

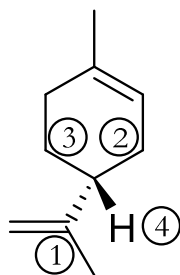
Experiment 8

Isolation of Limonene: Using Liquid Carbon Dioxide as a Solvent

Study Questions

- 1) (+)-Limonene is the (R)-enantiomer. Draw the structure of this enantiomer indicating the proper stereochemistry at the stereocenter of the molecule.

Answer:



- 2) You isolate 5 g of limonene and place it in a polarimeter cell with a total volume of 30 mL and a path length of 1.2 dm.
- a) What would be the observed rotation, α ?

Answer:

$$[\alpha] = \frac{\alpha}{l \cdot c}$$

$$124^\circ = \frac{\alpha}{(1.2 \text{ dm}) \cdot (5\text{g}/30 \text{ mL})}$$

$$124^\circ \cdot (1.2 \text{ dm}) \cdot (5\text{g}/30 \text{ mL}) = \alpha$$

$$24.8^\circ = \alpha$$

- b) If the 5 g of limonene was actually not pure, what effect would this have on the observed rotation? **Answer:** The effect will be to make the observed rotation value lower, because the actual concentration of limonene would be less.
- c) If the observed rotation of this sample was actually 18.6° , what percent of the sample was limonene? Assume that all impurities are optically inactive. **Answer:** Since the observed rotation is $18.6/24.8 = 75\%$ of the expected rotation, the sample is 75% limonene.
- 3) What are the major diagnostic IR bands that you would expect to see in limonene? **Answer:** 3100-3000 (C–H stretch of an alkene), 3000-2850 (C–H stretch of an alkane), and 1680-1640 (C=C stretch).