

# 11 • Carbon Chemistry

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## Esters & Polymers

### ESTERS & AMIDES

1. Work your way through an esterification reaction:
  - a) Draw  $\text{CH}_3\text{CH}_2\text{COOH}$  and  $\text{CH}_3\text{CH}_2\text{OH}$   
You have drawn a(n) \_\_\_\_\_ and a(n) \_\_\_\_\_  
with the names \_\_\_\_\_ and \_\_\_\_\_.
  - b) Highlight the OH on the first molecule and the H on the second molecule. These atoms leave to become  $\text{H}_2\text{O}$ . We call this a condensation reaction. We will also see this when amides are formed and when proteins are formed (peptide bonds).
  - c) Draw the ester (ethyl propanoate):
2. Draw the following ester, draw and name the carboxylic acid and alcohol that formed it.  
 $\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_3$
3. Draw  $\text{CH}_3\text{COOH}$  and  $\text{CH}_3\text{NH}_2$ . They can react to form an amide. Draw the amide molecule.

## POLYMERS

4. Monomers with double bonds can form “addition polymers.” For each of the following monomers, draw the “repeat unit” and the “trimer” that results as the polymer forms. Pictures of these monomers are on page 521 of your textbook.

- a)  $\text{CH}_2\text{CH}_2$  (ethylene)
- b)  $\text{CH}_2\text{CHCl}$  (vinyl chloride)
- c)  $\text{CF}_2\text{CF}_2$  (tetrafluoroethylene)
- d)  $\text{CH}_2\text{CHC}_6\text{H}_5$  (styrene)
- e)  $\text{H-C}\equiv\text{C-H}$  (acetylene)

5. Polyesters (a condensation polymer) can be formed from two different monomers, a di-acid and a di-alcohol. Draw the two monomers and draw a polymer made of three of each unit.

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| $\text{HOOC}\text{C}_6\text{H}_4\text{COOH}$<br>benzene ring with two acid groups in para positions | $\text{HOCH}_2\text{CH}_2\text{OH}$<br>ethane with an $-\text{OH}$ group on each carbon |
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