

### Experiment 12A: Isopentyl Acetate

**Pre-lab exercise:** Please read Techniques 3 (about heating under reflux) and 8 (simple distillation) in PLKE. In addition to writing the usual purpose and materials and methods, **draw two setups:** The setup of the heating under reflux and the simple distillation before you come to class (the pictures should look similar to the descriptions in the technique sections).

**Lab changes:** Use **1.5 mL of isopentyl alcohol** at the beginning. Ideally, this will give you enough product to do both the **boiling point determination** and run the **IR spectrum**.

**Hint:** On the Hickman still during the distillation, use the Teflon cover with the cap on the side port. **Do not use the O-ring at all in this experiment.**

**Lab report format (Due Tuesday, February 17, at 6 p.m.):**

## First page

### Abstract:

Abstract format: Should be word-processed, double-spaced and on a **separate** page from the rest of the report. You should fill in the blanks in the paragraph below with the appropriate numbers or words; the parenthetical comments should be removed and replaced with your own words. Finally, the square-bracketed sections are included if you need to explain an error or low yield. You do not need to include these if you are satisfied with your yield and purity.

Name and partner's name  
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**(Title of experiment 12A in bold face)**

The microscale synthesis of isopentyl acetate from \_\_\_\_\_ grams isopentyl alcohol and excess acetic acid yielded \_\_\_\_\_ grams (\_\_\_\_ % yield) of product after heating under reflux and subsequent distillation. [We believe the yield was low due to (state the main reason why your yield was low)] The purified product had a boiling point of \_\_\_\_ °C which indicated (comment about purity). The infrared spectrum of the product showed a characteristic ester carbonyl peak at \_\_\_\_\_  $\text{cm}^{-1}$  and indicated that the desired product was present. [However, an anomalous peak at \_\_\_\_\_  $\text{cm}^{-1}$  indicated the presence of an impurity, most likely \_\_\_\_\_ ]

## Second and third pages (possibly more if you write big)

The photocopies of your purpose and materials and methods section

## Fourth page

**Results write-up** (please number the answers)

Note: Clearly, unless you have some specialized software, it is permissible to handwrite questions 5 and 6.

1. **Mass** of isopentyl alcohol.
2. **Appearance** of reaction mixture during the reflux period (color, phase, etc.)
3. **Appearance** of crude ester (before distillation)
4. **Mass** of distilled isopentyl acetate and its **appearance**
5. Write the **balanced equation** for the synthesis of isopentyl acetate. Use condensed structural formulas and write the **names** of each compound below the structure. Write the **temperature** and **names of solvents or catalysts** above or below the reaction arrow.
6. Calculate the **percentage yield** of isopentyl acetate (show all work, including the calculations which determine the **limiting reagent**)
7. **Boiling point** of the ester and what this indicates about the **purity** of your product
8. Explain what the **IR spectrum** indicates about the **purity** of your product.
9. What would you do differently, if you were to repeat this experiment? Give **two** procedural step changes or clarifications, and **be specific**.

## Fifth page (use more sheets if needed)

### Questions

End of Experiment 12 (p. 135): 1, 2, 3, 8, 9

End of Technique 8 (pp 628-629): 1, 3, 4, 6a