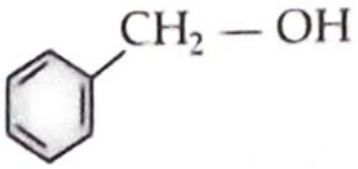
Level - 1

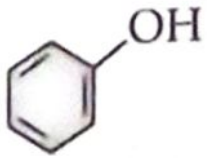
CORE SUBJECTIVE QUESTIONS

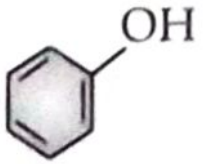
MULTIPLE CHOICE QUESTIONS (MCQs)

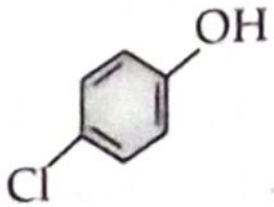
(1 Mark)

Q. 1. Which of the following is most acidic?

(A) 

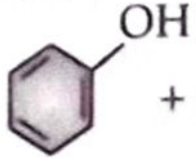
(B) 

(C) 

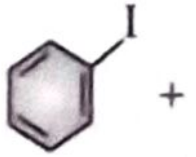
(D) 

[Ap] [CBSE 2024]

Q. 2. Anisole reacts with HI to give:

(A) 

$+ CH_3 - I$

(B) 

$+ CH_3 - OH$

(C)  + $CH_3 - I$

(D)  + $CH_3 - OH$

[Ap] [CBSE 2024]

Q. 3. Ethanol on heating with conc. H_2SO_4 at 413 K gives:

(A) $C_2H_5OSO_3H$ (B) C_2H_5-O-CH_3

(C) C_2H_5-O-C_2H_5 (D) $CH_2 = CH_2$

[R] [CBSE 2024]

Q. 4. Which one of the following compounds has the lowest pKa value?

(A) *p*-Cresol

(B) *m*-Nitrophenol

(C) *p*-Nitrophenol

(D) 2, 4, 6-Trinitrophenol **[A] [CBSE 2024]**

Q. 5. $(CH_3)_2CH - O - CH_3$ when treated with HI gives:

(A) $(CH_3)_2CHI + CH_3OH$

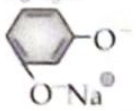
(B) $(CH_3)_2CH - OH + CH_3 - I$

(C) $(CH_3)_2CH - I + CH_3 - I$

(D) $(CH_3)_2CH - OH + CH_3OH$ **[A] [CBSE 2024]**

Q. 6. Which of the following species can act as the strongest base?

(A) OH^- (B) $C_6H_5O^-$

(C) RO^- (D) 

[A] [CBSE 2024]

Q. 7. Match the reagents required for the given reactions:

I	Oxidation of primary alcohols to aldehydes	(p)	$NaBH_4$
II	Butan-2-one to Butan-2-ol	(q)	85% phosphoric acid at 440 K
III	Bromination of Phenol to 2, 4, 6-Tribromophenol	(r)	PCC
IV	Dehydration of propan-2-ol to propene	(s)	Bromine water

(A) I-(r), II - (p), III - (s), IV-(q)

(B) I-(q), II — (r), III — (p), IV - (s)

(C) I-(s), II - (q), III - (p), IV - (r)

(D) I-(p), II — (s), III — (r), IV - (q)

[A] [CBSE 2024]

Q. 8. Out of the following alkenes, the one which will produce tertiary butyl alcohol on acid catalysed hydration is:

(A) $CH_3CH_2CH = CH_2$

(B) $CH_3CH = CH_2$

(C) $CH_3 - CH = CH - CH_3$

(D) $(CH_3)_2C = CH_2$ **[A] [CBSE 2024]**

Q. 9. Which of the following compounds will give a ketone on oxidation with chromic anhydride (CrO_3)?

(A) $(CH_3)_2CH - CH_2OH$

(B) $CH_3CH_2CH_2OH$

(C) $(CH_3)_3C - OH$

(D) $CH_3 - CH_2 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_3$

[A] [CBSE 2024]

