1) How can you distinguish between the following (only by one chemical test)?

* **Example: 2-pentanone, 3-pentanone**

2-pentanone will give a positive iodoform test. 3-Pentanone will negative results.

I. **Acetone and acetaldehyde**

   **Tollens test**

II. **Primary, secondary and tertiary alcohols**

   **Lucas test**

III. **Ethanol and methanol**

   **Iodoform test**

IV. **Benzaldehyde and butanal**

   **Bendicts test**

V. **phenol and cyclohexane**

   **Ferric chlorid test**
2) (Acetone, propanal, benzaldehyde)

A. Tollens' Test. Which compound(s) gave a positive test? Why?

B. Benedict's Test. Which compound(s) gave a positive test? Why?

3) Write chemical equations (not necessarily balanced) for the reaction of propanal with

a. Tollens' reagent

b. Benedict's reagent

4) What results would be expected if the following tests were carried out on 4-hydroxy-3-methoxybenzaldehyde (Explain your answers.)

a. H₂O solubility: Insoluble in water

b. Tollens' test: (+Ve) silver mirror will form

c. Benedict's test: (-Ve)

5) An unknown sample produces a precipitate upon reaction with 2,4-dinitrophenylhydrazine reagent, color change with ferric chloride reagent, and a yellow precipitate when mixed with iodine and base. Draw the structure of a compound that would give this result.

6) What results would you expect to observe when benzyl alcohol, C₆H₅CH₂OH, is treated with (i) acidic sodium dichromate, and (ii) Lucas reagent?
Choose the correct answer:

1. Which is the most likely compound to give 2,4-DNP test (bright yellow color), Tollens’ test (no silver mirror), iodoform test (yellow precipitate)?

   a.  
   b.  
   c.  
   d.  

Answer: b

2. Identify which of the following compounds would give positive iodoform test.

   1. \( \text{CH}_3\text{CH}_2\text{CH}_2\text{-C-CH}_3 \)  
   2. \( \text{CH}_3\text{CH}_2\text{-C-CH}_2\text{CH}_3 \)  
   3. \( \text{C}_6\text{H}_5\text{-C-CH}_3 \)  
   4. \( \text{CH}_3\text{CH}_2\text{-C-OCH}_2\text{CH}_3 \)  
   5. \( \text{C}_6\text{H}_5\text{-C-CH}_3 \)

Answer: 1 and 3
3. Which of the following is a suitable reagent that will quickly distinguish between pentanal and 3-pentanone?
   a. Na metal
   b. NH2OH
   c. 2,4-DNP
   d. Ag(NH3)2+ OH-

4. A compound forms a 2,4-dinitrophenylhydrazine derivative, gives a positive iodoform test and a negative result with the Tollens'. This compound is most likely:
   a. CH₃CH₂CCH(CH₃)₂
   b. CH₃CH
   c. CH₃CH₂CCH₃
   d. \[ \text{Structure Image} \]
   e. \[ \text{Structure Image} \]

**Answer: c**
Here is a summary table of all the reactions:

<table>
<thead>
<tr>
<th>Reaction</th>
<th>Chemical</th>
<th>Positive result (seen)</th>
<th>Negative result (seen)</th>
<th>Groups that give positive result</th>
<th>Groups that give negative result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium dichromate Oxidation</td>
<td>$K_2Cr_2O_7$</td>
<td>Orange to green, blue or blue/green</td>
<td>Remains orange</td>
<td>$1^\circ$ and $2^\circ$ alcohols, aldehydes</td>
<td>Ketones, $3^\circ$ alcohol</td>
</tr>
<tr>
<td>Lucas test (to distinguish alcohols)</td>
<td>$ZnCl_2$ and $HCl$</td>
<td>Clear to cloudy</td>
<td>Remains clear</td>
<td>Secondary alcohol- slow Tertiary alcohol-fast</td>
<td>Primary alcohol, Aldehydes, Ketones, Ketones</td>
</tr>
<tr>
<td>2,4-dinitrophenyl-hydrazine test (aldehydes, ketones from alcohols)</td>
<td>2,4-dinitrophenyl-hydrazine</td>
<td>Form yellow/orange solid</td>
<td>No solid formed</td>
<td>Aldehydes, Ketones</td>
<td>All alcohols</td>
</tr>
<tr>
<td>Fehling’s Test (aldehydes from ketones)</td>
<td>$Cu(OH)_2$ and $OH$</td>
<td>Blue to something else (red, green yellow)</td>
<td>Remains blue</td>
<td>Aldehydes</td>
<td>Ketones All alcohols</td>
</tr>
</tbody>
</table>
Esterification of alcohols and phenols:

1. In the esterification reactions to produce fragrant esters, the catalyst used was?
   a. HNO₃  b. H₂SO₄  c. NaHCO₃  d. NaOH

2. What is the name of ester prepared from butyl alcohol and propanoic acid?
   a. propyl butanoate  b. butyl propanoate  c. butyl propyl ether  d. ethyl acetate

3. 9.0 g of benzoic acid (MW = 122) reacts with 18 g of methanol (MW = 32) in the presence of an acid to give 7.0 g of methyl benzoate (MW = 136). What is the percent yield?
   a. 69.8%  b. 45.7%  c. 51.6%  d. 77.8%  e. 86.7%

In the esterification of benzoic acid with methanol, which of the following statements is true?

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1. The excess methanol increases the yield of the ester.</td>
<td></td>
</tr>
<tr>
<td>2. The H₂SO₄ catalyzes the reaction.</td>
<td></td>
</tr>
<tr>
<td>3. Adding H₂O will increase the yield of the ester.</td>
<td></td>
</tr>
</tbody>
</table>

a. 1 only  b. 1 and 3  c. 2 and 3  d. 1 and 2  e. 1, 2 and 3

Answer: d

Good Luck
Mr. Basem Qeshta