

**SIR ARTHUR LEWIS COMMUNITY COLLEGE
SCIENCE, TECHNOLOGY, INNOVATION AND SUSTAINABILITY**

**2024 – 2025 ACADEMIC YEAR - SEMESTER I
END OF SEMESTER EXAMINATION**

COURSE TITLE : ORGANIC CHEMISTRY 1

COURST CODE : CHM215

LECTURER : LERALYN HUNTE-MARTY

DATE : Thursday 19th December 2024

TIME : 9.00 – 11.00 AM

DURATION : 2 HRS

STUDENT ID# :

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

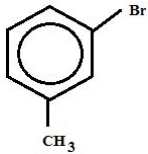
1. Write your student's ID number on all the work you hand in.
2. This paper consists of TWO Sections.
3. SECTION 1 consists of 50 multiple-choice questions. Circle the correct on your question paper.
4. SECTION 2 consists of three (3) compulsory structured questions. Answer on the question paper.
5. The use of a silent, non-programmable, scientific calculator is permitted
6. Draw structural and displayed formulae using a blue or black pen
7. Do not use correction fluid.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO

SECTION I – MULTIPLE CHOICE QUESTIONS

1. The isomers of a substance must have
 - A. same chemical properties
 - B. same molecular weight
 - C. same structural formula
 - D. same functional groups
2. Compounds with the same molecular formula but different structural formulae are called
 - A. Alkoxides
 - B. Iso compounds
 - C. Isomers
 - D. Ortho compounds
3. Ethanol ($\text{CH}_3\text{CH}_2\text{OH}$) and dimethyl ether (CH_3OCH_3) are best considered:
 - A. structural isomers
 - B. stereoisomers
 - C. enantiomers
 - D. diastereomers
4. Alkenes show geometrical isomerism due to:
 - A. Asymmetry
 - B. Rotation around a single bond
 - C. Resonance
 - D. Restricted rotation around a double bond
5. A molecule is said to be chiral
 - A. if it contains plane of symmetry
 - B. if it contains centre of symmetry
 - C. if it cannot be superimposed on its mirror image
 - D. if it can be superimposed on its mirror image
6. 2-Butanol is optically active because it contains:
 - A. an asymmetric carbon
 - B. a plane of symmetry
 - C. a hydroxyl group
 - D. a centre of symmetry
7. The chlorination of methane to give CCl_4 is an example of
 - A. an electrophilic addition
 - B. a free-radical substitution
 - C. a nucleophilic addition
 - D. an electrophilic substitution
8. In the reaction of propene with HCl , H^+ ion acts as the:
 - A. electrophile
 - B. carbonium ion
 - C. nucleophile
 - D. carbanion
9. Propene reacts with bromine to form 1, 2-dibromopropane. This is an example of
 - A. Nucleophilic addition
 - B. Electrophilic addition
 - C. Nucleophilic substitution
 - D. Electrophilic substitution

10. Markovnikov's addition of HBr is not applicable to
- Propene
 - 1-butene
 - 1-pentene
 - 2-butene
11. Which of the following compounds will react most readily with bromine in CCl_4 ?
- $\text{CH}_3\text{CH}_2\text{CH}_3$
 - $(\text{CH}_3)_3\text{CH}$
 - $\text{CH}_3\text{CH}=\text{CH}_2$
 - $(\text{CH}_3)_4\text{C}$
12. Which of the following reagents will react with propene?
- Hot alkaline KMnO_4
 - Sodium metal
 - Cold dilute HNO_3
 - LiAlH_4
13. A compound reacts with steam in the presence of concentrated H_2SO_4 to give isopropyl alcohol. The compound could be
- Alkane
 - Alkyne
 - Alkene
 - Allene
14. How should $\text{CH}_3\text{CHClCH}_2\text{CH}_3$ be classified?
- primary alkyl halide
 - secondary alkyl halide
 - tertiary alkyl halide
 - quarternary alkyl halide
15. Which of the following species is most reactive in a $\text{S}_\text{N}2$ reaction?
- $\text{CH}_3\text{CH}_2\text{Cl}$
 - $\text{CH}_3\text{CH}_2\text{Br}$
 - $\text{CH}_3\text{CH}_2\text{I}$
 - $\text{CH}_3\text{CH}_2\text{F}$
16. Which of the following is the rate law for $\text{S}_\text{N}1$ mechanisms?
- Rate = k [Alkyl Halide] [Nucleophile]
 - Rate = k [Nucleophile]
 - Rate = k [Alkyl Halide]
 - Rate = k_1 [Alkyl Halide] + k_2 [Nucleophile]
17. Which of the following factors has no effect on the rate of $\text{S}_\text{N}1$ reactions?
- the nature of the alkyl halide
 - the nature of the leaving group
 - the concentration of the alkyl halide
 - the concentration of the nucleophile
18. Which of the following is the best leaving group?
- F^-
 - Cl^-
 - Br^-
 - I^-

