

CHAPTERWISE QUESTION

CHEMISTRY

Class XII

Time : 1½ hrs.

Marks : 35

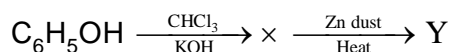
ALCOHOLS, PHENOLS AND ETHERS

SET A

SECTION - A

7 × 1 = 7

- Tertiary butyl alcohol gives tertiary butyl chloride on treatment with
 - ConcHCl/anhydrous ZnCl₃
 - KCN
 - NaOCl
 - Cl₂
- Propanone on reaction with alkyl magnesium bromide followed by hydrolysis will produce
 - Primary alcohol
 - Secondary alcohol
 - Tertiary alcohol
 - Carboxylic acid
- Benzoquinone is prepared by reaction of phenol with
 - Na₂Cr₂O₇, H₂SO₄
 - KMnO₄, H₂SO₄
 - Na₂CrO₄, HCl
 - K₂MnO₄, H₂SO₄
- What happens when tertiary butyl alcohol is passed over heated copper at 300°C?
 - Secondary butyl alcohol is formed
 - 2-methylpropene is formed
 - 1-butene is formed
 - Butanol is formed
- An unknown alcohol is treated with "Lucas reagent" to determine whether the alcohol is primary, secondary or tertiary. Which alcohol reacts fastest and by what mechanism?
 - Tertiary alcohol by SN¹
 - Secondary alcohol by SN¹
 - Tertiary alcohol by SN²
 - Secondary alcohol by SN²
- Correct statements in case of n-butanol and t-butanol are :
 - both are having equal solubility in water
 - t-butanol is more soluble in water than n-butanol
 - boiling point of t-butanol is lower than n-butanol
 - boiling point of n-butanol is lower than t-butanol
 - Only (iii)
 - Both (ii) and (iii)
 - Both (iii) and (iv)
 - (i), (iii) and (iv)
- Identify Y in the following reaction sequence



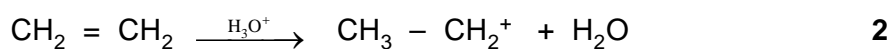
- Benzene
- Benzaldehyde
- Phenol
- None of these

In the following questions (No. 8-9) a statement of Assertion followed by a statement of Reason is given. Choose the correct answer out of the following choices. 2 × 1 = 2

- a) If both the assertion and the reason are true and the reason is a correct explanation of the assertion.
- b) If both the assertion and reason are true but the reason is not a correct explanation of the assertion.
- c) Assertion is true but reason is false
- d) Assertion is false but reason is true.
8. Assertion (A) : The boiling point of ethanol is more than that of methoxy methane.
Reason (R) : In ethanol intramolecular hydrogen bonding is present.
9. Assertion (A) : Secondary alcohol reacts faster with metal like Na than primary alcohol.
Reason (R) : O-H bond in secondary alcohol is less polar than primary alcohol.

SECTION - B

10. a) Arrange the following compounds in the increasing order of their acid strength : p-cresol, p-nitrophenol, phenol
- b) Write the mechanism (using curved arrow notation) of the following reaction :



11. Which compound in each of the following pairs will react faster in S_N2 reaction with –OH? Why?
- i) CH₃Br or CH₃I ii) (CH₃)₃CCl or CH₃Cl **2**

12. Illustrate the following reactions giving a chemical equation for each:

- i) Kolbe’s reaction
- ii) Williamson’s synthesis of an ether **2**

13. Answer the following questions.

- a) What is denaturation of an alcohol?
- b) Why alcohols and phenols are soluble in water? **2**

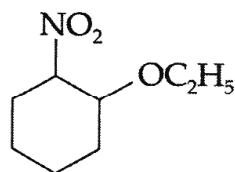
SECTION - C

14. Explain the mechanism of the following reactions :

- i) Addition of Grignard’s reagent to the carbonyl group of a compound forming an adduct followed by hydrolysis.
- ii) Acid catalysed dehydration of an alcohol forming an alkene.
- iii) Acid catalysed hydration of an alkene forming an alcohol. **3**

15. a) How would you obtain the following :
- 2-methylpentan-2-ol from 2-methyl-1-pentene
 - Acetophenone from phenol

b) Write IUPAC name of the following :



3

16. Give reasons for the following.

- Phenol is more acidic than methanol.
- The C–O–H bond angle in alcohols is slightly less than the tetrahedral angle ($109^{\circ}28'$)
- $(\text{CH}_3)_3\text{C–O–CH}_3$ on reaction with HI gives $(\text{CH}_3)_3\text{C–I}$ and $\text{CH}_3\text{–OH}$ as the main products and not $(\text{CH}_3)_3\text{C–OH}$ and $\text{CH}_3\text{–I}$.

3

OR

Account for the following :

- The boiling point of ethanol is higher than that of methanol.
- Phenol is a stronger acid than an alcohol.
- The boiling points of ethers are lower than isomeric alcohols.

