

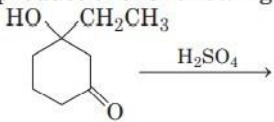
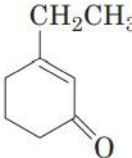
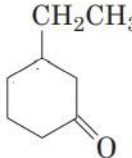
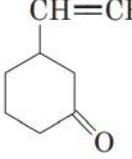
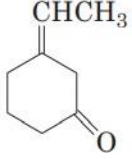
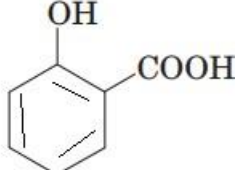


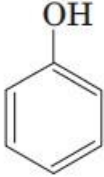

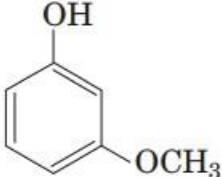
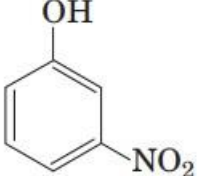

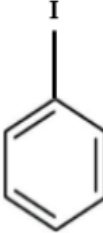
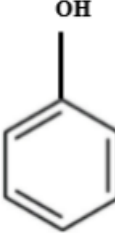
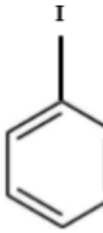
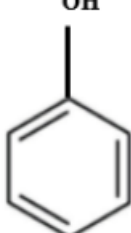
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|  | INDIAN SCHOOL AL WADI AL KABIR | |  |
| Class: XII | DEPARTMENT: SCIENCE 2024 - 25 SUBJECT: CHEMISTRY | | Date:06.05.2024 |
| Worksheet No:02 with answers | TOPIC: ALCOHOLS, PHENOLS & ETHERS | | Note: A4 FILE FORMAT |
| NAME OF THE STUDENT | | CLASS & SEC: | ROLL NO. |
| | | | |

MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

| | |
|---|--|
| 1 | <p><i>Iso-propyl alcohol is</i> <i>(NCERT)</i></p> <p>(a) $\text{CH}_2-\underset{\text{CH}_3}{\text{CH}}-\text{CH}_2-\text{OH}$ (b) $\begin{array}{l} \text{CH}_3 \\ \text{H}_3\text{C} \quad \diagdown \\ \quad \quad \quad \text{C}-\text{OH} \\ \text{H}_3\text{C} \quad \diagup \end{array}$</p> <p>(c) $\text{CH}_3-\underset{\text{CH}_3}{\text{CH}}-\text{OH}$ (d) $\text{CH}_3-\underset{\text{CH}_2-\text{CH}_3}{\text{CH}}-\text{OH}$</p> |
| 2 | <p>The major product of the following reaction is</p> <p>$\text{CH}_3\text{CH}=\text{CHCO}_2\text{CH}_3 \xrightarrow{\text{LiAlH}_4} \quad (2019)$</p> <p>(a) $\text{CH}_3\text{CH}=\text{CHCH}_2\text{OH}$ (b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$ (c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CO}_2\text{CH}_3$ (d) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$</p> |

| | |
|---|--|
| 3 | <p>The reduction,</p> $\text{HC} \begin{array}{c} \text{O} \\ \parallel \end{array} \text{---} \text{C}_6\text{H}_{10} \text{---} \begin{array}{c} \text{O} \\ \parallel \end{array} \text{COCH}_3 \longrightarrow \text{HOH}_2\text{C} \text{---} \text{C}_6\text{H}_{10} \text{---} \begin{array}{c} \text{O} \\ \parallel \end{array} \text{COCH}_3$ <p>can be achieved by using</p> <p>(a) NaBH_4 (b) LiAlH_4 (c) $\text{CuO} \cdot \text{CuCN}_2\text{O}_4$ (d) None of these</p> |
| 4 | $\begin{array}{c} \text{OH} \\ \\ \text{CH}_3\text{CH}_2\text{---C---CH}_3 \\ \\ \text{Ph} \end{array}$ cannot be prepared by (2019) <p>(a) $\text{CH}_3\text{CH}_2\text{COCH}_3 + \text{PhMgX}$ (b) $\text{PhCOCH}_3 + \text{CH}_3\text{CH}_2\text{MgX}$ (c) $\text{PhCOCH}_2\text{CH}_3 + \text{CH}_3\text{MgX}$ (d) $\text{HCHO} + \text{PhCH}(\text{CH}_3)\text{CH}_2\text{MgX}$</p> |
| 5 | <p>In the following reaction, identify X.</p> <p>Methyl magnesium bromide + X \longrightarrow 2-methyl propan-2-ol (NCERT)</p> <p>(a) propanol (b) ethanone (c) propanone (d) butane</p> |
| 6 | <p>What is the correct order of reactivity of alcohols in the following reaction?</p> $\text{R---OH} + \text{HCl} \xrightarrow{\text{ZnCl}_2} \text{R---Cl} + \text{H}_2\text{O}$ <p>(a) $1^\circ > 2^\circ > 3^\circ$ (b) $1^\circ < 2^\circ > 3^\circ$ (c) $3^\circ > 2^\circ > 1^\circ$ (d) $3^\circ > 1^\circ > 2^\circ$</p> |