19. Which of the following is the strongest nucleophile in an aqueous solution?
- OH^-
 - Cl^-
 - Br^-
 - I^-
20. Which of the following is incorrect concerning alkyl halides' substitution and elimination reactions?
- The electrophile replaces the leaving group.
 - Compounds containing electron-donating groups bonded to an sp^3 hybridized carbon undergo substitution and elimination reactions.
 - The electronegative atom is replaced by another atom or group in substitution reactions.
 - (a) and (b)
21. The best name for the following compound is:
- 
22. Which of the following statements are correct concerning benzene?
- Benzene is a planar molecule.
 - The six carbon-carbon bonds have the same length.
 - Benzene has alternating single and double bonds.
 - (a) and (b)
23. Which of the following statements is incorrect about benzene?
- All of the carbon atoms are sp hybridized.
 - It has delocalized electrons.
 - The carbon-carbon bond lengths are all the same.
 - All twelve atoms lie in the same plane.
24. The delocalized π system in benzene is formed by a cyclic overlap of 6 orbitals.
- s
 - p
 - sp
 - sp^2
25. Which of the following is not a correct statement about the electrophilic substitution mechanism of benzene?
- Benzene functions as a nucleophile.
 - Formation of a carbocation intermediate is the rate-determining step.
 - The carbocation intermediate contains an sp^3 hybridized carbon in the ring.
 - The addition product is a frequently observed minor product.
26. The C–C bond length in benzene is
- greater than the C–C bond length in ethane.
 - shorter than the C–C bond length in ethene.
 - Same as that of C–C bond length in ethene.
 - intermediate between C–C bond length in ethane and C–C bond length in ethene.

27. Characteristic reactions of aromatic hydrocarbons are initiated by
- Electrophiles
 - Nucleophiles
 - Free radicals
 - Uncharged molecules
28. Which reagents will react with methyl group rather than the benzene ring in methylbenzene?
- Chlorine in the presence of uv light
 - CH_3Cl in the presence of AlCl_3
 - CH_3COCl in the presence of AlCl_3
 - Hydrogen in the presence of nickel
29. Methyl Benzene (Toluene) undergoes oxidation to give
- Benzyl alcohol
 - Quinone
 - Benzaldehyde
 - Benzoic acid
30. Benzene reacts with concentrated HNO_3 in the presence of concentrated H_2SO_4 to give nitrobenzene. This reaction is an example of
- Electrophilic addition
 - Nucleophilic addition
 - Electrophilic substitution
 - Nucleophilic substitution
31. Which of the following agents is used in order to make benzene react with bromine to give bromobenzene?
- Ultraviolet light
 - Fe catalyst
 - Nickel catalyst
 - Al_2O_3 catalyst
32. Phenol is
- stronger acid than acetic acid
 - weaker acid than ethanoic acid
 - stronger base than methylamine
 - weaker base than methylamine
33. Which of the following compounds does not give a positive iodoform test:
- Ethanol
 - Ethanal
 - Methanol
 - Propanone
34. An organic compound (A), $\text{C}_3\text{H}_8\text{O}$, on oxidation gives (B), $\text{C}_3\text{H}_6\text{O}$. The compound (B) could be
- a carbonyl compound
 - an alcohol
 - a carboxylic acid
 - an ether
35. Which of the following is a secondary alcohol?
- 3-ethyl-2-methyl-1-pentanol
 - 3-ethyl-2-methyl-2-heptanol
 - 3-methyl-2-hexanol
 - 1-hexanol

36. What is the functional group in an alcohol?
- Carbon-carbon double bond
 - NH_2
 - OH
 - COOH
37. Oxidation of a primary alcohol with produces
- a carboxylic acid
 - an ether
 - a ketone
 - an ester
38. Ketones are prepared by the oxidation of
- Primary alcohol
 - Secondary alcohol
 - Tertiary alcohol
 - None of these
39. Which statement about the carbonyl group of ketones and aldehydes is true?
- It can attract nucleophiles.
 - It can attract electrophiles.
 - It tends to undergo addition reactions.
 - It tends to undergo substitution reactions.
- I and III
 - II and IV
 - I, II, and III
 - I, III, and IV
40. Acetone reacts with HCN to form a cyanohydrin. It is an example of
- Electrophilic addition
 - Electrophilic substitution
 - Nucleophilic addition
 - Nucleophilic substitution
41. Aldehydes undergo oxidation with KMnO_4/H^+ to give
- Alcohols
 - Acetals
 - Ketones
 - Acids
42. Oxidation of Ethanal with $\text{Na}_2\text{Cr}_2\text{O}_7/\text{H}^+$ gives
- Ethylene glycol
 - Acetic acid
 - Ethanol
 - Acetone
43. A hydrazone will result from the reaction of hydrazine with
- a phenol
 - an aldehyde
 - an alcohol
 - an acid
44. Aldehydes can be distinguished from ketones by using
- Ammoniacal AgNO_3 solution
 - Phenylhydrazine
 - Saturated NaHSO_3 solution
 - Thionyl chloride