SECTION - D

17. Read the following passage and answer the questions.

Ethers are the least reactive of the functional groups. The cleavage of C-O bond in ethers takes place under drastic conditions with excess of hydrogen halides. The reaction of dialkyl ether gives two alkyl halides. Alkyl aryl ethers are cleaved at the alkyl-oxygen bond due to the more stable aryl-oxygen bond. The order of reactivity of hydrogen halides is as follows: $\text{HI} > \text{HBr} > \text{HCl}$. The cleavage of ethers takes place with concentrated HI or HBr at high temperature.

- i) What are the products in the reaction of anisole with HBr?

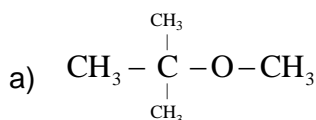
2

OR

What is the product when, tert-Butyl methyl ether on heating with HI?

- ii) Among the following ethers, which one will produce methyl alcohol on treatment with hot concentrated HI?

1



- iii) Chloroethane reacts with which of the following to give Diethyl Ether?

1

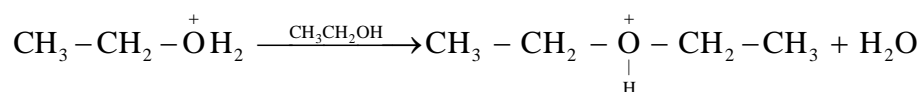
- a) NaOH b) H_2SO_4 c) $\text{C}_2\text{H}_5\text{ONa}$ d) $\text{Na}_2\text{S}_2\text{O}_3$

3

C - Ch-Alcohols, Phenols (A)

SECTION - E

18. a) Write the formula of reagents used in the following reactions :
- Bromination of phenol to 2, 4, 6-tribromophenol
 - Hydroboration of propene and then oxidation to propanol.
- b) Arrange the following compound groups in the increasing order of their property indicated:
- p-nitrophenol, ethanol, phenol (acidic character)
 - Propanol, Propane, Propanal (boiling point)
- c) Write the mechanism (using curved arrow notation) of the following reaction :



5

OR

- a) How are following conversions done?
- 1 - Propanol to 1 - Bromopropane
 - 1 - Chloropropane to 1 - Propanol
 - 2-Methyl-1-pentene to 2-Methyl-2-pentanol
 - Phenol to Phenyl ethanoate.
- b) What happens when anisole is treated with the mixture of concentrated sulphuric acid and nitric acid? Write the chemical reaction involved.

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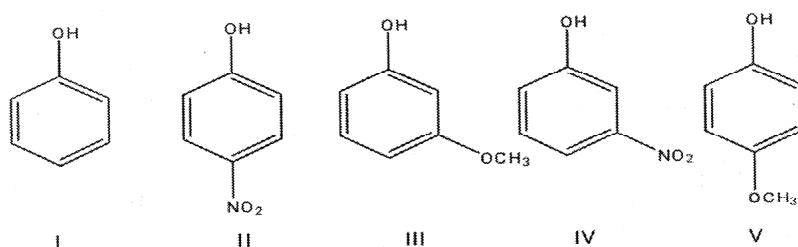
SET B

SECTION - A

7 × 1 = 7

1. The decreasing order of boiling point of the following alcohols is
 - a) 3-methylbutan-2-ol > 2-methylbutan-2-ol > pentan-1-ol
 - b) Pentan-1-ol > 3-methylbutan-2-ol > 2-methylbutan-2-ol
 - c) 2-methylbutan-2-ol > 3-methylbutan-2-ol > pentan-1-ol
 - d) 2-methylbutan-2-ol > pentan-1-ol > 3-methylbutan-2-ol
2. Phenol when treated with excess of bromine water gives a white precipitate of
 - a) 2, 4, 6-tribromophenol
 - b) o-bromophenol
 - c) p-bromophenol
 - d) bromobenzene
3. Conversion of phenol to salicylic acid and to salicylaldehyde are known as (respectively)
 - a) Reimer-Tiemann reaction and Kolbe's reaction
 - b) Williamson's synthesis and Hydroboration-oxidation
 - c) Kolbe's reaction and Williamson's synthesis
 - d) Kolbe's reaction and Reimer-Tiemann reaction
4. An ether is more volatile than alcohol having the same molecular formula. This is due to
 - a) intermolecular hydrogen bonding in alcohols
 - b) dipolar character of ethers
 - c) alcohols, having resonance structures
 - d) intermolecular hydrogen bonding in ethers
5. A compound X with the molecular formula C_3H_8O can be oxidised to another compound Y whose molecular formulae is $C_3H_6O_2$. The compound X may be
 - a) $CH_3CH_2OCH_3$
 - b) CH_3CH_2CHO
 - c) $CH_3CH_2CH_2OH$
 - d) $CH_3CHOHCH_3$
6. Arrange the following alcohols in order of increasing reactivity towards sodium metal.
 - i) $(CH_3)_3C-OH$ ii) $(CH_3)_2CH-OH$ iii) CH_3CH_2OH
 - a) (iii) < (ii) < (i) b) (ii) > (i) < (iii) c) (i) < (ii) < (iii) d) (iii) < (i) < (ii)