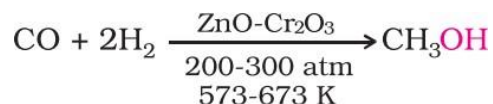
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|---|--|
| 7 | <p>The major product of the following reaction is</p>  <p style="text-align: right;">(2020)</p> <p>(a) </p> <p>(b) </p> <p>(c) </p> <p>(d) </p> |
| 8 | <p>Reaction of tertiary butyl alcohol with hot Cu at 300 °C produces</p> <p>(a) butanol (b) butanal (c) 2-butene (d) 2-methylpropene</p> |
| 9 | <p>IUPAC name of <i>m</i>-cresol is</p>  <p>(a) 0-hydroxybenzoic acid (b) 2-hydroxybenzoic acid (c) Phenol-2-carboxylic acid (d) 6-hydroxybenzoic acid</p> |

| | |
|-----|---|
| 10. | <p>Mark the correct order of decreasing acid strength of the following compounds.</p> <p>I.  II.  III. </p> <p>IV.  V. </p> <p>(a) V > IV > II > I > III (b) II > IV > I > III > V (c) IV > V > III > II > I (d) V > IV > III > II > I</p> |
| 11. | <p>Which of the following is most acidic? (2024)</p> <p>(a) Benzyl alcohol (b) Cyclohexanol (c) Phenol (d) p- Chlorophenol</p> |
| 12 | <p>Anisole on reaction with HI gives: (2024)</p> <p>(a)  + CH₃COOH (b)  + C₂H₅I</p> <p>(c)  + C₂H₅OH (d)  + CH₃I</p> |

| | | | | | | | | | | | |
|---|--|-----------------|-----------------|---|--------------------|------------------------------|--------|---|---------------------------------|--|------------------|
| 13. | Ethanol on heating with conc. H_2SO_4 at 413 K gives: (2024) (a) $\text{C}_2\text{H}_5\text{OSO}_3\text{H}$ (b) $\text{C}_2\text{H}_5\text{-O-CH}_3$ (c) $\text{C}_2\text{H}_5\text{-O-C}_2\text{H}_5$ (d) $\text{CH}_2=\text{CH}_2$ | | | | | | | | | | |
| 14. | Match the reagents required for the given reactions: <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Column A</td> <td style="width: 50%;">Column B</td> </tr> <tr> <td>1. Oxidation of primary alcohols to aldehydes</td> <td>a. NaBH_4</td> </tr> <tr> <td>2. Butan-2-one to Butan-2-ol</td> <td>b. PCC</td> </tr> <tr> <td>3. Bromination of Phenol to 2, 4, 6- Tribromophenol</td> <td>c. 85% phosphoric acid at 440 K</td> </tr> <tr> <td>4. Dehydration of propan-2-ol to propene</td> <td>d. Bromine water</td> </tr> </table> | Column A | Column B | 1. Oxidation of primary alcohols to aldehydes | a. NaBH_4 | 2. Butan-2-one to Butan-2-ol | b. PCC | 3. Bromination of Phenol to 2, 4, 6- Tribromophenol | c. 85% phosphoric acid at 440 K | 4. Dehydration of propan-2-ol to propene | d. Bromine water |
| Column A | Column B | | | | | | | | | | |
| 1. Oxidation of primary alcohols to aldehydes | a. NaBH_4 | | | | | | | | | | |
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| 4. Dehydration of propan-2-ol to propene | d. Bromine water | | | | | | | | | | |
| 15. | Out of the following alkenes, the one that will produce tertiary butyl alcohol on acid catalysed hydration is: (2024) (a) $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$ (b) $\text{CH}_3\text{CH}=\text{CH}_2$ (c) $\text{CH}_3\text{-CH}=\text{CH-CH}_3$ (d) $(\text{CH}_3)_2\text{C}=\text{CH}_2$ | | | | | | | | | | |