Q. 10. The correct order of the ease of dehydration of the following alcohols by the action of conc. H_2SO_4 is:

(A) $(CH_3)_3C - OH > (CH_3)_2CH - OH > CH_3CH_2 - OH$

(B) $(CH_3)_2CH - OH > CH_3CH_2 - OH > (CH_3)_3C - OH$

(C) $(H_3CH_2 - OH > (CH_3)_2CH - OH > (CH_3)_3C - OH$

(D) $(CH_3)_2CH - OH > (CH_3)_3C - OH > CH_3CH_2 - OH$

[A] [CBSE 2024]

Q. 11. Williamson's synthesis of preparing dimethyl ether is a/an:

(A) electrophilic substitution

(B) S_N1 reaction

(C) electrophilic addition

(D) S_N2 reaction **[U] [CBSE Comptt. 2024]**

Q. 12. Which of the following reactions are feasible?

(A) $CH_3CH_2Br + Na^+ \bar{O} - C(CH_3)_3 \rightarrow CH_3CH_2 - OC(CH_3)_3$

(B) $(CH_3)_3C - Cl + Na^+ O - CH_2CH_3 \rightarrow CH_3CH_2O - C(CH_3)_3$

(C) Both (a) and (b)

(D) Neither (a) nor (b) **[A] [CBSE 2023]**

Q. 13. When diethyl ether is heated with excess of HI, it produces:

(A) Ethanol (B) Iodoform

(C) Methyl iodide (D) Neither (a) nor (b)

[U] [CBSE 2023]

Q. 14. Which of the following alcohols will not undergo oxidation ?

(A) Butanol (B) Butan-2-ol

(C) 2-Methylbutan-2-ol (D) 3-Methylbutan-2-ol

[U] [CBSE 2023]

Q. 15. In The reaction $R - OH + HCl \xrightarrow{ZnCl_2} RCl + H_2O$, What is the correct order of reactivity of alchol?

(A) $1^\circ < 2^\circ < 3^\circ$ (B) $1^\circ > 3^\circ > 2^\circ$

(C) $1^\circ > 2^\circ > 3^\circ$ (D) $3^\circ > 1^\circ > 2^\circ$

[U] [CBSE 2023]

Q. 16. Choose the compound which is more acidic than phenol:

(A) o-nitrophenol (B) ethanol

(C) o-methylphenol (D) o-methoxyphenol

[U] [CBSE 2023]

ASSERTION-REASON QUESTIONS (1 Mark)

Directions: two statements are given one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Q. 1. **Assertion (A):** The boiling point of ethanol is higher than that of dimethyl ether.

Reason (R): Ethanol molecules are associated through hydrogen bonding whereas in dimethyl ether, it is not possible. **[Ap] [CBSE 2024]**

Q. 2. **Assertion (A):** *p*-nitrophenol is less acidic than phenol.

Reason (R): Nitrogroup is electron withdrawing and helps in the stabilisation of *p*-nitrophenoxide ion.

[A] [CBSE 2024]

Q. 3. **Assertion (A):** *p*-methoxyphenol is a stronger acid than *p*-nitrophenol.

Reason (R): Methoxy group shows +R effect whereas nitro group shows -I effect. **[A] [CBSE 2024]**

Q. 4. **Assertion (A):** Phenol gives 2,4,6-trinitrophenol on treatment with concentrated HNO_3 and concentrated H_2SO_4.

Reason (R): — OH group in phenol is *m*-directing.

[Ap] [CBSE Comptt. 2023]

VERY SHORT ANSWER TYPE QUESTIONS

LONG ANSWER TYPE QUESTIONS (5 Marks)

Q. 1. (i) Give reasons for the following:

(a) The reaction of ethanol with acetyl chloride is carried out in the presence of pyridine.

(b) Cresols are less acidic than phenol.

(ii) Williamson's process is used for the preparation of ethers from alkyl halide. Identify the alkyl bromide and sodium alkoxide used for the preparation of 2- Ethoxy-3-methylpentane.