7. The correct order of decreasing acid strength of the following compounds is



- a) V > IV > II > I > III b) II > IV > I > III > V
c) IV > V > III > II > I d) II > IV > III > V > I

In the following questions (No. 8-9) a statement of Assertion followed by a statement of Reason is given. Choose the correct answer out of the following choices. $2 \times 1 = 2$

- a) If both the assertion and the reason are true and the reason is a correct explanation of the assertion.
b) If both the assertion and reason are true but the reason is not a correct explanation of the assertion.
c) Assertion is true but reason is false.
d) Assertion is false but reason is true.
8. Assertion (A) : Phenol is more reactive than benzene towards electrophilic substitution reactions.

Reason (R) : -OH group in phenols is electron donating ring activating group.

9. Assertion (A) : $(\text{CH}_3)_3\text{C}-\text{O}-\text{CH}_3$ on reaction with HI gives $(\text{CH}_3)_3\text{C}-\text{I}$.

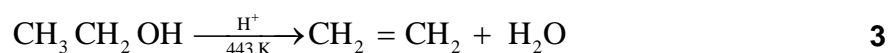
Reason (R) : The reaction takes place by SN^1 mechanism.

SECTION - B

10. a) Predict the major product of acid catalysed dehydration of 1-Methylcyclohexanol.
b) You are given benzene, conc. H_2SO_4 , NaOH and dil.HCl. Write the preparation of phenol using these reagents. **2**
11. Write the reagents required in the following reactions :
i) $\text{CH}_2 = \text{CH} - \text{CH}_2\text{OH} \xrightarrow{?} \text{CH}_2 = \text{CH} - \text{CHO}$
ii) $\text{CH}_3 - \text{COOH} \xrightarrow{?} \text{CH}_3 - \text{CONH}_2$ **2**
12. Explain the following reactions with an example for each "
i) Reimer-Tiemann reaction ii) Friedel-Crafts reaction **2**
13. Answer the following questions
a) Phenols do not give protonation reactions readily. Why?
b) What is the cause of large difference in boiling points of alcohols and ethers? **2**

SECTION - C

14. Explain the following observations :
- i) The boiling point of ethanol is higher than that of methoxymethane.
 - ii) Phenol is more acidic than ethanol.
 - iii) o- and p- nitrophenols are more acidic than phenol. 3
15. a) Give a separate chemical test to distinguish between the following pairs of compounds:
- i) Ethanol and Phenol
 - ii) 2-Pentanol and 3-Pentanol
- b) Explain Kolbe's reaction with the help of suitable example. 3
16. Write the mechanism of acid dehydration of ethanol to yield ethene :



OR

Account for the following :

- i) The boiling points of alcohols decrease with increase in branching of the alkyl chain.
- ii) Phenol does not give protonation reaction readily.
- iii) Phenylmethyl ether reacts with HI to give Phenol and Methyl iodide and not Iodobenzene and Methyl alcohol.

SECTION - D

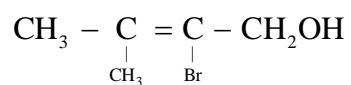
17. Read the following passage and answer the questions.

A compound (X) containing C, H and O is unreactive towards sodium. It also does not react with Schiff's reagent. On refluxing with an excess of hydroiodic acid, (X) yields only one organic product (Y). On hydrolysis, (Y) yields a new compound (Z) which can be converted into (Y) by reaction with red phosphorous and iodine. The compound (Z) on oxidation with potassium permanganate gives a carboxylic acid. The equivalent weight of this acid is 60.

- i) The compound (X) is an
 - a) acid
 - b) aldehyde
 - c) alcohol
 - d) ether1
- ii) Write the IUPAC name of the acid formed. 1
- iii) Name the compound (Y) and (Z). 1
- iv) What is the product formed when, compound (X) on treatment with excess of Cl_2 in presence of light? 1

SECTION - E

18. a) Write IUPAC names of the following :



b) Give mechanism of preparation of alcohols from alkenes (Acid catalysed hydration).

c) How are the following obtained?

i) Toluene from phenol

ii) Phenol from aniline.

5

OR

a) Give reason for the following :

i) *t*-butyl chloride on heating with sodium methoxide gives 2-methylpropene instead of *t*-butylmethylether.

ii) C – O bond in phenol is much shorter than ethanol.

b) Give chemical test to distinguish between the following pair of compounds :

Methanol and propan-2-ol

c) Write IUPAC name of the following :