Read the given passage and answer the questions that follow: (1 MARK EACH)

Methanol, CH_3OH , also known as ‘wood spirit’, was produced by the destructive distillation of wood. Today, most of the methanol is produced by catalytic hydrogenation of carbon monoxide at high pressure and temperature and in the presence of $\text{ZnO} - \text{Cr}_2\text{O}_3$ catalyst.



Methanol is a colourless liquid and boils at 337 K. It is highly poisonous. Ingestion of even small quantities of methanol can cause blindness and large quantities cause even death. Methanol is used as a solvent in paints, and varnishes and chiefly for making formaldehyde.

16. What happens when methanol is subjected to PCC?

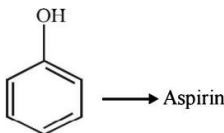
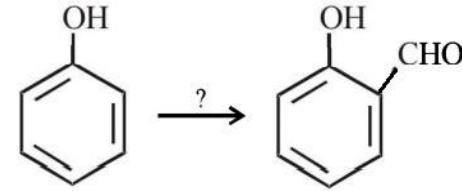
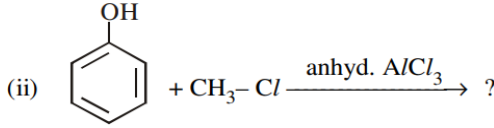
17. Give two applications of methanol.

18. Mention the IUPAC name of the compound formed when methanol is subjected to thionyl chloride.

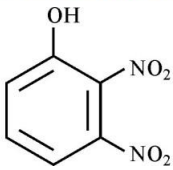
19. Give one commercial preparation of methanol.

20. Which is readily soluble in water – methanol or butan-1-ol.

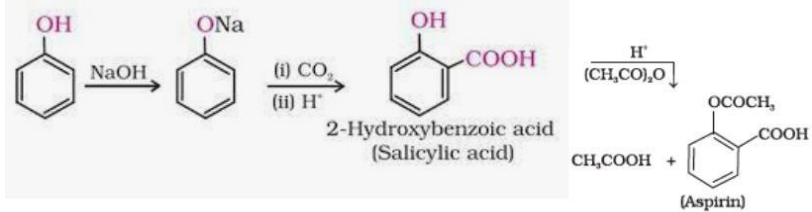
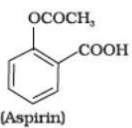
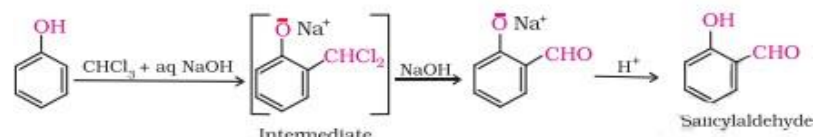
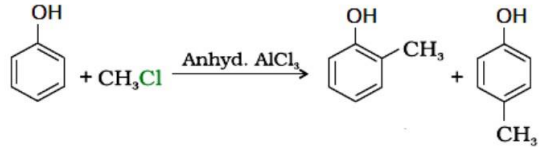
Question – Answer Type: (Previous Years' Board Questions)