[A] [CBSE SQP 2024-25]

Q. 2. (i) Alcohols are acidic but they are weaker acids than water. Arrange various isomers of butanol in the increasing order of their acidic nature. Give a reason for the same.

(ii) An organic compound A which is a Grignard reagent is used to obtain 2-methylbutan-2-ol on reaction with a carbonyl compound 'B' . Identify A' and 'B'. Write the equation for the reaction between A and B.

[Ap] [CBSE SQP 2024-25]

Q. 3. (i) Write the formula of reagents used in the following reactions:

(1) Bromination of phenol to 2,4,6-tribromophenol

(2) Hydroboration of propene and then oxidation to propanol.

(ii) Arrange the following compound groups in the increasing order of their property indicated:

(1) p-nitrophenol, ethanol, phenol (acidic nature)

(2) Propanal, Propane, Propanol (boiling point)

(iii) Write the mechanism (using curved arrow notation) of the following reaction:

$$CH_3-CH_2-\overset{+}{O}H_2 \xrightarrow{CH_3CH_2OH} CH_3-CH_2-O-CH_2-CH_3 + H_2O$$

[AI] [Ap] + [U]

Q. 4. Write the mechanism of the reaction of HI with methoxymethane. **[Ap]**

Level - 2 ADVANCED COMPETENCY FOCUSED QUESTIONS

MULTIPLE CHOICE QUESTIONS (MCQs) (1 Mark)

Q. 1. On oxidation, an alcohol gave a product X which reduced Tollens' reagent.

Which of the following could the alcohols be?

(P) CH_3-CH_2-CH_2OH

(Q) CH_3-CH_2-CHOH - CH_3

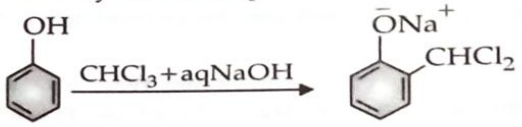
(R) CH_3-CH_2-C $(CH_3)_2$ - OH

(A) only P (B) only P or Q

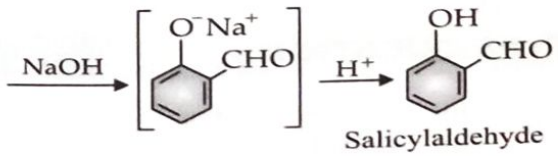
(C) only Qor R (D) any of P, Q or R

[A] [CBSE CFPQ]

Q. 2. Identify the electrophile in the following reaction.



Intermediate



Salicylaldehyde

(A) CCl_3 (B) $:CCl_2$

(C) $*CHCl_2$ (D) *CHO

[A] [CBSE CFPQ]

Q. 3. Ethanol is used as a fuel additive in automobiles. Which of the following properties makes it suitable for this purpose?

(A) It is a weak acid

(B) It burns with a sooty flame

(C) It is miscible with petrol and increases octane rating

(D) It reacts violently with air **[U]**

Q. 4. Which of the following explains why phenol is used in the manufacture of antiseptics like Dettol?

(A) It is highly basic and reacts with skin proteins

(B) It forms ethers easily

(C) It has antiseptic properties due to its ability to denature proteins

(D) It evaporates quickly leaving no residue **[U]**

Q. 5. Glycerol is commonly used in cosmetic products. This is because glycerol:

(A) Is acidic in nature and exfoliates skin

(B) Is a tri-alcohol and absorbs moisture from the air

(C) Forms esters with oils

(D) Acts as a catalyst in soap formation **[U]**

Q. 6. Which of the following alcohols is used as an industrial solvent and antifreeze agent?

(A) Ethanol (B) Methanol

(C) Propanol (D) Ethylene glycol **[R]**

Q. 7. Why is methanol considered highly dangerous for human consumption?

(A) It acts as a mild laxative

(B) It forms esters in the stomach

(C) It metabolises into formaldehyde and formic acid

(D) It is completely excreted unchanged [U]

Q. 8. Anisole is often used as a precursor in perfume industries. This is due to:

(A) Its sweet odour and ether functional group

(B) Its high boiling point

(C) Its acidic nature due to phenyl group

(D) Its ability to form polymers easily [U]

ASSERTION-REASON QUESTIONS (1 Mark)

Directions: For below questions, two statements are given one labelled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

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(D) Assertion (A) is false, but Reason (R) is true.

