Experiment #3: Identification of Alcohol and Phenol

Complete Question Bank (MCQs + Essay Questions + Model Answers)

Part 1 — MCQs (Circle the correct answer)

1) Which of the following alcohols is expected to be the most soluble in water?

A) 1 - Butanol

B) Ethanol

C) 2 - Methyl - 2 - propanol

D) Cyclohexanol

2) The solubility of alcohols in water generally decreases with:

A) Increasing branching

B) Increasing number of hydroxyl groups

C) Increasing molecular mass

D) Increasing polarity

3) The hydroxyl group (– OH) in alcohols is considered:

A) Hydrophobic

B) Hydrophilic

C) Nonpolar

D) Aromatic

4) In the solubility test of alcohols, the reagent added after the alcohol is:

A) 2 mL NaOH

B) 2 mL HCl

C) 2 mL water

D) 2 mL iodine solution

5) In the Lucas test, the Lucas reagent consists of:

A) Iodine in KI/water

B) $FeCl_3$ in water

C) Concentrated H_2SO_4 and $KMnO_4$

D) $ZnCl_2$ in concentrated HCl

6) The Lucas test is mainly used to distinguish between:

A) Aldehydes and ketones

B) Primary, secondary, and tertiary alcohols

C) Alcohols and ethers

D) Phenols and carboxylic acids

7) A positive Lucas test is indicated by formation of:

A) Violet solution

B) Green solution

C) White cloudy mixture

D) Yellow precipitate

8) Which class of alcohol reacts immediately with Lucas reagent at room temperature?

A) Primary alcohol

B) Secondary alcohol

C) Tertiary alcohol

D) Polyhydric alcohol

9) In the Lucas test, secondary alcohols usually give a positive result within:

A) A few seconds only

B) 5 – 10 minutes

C) 1 – 2 hours

D) Only after reflux

10) Primary alcohols in the Lucas test usually:

A) React immediately

B) Form yellow precipitate

C) Require several hours at room temperature

D) Give violet color

11) If no immediate change occurs in the Lucas test, the test tubes are placed in:

A) Ice bath

B) Water bath at 100 ° C

C) Oil bath at 150 ° C

D) Freezer

12) The iodoform test is used to identify:

A) Tertiary alcohols only

B) Primary alcohols only

C) Secondary alcohols of the type $RCH(OH)CH_3$

D) Aromatic hydrocarbons

13) A positive iodoform test gives:

A) White precipitate

B) Green solution

C) Violet ring

D) Bright yellow precipitate

14) The reagents used in the iodoform test are:

A) NaOH and iodine solution

B) HCl and $ZnCl_2$

C) $FeCl_3$ and water

D) $KMnO_4$ and H_2SO_4

15) In the iodoform test procedure, the mixture is allowed to stand for:

A) 30 seconds

B) 1 minute

C) 3 – 5 minutes

D) 15 – 20 minutes

16) In chromic acid oxidation, primary and secondary alcohols usually give a positive result because the solution changes from:

A) Green to orange

B) Orange to green

C) Violet to red

D) Yellow to white

17) Which of the following alcohols generally shows no reaction with chromic acid oxidation?

A) Primary alcohol

B) Secondary alcohol

C) Tertiary alcohol

D) Dihydric alcohol

18) In preparing the chromic acid oxidation test, concentrated sulfuric acid is added to:

A) Sodium hydroxide

B) Ferric chloride

C) 1% potassium dichromate solution

D) Lucas reagent

19) Which statement correctly differentiates phenols from alcohols?

A) Phenols are less acidic than alcohols

B) Alcohols react with NaOH more readily than phenols

C) Phenols are more acidic and can react with NaOH

D) Alcohols form phenoxide ions more easily

20) A positive ferric chloride test for phenol is indicated by formation of:

A) Bright yellow precipitate

B) Violet solution

C) Green solution

D) White cloudy layer

Part 2 — Essay Questions

1) Mention the general formula of alcohols and classify alcohols according to the number of hydroxyl groups.

2) Explain the factors affecting the solubility of alcohols in water.

3) List the steps of the alcohol solubility test.