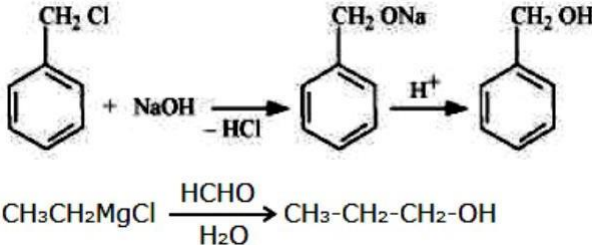
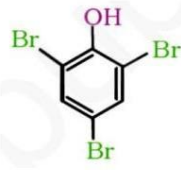
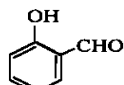
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| 21 | Convert:  | 1 |
| 22 | Give a reason: Acid catalysed dehydration of t-butanol is faster than that of n-butanol. | 1 |
| 23 | Give a chemical test to distinguish : Ethanol and Propan-2-ol | 1 |
| 24 | Complete the following:  | 1 |
| 25 | Complete the equation: $(\text{CH}_3)_3\text{CBr} + \text{NaOMe} \rightarrow$ | 1 |
| 26 | Write the major product in the following equations : (i) $\text{CH}_3 - \text{CH}_2\text{OH} \xrightarrow{\text{PCl}_5} ?$ (ii)  | 2 |
| 27 | $\text{CH}_3 - \text{Cl} + \text{CH}_3\text{CH}_2 - \text{ONa} \rightarrow ?$ a. Identify the name of the reaction. b. What are the products formed. | 2 |
| 28 | How are the following conversions carried out ? (i) Benzyl chloride to Benzyl alcohol (ii) Ethyl magnesium chloride to Propan-1-ol | 2 |
| 29 | Convert the following a. Propene to Propan-2-ol b. Propene to Propan-1-ol | 2 |

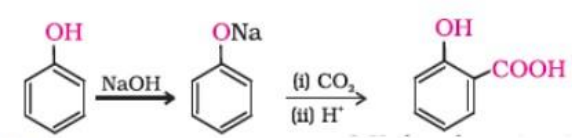
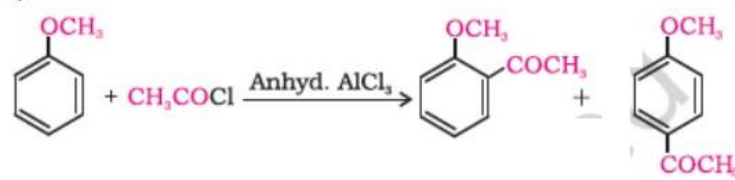
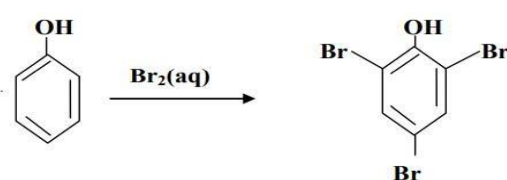

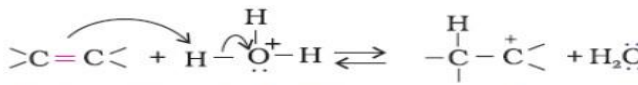
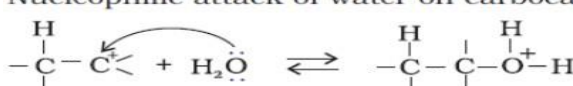
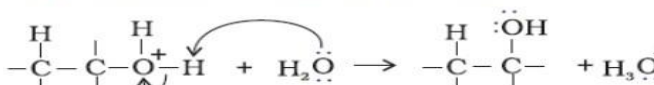
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| 30 | <p>Write the IUPAC name of the given compound :</p> $\text{HO} - \text{CH}_2 - \text{CH} = \underset{\text{CH}_3}{\text{C}} - \text{CH}_3$ <p>Name the reagents used in the following reactions :</p> $\text{CH}_3 - \text{CHO} \xrightarrow{?} \underset{\text{OH}}{\text{CH}_3 - \text{CH}} - \text{CH}_3$ | 2 |
| 31 | <p>Predict the products of the following reactions :</p> <p>(i) $\text{CH}_3 - \text{CH} = \text{CH}_2 \xrightarrow[\text{ii) } 3 \text{H}_2\text{O}_2 / \text{OH}^-]{\text{i) } \text{B}_2\text{H}_6} ?$</p> <p>(ii) $\text{C}_6\text{H}_5 - \text{OH} \xrightarrow{\text{Br}_2 (\text{aq})} ?$</p> <p>(iii) $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow{\text{Cu}/573 \text{ K}} ?$</p> | 3 |
| 32 | <p>(a) Write the major product(s) in each of the following reactions :</p> <p>(i) $\text{CH}_3 - \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{O} - \text{CH}_3 + \text{HI} \longrightarrow$</p> <p>(ii) $\text{CH}_3 - \text{CH}_2 - \underset{\text{OH}}{\text{CH}} - \text{CH}_3 \xrightarrow{\text{Cu}/573 \text{ K}}$</p> <p>(iii) $\text{C}_6\text{H}_5 - \text{OH} \xrightarrow[\text{(ii) } \text{H}^+]{\text{(i) } \text{CHCl}_3 + \text{aq} \cdot \text{NaOH}}$</p> | 3 |
| 33 | <p>Write the chemical reaction involved in the following reactions :</p> <p>(i) Kolbe's reaction</p> <p>(ii) Friedal-Crafts acetylation of anisole</p> <p>Distinguish between :</p> <p>(i) Ethanol and phenol</p> | 2, 1 |
| 34 | <p>What happens when</p> <p>(i) phenol reacts with Bromine water ?</p> <p>(ii) ethanol reacts with CH_3COCl/pyridine ?</p> <p>(iii) anisole reacts with HI ?</p> <p>Write the chemical equations involved in the above reactions.</p> | 3 |

