hydroxy propanoic acid
C. 2-Bromo propanoic acid
D. 3-Hydroxy propanoic acid

20. The following reactions will lead to the formation of amines except…….
A. Reduction of nitroalkane
B. Carboxylic acid + ammonia
C. Reduction of alkyl cyanide
D. Alkyl Bromide + ammonia

QII Solve any two of the following

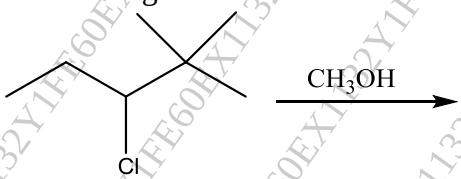
1. A) Predict the product/s of the following reactions. Discuss the mechanism and orientation of any one of the given reactions.

a) 2-Pentyl trimethyl ammonium bromide $\xrightarrow{\text{NaOEt/ EtOH}}$

b) 2-Bromo-3-methylpentane $\xrightarrow{\text{NaOEt/ EtOH}}$

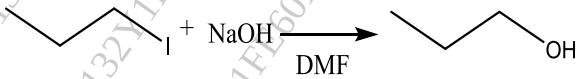
B) Depict the mechanism for **any two** of the following:
i. Perkin condensation
ii. Benzoin condensation
iii. Aldol condensation

2. A. Predict the product of the following reaction and discuss the mechanism for the same.



B. Predict the suitable reagents for the following conversions.
i) Toluene to Benzoic acid
ii) 2-Butanone to 2-Methy-2-butanol
iii) 1-Pentene to Butanoic acid

3. A. Give a detailed account of halogenation of propane.
B. Depict the mechanism and answer the questions for the reaction given below:



i. Identify whether the given reaction is unimolecular or bimolecular.
ii. Discuss the impact of changing the solvent from DMF to ethanol.
iii. Predict the effect on rate of the reaction if the substrate is changed to n-Propyl fluoride.

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QIII. Solve any 7 questions from the following.

1. Discuss any one method each for the synthesis of aldehyde and ketone. Depict the reaction of acetaldehyde with semicarbazide, phenyl hydrazine and hydroxylamine.

2. Arrange the following compounds in increasing order of basicity and justify the order. Propylamine, N-methyl ethanamine, N-ethyl-N-methylpropan-1-amine. Give any one distinguishing test for primary, secondary, and tertiary amines.

3. A. Draw the structures for the following compounds (any 3)
   a) Cyclohexanecarbaldehyde
   b) 2-bromo-3-oxobutanoic acid
   c) Ethyl propanoate
   d) 3-methoxybutanamide

   B. Draw the tautomeric structure of the following
   i) N-methyl acetamide ii) 4-hydroxy pent-3-en-2-one

4. A. Discuss the reaction of 1,3-butadiene with hydrogen bromide highlighting the preferred product under varying temperature conditions.

   B. An alkene C_7H_{14} after ozonolysis yielded two products A and B. Both compounds gave 2,4-DNP test positive. Compound A gave Tollen's test positive. Compound B gave both Tollen's test and the Iodoform test negative. Identify the structures of A and B with suitable justification.

5. Give the mechanism for Reimer Tiemann reaction and Kolbe Reaction.

6. Discuss the method for synthesis of primary, secondary, and tertiary alcohol using Grignard's reagent; Discuss the test to distinguish the above alcohols.

7. Identify the reagents and reaction conditions for the following conversions (any 5)

   1. 1-Iodopropane to propane
   2. Propene to 1,2-Propane diol
   3. Butanoic acid to 2-Bromo butanoic acid
   4. Cyclohexanol to cyclohexene
   5. Isobutyl alcohol to isobutyric acid
   6. 1-Butene to 1-Butanol

8. Give the mechanism for Hoffmann degradation of amides. Give the structure and uses of amphetamine and acetyl salicylic acid.

9. Depict any two methods for the preparation of carboxylic acid. Discuss the reaction conditions and reagents for the conversion of carboxylic acid to acid chloride, ester, and amide.

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