45. The appearance of a silver mirror in Tollens' test indicates the presence of:
- an aldehyde
 - a ketone
 - an alcohol
 - an alkene
46. In the conversion of wine to vinegar
- Ethanol is oxidized to acetic acid
 - Ethanol is reduced to acetic acid
 - Methanol is oxidized to acetic acid
 - Methanol is reduced to acetic acid
47. The greater acidity of carboxylic acids compared to alcohols arises primarily from:
- the electron-donating effect of the hydroxyl group
 - the electron-withdrawing effect of the carboxyl oxygen
 - the acidity of α -hydrogens of carboxylic acids
 - the resonance stability associated with the carboxylate ion
48. Which of the following statements is false about the acid-strength of acetic/ethanoic acid?
- Acetic acid is a stronger acid than monochloroacetic acid.
 - Acetic acid is a stronger acid than propionic acid.
 - Acetic acid is a weaker acid than trichloroacetic acid.
 - Acetic acid is a weaker acid than formic acid.
49. Which of the following will give ethanoic acid on acid-hydrolysis?
- Ethyl ethanoate
 - Propanone
 - Methyl propanoate
 - Lactic acid
50. Which of the following compounds on treatment with NaHCO_3 will liberate CO_2 ?
- Ethanoic acid
 - Ethylamine
 - Propanone
 - Ethanol

SECTION II

Question 1

- a. Suggest suitable reagents and conditions for the following reactions of Propan-1-ol [6]

Reactants	Products	Reagents & Conditions
i. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	$\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$	
ii. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	$\text{CH}_3\text{CH}_2\text{COOH}$	
iii. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	$\text{CH}_3\text{CH}=\text{CH}_2$	

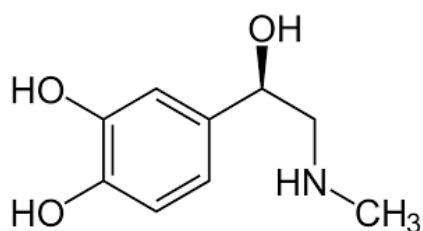
- b. What product would be formed in each case if Propan-2-ol is used instead of Propan-1-ol? Draw the displayed formula for each product. [3]

- c. What type of alcohol is propan-1-ol and propan-2-ol? [2]

TOTAL 10 MARKS

Question 2

Adrenalin is a hormone secreted directly into the bloodstream and acts as a stimulant. It has a structure.

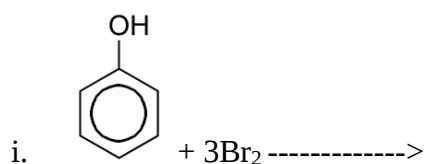


a. Name the three functional groups present in the adrenalin molecule [3]

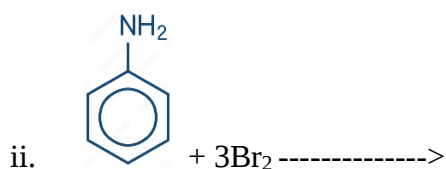
b. Using an asterisk, identify the chiral centre in the structure of adrenalin drawn above [1]

c. Phenol and phenylamine are each slightly soluble in water and give saturated solutions containing 0.7 mol dm^{-3} and 0.3 mol dm^{-3} , respectively. Both compounds react with aqueous bromine.

Complete the balanced chemical equation for the following reactions. What would you observe when these reactions are carried out? [5]



Observation:



Observation:

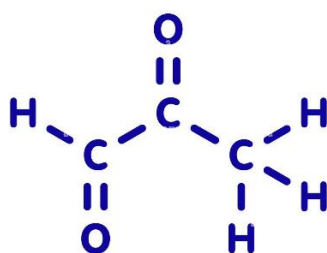
TOTAL 10 MARKS

Question 3

Carbonyl compounds react with hydrogen cyanide to form cyanohydrins.

- Name the type of reaction. [1]
- Describe the mechanism of the reaction between ethanol and hydrogen cyanide, state any other reagents needed, and include the structural formula of any intermediate as well as of the product [3]

- 2-Oxopropanal is one of several components responsible for the characteristic smell of burnt sugar.



Complete the table by describing your observations when the above compound is

Reactions	Observations	Structural Formula
i. heated gently with acidified potassium dichromate (VI)		
ii. added to alkaline aqueous Iodine		
iii. warmed gently with Fehling's solution		

In each case suggest the structural formula of each organic product [6]

TOTAL 10 MARKS

END OF EXAMINATION