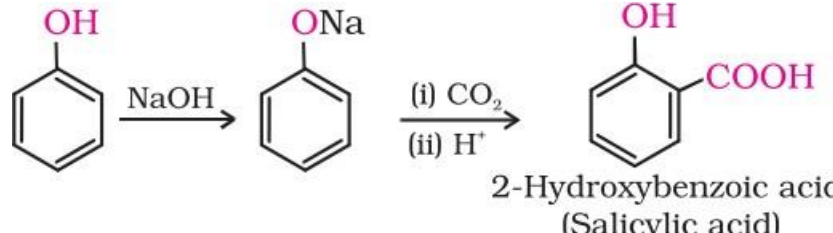
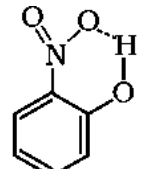
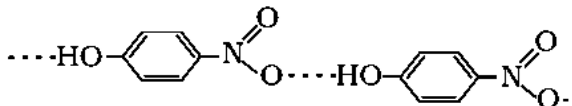
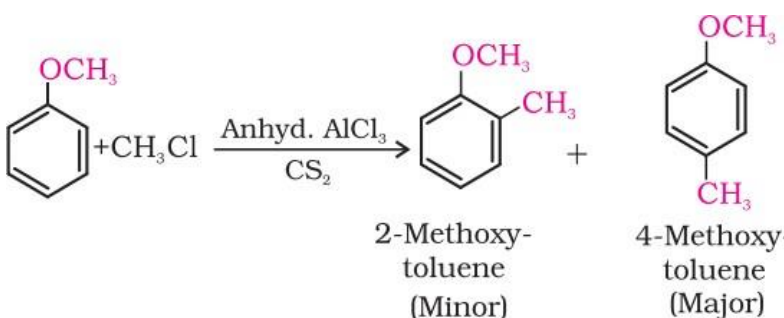
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| 35 | <p>Write IUPAC name of the following compound :</p>  <p>Explain mechanism for hydration of acid catalyzed ethene :</p> $\text{CH}_2 = \text{CH}_2 + \text{H}_2\text{O} \xrightarrow{\text{H}^+} \text{CH}_3 - \text{CH}_2 - \text{OH}$ | 3 |
| 36 | <p>Which of the following reactions are feasible ?</p> <p>(a) $\text{CH}_3\text{CH}_2\text{Br} + \text{Na}^+ \text{O}^- \text{C}(\text{CH}_3)_3 \rightarrow \text{CH}_3\text{CH}_2\text{O} - \text{C}(\text{CH}_3)_3$</p> <p>(b) $(\text{CH}_3)_3\text{C} - \text{Cl} + \text{Na}^+ \text{O}^- \text{CH}_2\text{CH}_3 \rightarrow \text{CH}_3\text{CH}_2\text{O} - \text{C}(\text{CH}_3)_3$</p> <p>(c) Both (a) and (b)</p> <p>(d) Neither (a) nor (b)</p> | 1 [2023] |
| 37 | <p>Write the chemical equation involved in the following :</p> <p>(a) Kolbe's reaction</p> <p>(b) Williamson synthesis</p> | 2 [2023] |
| 38 | <p>(a) (i) Write the mechanism of the following reaction :</p> $2\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[413 \text{ K}]{\text{H}^+} \text{CH}_3 - \text{CH}_2 - \text{O} - \text{CH}_2 - \text{CH}_3 + \text{H}_2\text{O}$ <p>(ii) Why ortho-nitrophenol is steam volatile while para-nitrophenol is not ?</p> <p style="text-align: center;">OR</p> <p>(b) What happens when</p> <p>(i) Anisole is treated with $\text{CH}_3\text{Cl}/\text{anhydrous AlCl}_3$?</p> <p>(ii) Phenol is oxidised with $\text{Na}_2\text{Cr}_2\text{O}_7/\text{H}^+$?</p> <p>(iii) $(\text{CH}_3)_3\text{C} - \text{OH}$ is heated with $\text{Cu}/573 \text{ K}$?</p> <p>Write chemical equation in support of your answer.</p> | 2+1 [2023] 1+1+1 [2023] |