Q. 1. **Assertion (A):** The carbon-oxygen bond length in phenol is slightly less than that in methanol.

Reason (R): The hybridised state of carbon to which oxygen is attached sp^3 in phenol. [Ap] [CBSE CFPQ]

Q. 2. **Assertion (A):** The addition of diborane to alkene followed by treatment with alkaline H_2O_2 yields alcohols.

Reason (R): Hydroboration is an addition reaction, where a C-C bond is broken, and two new single bonds to C are formed. [E] [CBSE CFPQ]

Q. 3. **Assertion (A):** Tertiary alcohols resist oxidation under mild conditions.

Reason (R): Tertiary alcohols do not have any hydrogen atom on the carbon carrying the –OH group. [A]

Q. 4. **Assertion (A):** Phenol is more acidic than ethanol.

Reason (R): The phenoxide ion formed after the loss of a proton is resonance stabilised. [A]

Q. 5. **Assertion (A):** Ethers show lower boiling points than alcohols of comparable molecular mass.

Reason (R): Ethers do not form hydrogen bonds between their own molecules. [A]

Q. 6. **Assertion (A):** The dehydration of ethanol gives ethene when heated with concentrated H_2SO_4.

Reason (R): Sulphuric acid acts as a dehydrating agent, removing water molecules during the reaction. [A]

CASE BASED QUESTIONS (4 Mark)

Q. 1. Alkene hydration is a catalytic process that involves the addition of water across the double bond of an alkene to produce an alcohol. This is the most direct and atom economical approach to the synthesis of alcohols. Acid - catalysed alkene hydration is the most well - known hydration process. This process is used industrially with several different acidic species as the catalyst, including zeolites, oxides, solid phosphoric acid and sulphuric acid. These are several major drawbacks with this catalytic process. The first drawback is the acidic environment which is very corrosive and can lead to degradation of reactors or the need to use specially engineered and expensive reactors to resist the acidic conditions Another drawback is the acidic environment required for hydration is suitable for alkanes with acid-sensitive functional groups. Thus, this process is typically only used with simple alkanes such as ethylene, propylene and butanes. The final and biggest drawback is the selectivity of the reaction. Acid catalysed hydration follows Markovnikov's rule which states that the proton will add to the carbon with the most hydrogens attached to it. Therefore, starting with propylene, acid- catalysed hydration will always be selective for internal alcohols (secondary or tertiary). Except of ethanol, primary alcohols cannot be synthesised by acid-catalysed hydration. Generally, primary alcohols are the more valuable commodity industrially. Therefore, different synthetic strategies have to be invented for the synthesis of primary alcohols.

Answer the following questions:

(i) Draw structure of 2-methyl propan-2-ol. **(1)**

(ii) What happens when propene react with water under acidic condition? **(1)**

(iii)(a) Write the mechanism of acid catalysed dehydration of ethanol to ethcne.

OR

(a) Explain the following behaviours:

(1) Alcohol are more soluble to water then the hydrocarbon of comparable molecular masses.

(2) Ortho-nitrophenol is more acidic than ortho/ **[Ap] (2)**

Q. 2. An owner of a paint company who was using ethanol as solvent noted that his stock of ethanol was misused by his employees. To prevent this, he decided to add small amount of blue coloured compound (A) and another nitrogen containing heterocyclic base (B) which gives a font smell to alcohol.

Answer the following questions:

(i) Do you think that he took right decision. **(1)**

(ii) Write the names of the compound A and B. **(1)**

(iii)(a) Consumption of methylated ethanol by person can cause blindness and even death. How is methanol poisioning treated?

OR

(b) How does the addition of the nitrogen - containing heterocyclic base (B) help in deterring the misuse of ethanol in the paint company? **[Ap](2)**

(5 Marks)