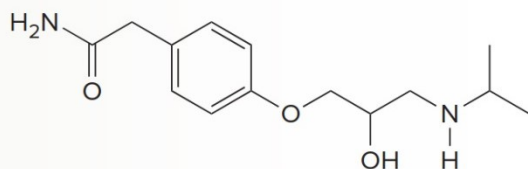
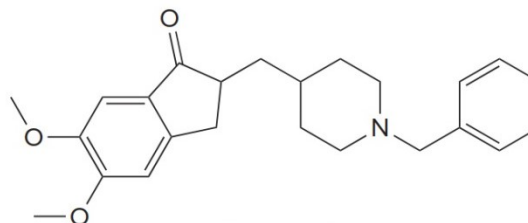


## Identifying Functional Groups in a Complex Molecule

Identify the functional groups in two drugs, atenolol and donepezil. Atenolol is a  $\beta$  (beta) blocker, a drug used to treat hypertension (high blood pressure), and donepezil (trade name Aricept) is used to treat mild to moderate dementia associated with Alzheimer's disease.



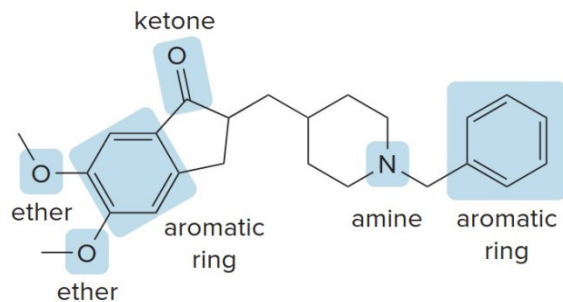
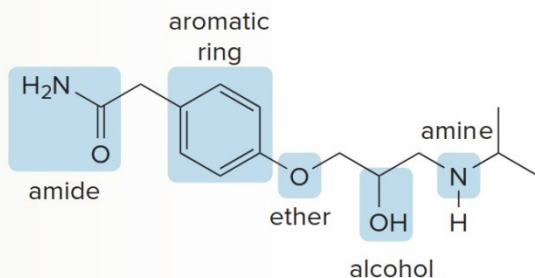
atenolol  
(used to treat high blood pressure)



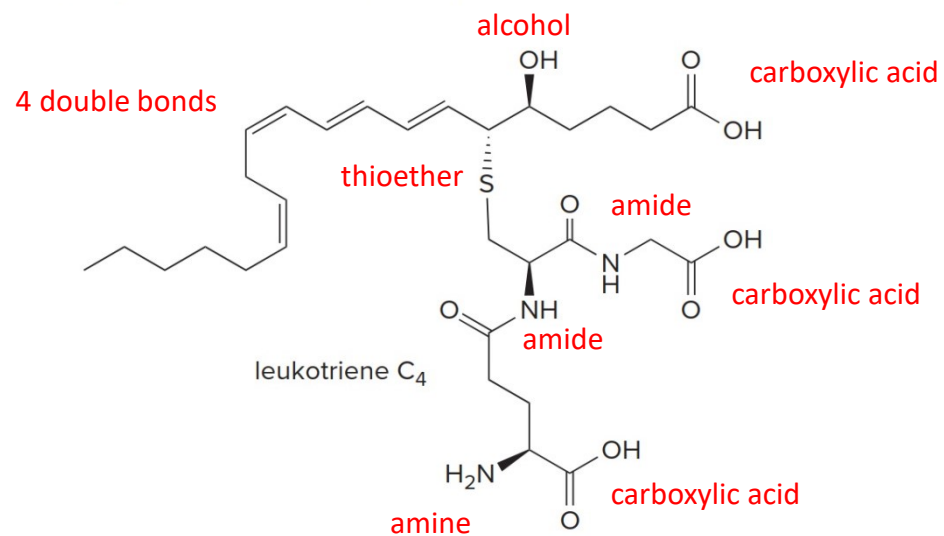
donepezil  
(used to treat Alzheimer's disease)

### Solution

**Concentrate on the heteroatoms and  $\pi$  bonds.** With carbonyl groups, pay attention to what is bonded to the carbonyl carbon—hydrogen, carbon, or a heteroatom.



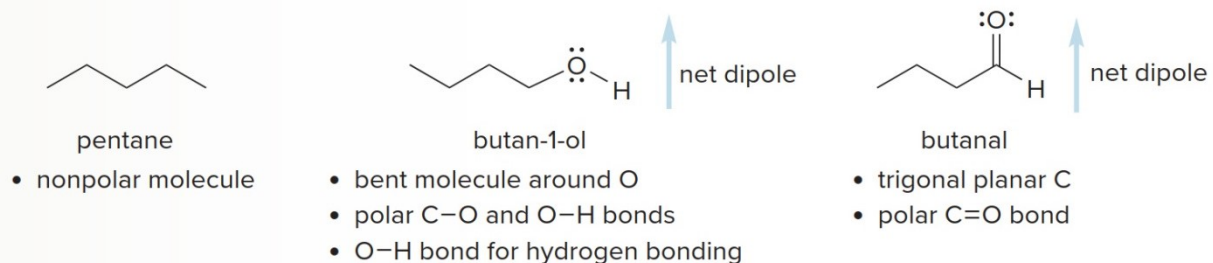
**Problem 3.11** Identify the functional groups in leukotriene C<sub>4</sub>, a major contributor to the inflammation associated with asthma.



### Sample Problem 3.3 Determining Intermolecular Forces in Organic Compounds

Rank the following compounds in order of increasing strength of intermolecular forces:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$  (pentane),  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$  (butan-1-ol), and  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$  (butanal).

#### Solution



- Pentane has only nonpolar C–C and C–H bonds, so its molecules are held together by only **van der Waals** forces.
- Butan-1-ol is a polar bent molecule, so it can have **dipole–dipole** interactions in addition to **van der Waals** forces. Because it has an O–H bond, butan-1-ol molecules are held together by intermolecular **hydrogen bonds** as well.
- Butanal has a trigonal planar carbon with a polar C=O bond, so it exhibits **dipole–dipole** interactions in addition to **van der Waals** forces. There is *no* H atom bonded to O, so two butanal molecules *cannot* hydrogen bond to each other.