ANSWER KEY

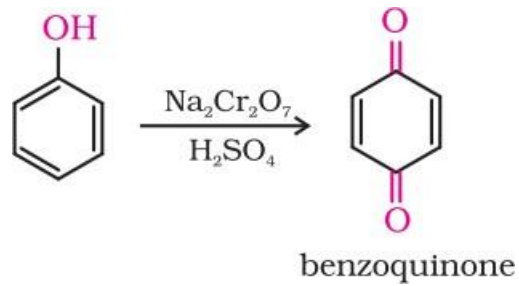
| | |
|----|--|
| 1 | c |
| 2 | a |
| 3 | a |
| 4 | d |
| 5 | c |
| 6 | c |
| 7 | a |
| 8 | d |
| 9 | b |
| 10 | b |
| 11 | d |
| 12 | d |
| 13 | c |
| 14 | 1-b, 2-a, 3-d, 4-c |
| 15 | d |
| 16 | Methanal |
| 17 | paints, varnishes |
| 18 | Chloromethane |
| 19 | $\text{CO} + 2\text{H}_2 \xrightarrow[573-673 \text{ K}]{\text{ZnO-Cr}_2\text{O}_3, 200-300 \text{ atm}} \text{CH}_3\text{OH}$ |
| 20 | methanol (lower carbon chain) |
| 21 |  <p style="text-align: center;">2-Hydroxybenzoic acid (Salicylic acid)</p> <p style="text-align: center;">CH₃COOH +  (Aspirin)</p> |
| 22 | Hint: T. alcohols are more stable than p. alcohols |
| 23 | Hint: Lucas test |
| 24 |  <p style="text-align: center;">Intermediate</p> <p style="text-align: center;">Salicylaldehyde</p> |
| 25 | $\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3 - \text{C} - \text{Br} \\ \\ \text{CH}_3 \end{array} + \text{CH}_3\text{ONa} \xrightarrow{\text{Elimination}} \begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3 - \text{C} = \text{CH}_2 \\ \text{Isobutylene} \end{array} + \text{CH}_3\text{OH} + \text{NaBr}$ |
| 26 | <p>i) $\text{CH}_3\text{-CH}_2\text{OH} \xrightarrow{\text{PCl}_5} \text{CH}_3\text{CH}_2\text{Cl}$</p> <p>ii)</p>  |