4) What is the principle of the Lucas test?

5) Mention the procedure of the Lucas test.

6) What is the positive result in the Lucas test and what does it indicate?

7) What is the function of iodine and sodium hydroxide in the iodoform test?

8) Write the procedure and positive observation of the iodoform test.

9) Explain the chromic acid oxidation test and mention the color change.

10) Why is phenol more acidic than alcohol, and how is phenol identified experimentally?

Answer Key / Model Answers

Section A — MCQ Answers

1) B) Ethanol

2) C) Increasing molecular mass

3) B) Hydrophilic

4) C) 2 mL water

5) D) $ZnCl_2$ in concentrated HCl

6) B) Primary, secondary, and tertiary alcohols

7) C) White cloudy mixture

8) C) Tertiary alcohol

9) B) 5 – 10 minutes

10) C) Require several hours at room temperature

11) B) Water bath at 100 ° C

12) C) Secondary alcohols of the type $RCH(OH)CH_3$

13) D) Bright yellow precipitate

14) A) NaOH and iodine solution

15) C) 3 – 5 minutes

16) B) Orange to green

17) C) Tertiary alcohol

18) C) 1% potassium dichromate solution

19) C) Phenols are more acidic and can react with NaOH

20) B) Violet solution

Section B — Essay Model Answers

1) Mention the general formula of alcohols and classify alcohols according to the number of hydroxyl groups.

- General formula: $CnH2n+1OH$
- Classification: monohydric, dihydric, trihydric, and polyhydric alcohols.

2) Explain the factors affecting the solubility of alcohols in water.

- Alcohols contain a polar hydrophilic OH group and a nonpolar hydrophobic alkyl group.
- Solubility decreases with increasing molecular mass and chain length.
- Solubility increases with branching and with increasing number of OH groups.

3) List the steps of the alcohol solubility test.

- Add 10 drops of alcohol into a test tube.
- Add 2 mL of water.
- Shake well.

- Record observations and result.

4) What is the principle of the Lucas test?

- Lucas test distinguishes primary, secondary, and tertiary alcohols.
- It uses Lucas reagent ($ZnCl_2$ in concentrated HCl).
- Alcohols form alkyl chlorides, which are insoluble and cause cloudiness.
- Reaction speed depends on alcohol class: tertiary fastest, secondary moderate, primary slowest.

5) Mention the procedure of the Lucas test.

- Place 2 mL of Lucas reagent in each test tube.
- Add 6 drops of alcohol.
- Close with parafilm and shake well.
- If no immediate change occurs, place in a water bath at 100 ° C for 5 – 13 minutes.
- Record observations and result.

6) What is the positive result in the Lucas test and what does it indicate?

- Positive result: white/cloudy mixture.
- It indicates formation of insoluble alkyl chloride.
- Immediate cloudiness suggests tertiary alcohol.
- Cloudiness after 5 – 10 minutes suggests secondary alcohol.
- Very slow or no quick change suggests primary alcohol.

7) What is the function of iodine and sodium hydroxide in the iodoform test?

- Iodine acts as the halogenating/oxidizing reagent.
- NaOH provides an alkaline medium.
- Together they convert suitable compounds into iodoform (CHI_3), giving a bright yellow precipitate.

8) Write the procedure and positive observation of the iodoform test.

- Add 3 mL of 5% NaOH into a test tube.
- Add 10 drops of alcohol.
- Add 5 – 10 drops of iodine solution gradually (or up to 0.5 mL).
- Shake well and leave for 3 – 5 minutes.
- Positive result: bright yellow precipitate.

9) Explain the chromic acid oxidation test and mention the color change.

- Primary and secondary alcohols are oxidized; tertiary alcohols usually do not react.
- Chromium is reduced from Cr(VI) to Cr(III).
- Positive color change: orange to green.

10) Why is phenol more acidic than alcohol, and how is phenol identified experimentally?

- Phenol is more acidic because the phenoxide ion is resonance - stabilized.
- Alkoxide ion from alcohol is not resonance - stabilized.
- Phenol can react with NaOH.
- Phenol can be identified by ferric chloride test, which gives a violet color.