| | |
|----|---|
| 27 | a. Williamson Synthesis b. $\text{CH}_3\text{Cl} + \text{CH}_3\text{CH}_2\text{-ONa} \rightarrow \text{CH}_3\text{CH}_2\text{-O-CH}_3 + \text{NaCl}$ |
| 28 |  <p> $\text{C}_6\text{H}_5\text{CH}_2\text{Cl} + \text{NaOH} \xrightarrow{-\text{HCl}} \text{C}_6\text{H}_5\text{CH}_2\text{ONa} \xrightarrow{\text{H}^+} \text{C}_6\text{H}_5\text{CH}_2\text{OH}$ </p> <p> $\text{CH}_3\text{CH}_2\text{MgCl} \xrightarrow[\text{H}_2\text{O}]{\text{HCHO}} \text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$ </p> |
| 29 | a. $\text{CH}_3\text{CH}=\text{CH}_2 + \text{H}_2\text{O} \xrightleftharpoons{\text{H}^+} \text{CH}_3\text{-}\underset{\text{OH}}{\text{CH}}\text{-CH}_3$ b. <div style="border: 1px solid black; padding: 10px; width: fit-content; margin: auto;"> $\text{CH}_3\text{-CH}=\text{CH}_2 + (\text{BH}_3)_2 \rightarrow \text{CH}_3\text{-CH}_2\text{-CH}_2\text{BH}_2$ <p style="text-align: center;">Propene</p> $\xrightarrow{\text{CH}_3\text{-CH}=\text{CH}_2} (\text{CH}_3\text{-CH}_2\text{-CH}_2)_2\text{BH}$ <p style="text-align: center;">↓</p> $\text{CH}_3\text{-CH}=\text{CH}_2$ $(\text{CH}_3\text{-CH}_2\text{-CH}_2)_3\text{B}$ <p style="text-align: center;">↓</p> $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + \text{B(OH)}_3 \xleftarrow{\text{H}_2\text{O}_2/\text{OH}^-}$ <p style="text-align: center;">Propan-1-ol Boric acid</p> </div> |
| 30 | 3-Methylbut-2-en-1-ol $\text{CH}_3\text{MgBr} / \text{H}_3\text{O}^+$ |
| 31 | i) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$  ii) iii) CH_3CHO |
| 32 | a) i) $(\text{CH}_3)_3\text{C-I} + \text{CH}_3\text{-OH}$ i) $\text{CH}_3\text{-CH}_2\text{-}\overset{\text{O}}{\parallel}{\text{C}}\text{-CH}_3$ ii)  |

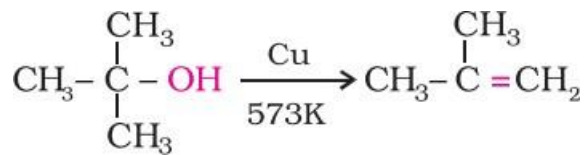
| | |
|----|---|
| 33 | <p>i.)</p>  <p>ii.)</p>  <p>(i) Warm each compound with iodine and sodium hydroxide. Phenol : No yellow ppt formed Ethanol: Yellow ppt of Iodoform are formed.</p> |
| 34 | <p>a). (i)</p>  <p>(ii) $\text{CH}_3\text{CH}_2\text{OH} + \text{CH}_3\text{COCl} \xrightarrow{\text{pyridine}} \text{CH}_3\text{CH}_2\text{O-COCH}_3 + \text{HCl}$</p> <p>(iii).</p>  |
| 35 | <p><u>2,3-dinitro phenol</u></p> <p>Protonation of alkene to form carbocation by electrophilic attack of H_3O^+. $\text{H}_2\text{O} + \text{H}^+ \rightarrow \text{H}_3\text{O}^+$</p>  <p>Nucleophilic attack of water on carbocation.</p>  <p>Deprotonation to form an alcohol.</p>  |

| | |
|----|---|
| 36 | ANS (a) |
| 37 | <p>(a)</p>  <p style="text-align: center;">2-Hydroxybenzoic acid (Salicylic acid)</p> <p>(b)</p> $R-X + R'-\ddot{O}^- Na^+ \longrightarrow R-\ddot{O}-R' + Na X$ |
| 38 | <p>(i)</p> <p>The formation of ether is a nucleophilic bimolecular reaction (S_N2) involving the attack of alcohol molecule on a protonated alcohol, as indicated below:</p> <p>(i) $CH_3-CH_2-\ddot{O}-H + H^+ \longrightarrow CH_3-CH_2-\overset{+}{O}-H$</p> <p>(ii) $CH_3CH_2-\ddot{O}: + CH_3-CH_2-\overset{+}{O}-H \longrightarrow CH_3CH_2-\overset{+}{O}-CH_2CH_3 + H_2O$</p> <p>(iii) $CH_3CH_2-\overset{+}{O}-CH_2CH_3 \longrightarrow CH_3CH_2-O-CH_2CH_3 + H^+$</p> <p>(ii)</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p><i>o</i>-Nitrophenol (Intramolecular H-bonding)</p> </div> <div style="text-align: center;">  <p><i>p</i>-Nitrophenol (Intermolecular H-bonding)</p> </div> </div> <p>b.</p> <p>(i)</p>  <p style="text-align: center;">2-Methoxytoluene (Minor) 4-Methoxytoluene (Major)</p> |

(ii)



(iii)



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