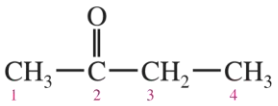
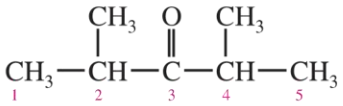
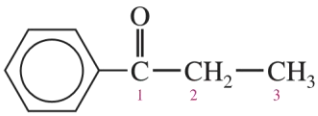
18-3 Nomenclature of Ketones and Aldehydes

IUPAC Names Systematic names of ketones are derived by replacing the final *-e* in the alkane name with *-one*. The "alkane" name becomes "alkanone." In open-chain ketones, we number the longest chain that includes the carbonyl carbon from the end closest to the carbonyl group, and we indicate the position of the carbonyl group by a number. In cyclic ketones, the carbonyl carbon atom is assigned the number 1.





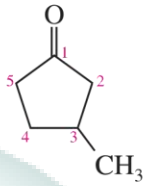


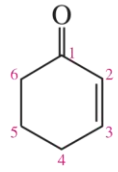
old IUPAC names in blue:
new IUPAC names in green:

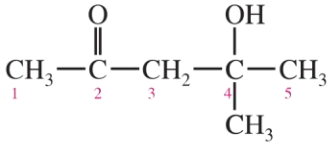
2-butanone
butan-2-one

2,4-dimethyl-3-pentanone
2,4-dimethylpentan-3-one

1-phenyl-1-propanone
1-phenylpropan-1-one





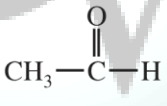


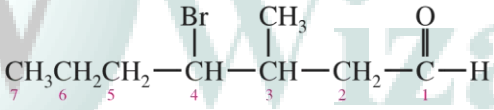
3-methylcyclopentanone

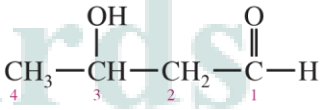
2-cyclohexenone
cyclohex-2-en-1-one

4-hydroxy-4-methyl-2-pentanone
4-hydroxy-4-methylpentan-2-one

Systematic names for aldehydes are derived by replacing the final *-e* of the alkane name with *-al*. An aldehyde carbon is at the end of a chain, so it is number 1. If the aldehyde group is a substituent of a large unit (usually a ring), the suffix *carbaldehyde* is used.



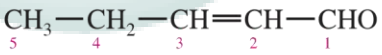


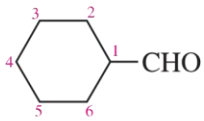


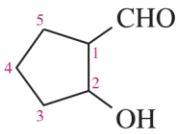
ethanal

4-bromo-3-methylheptanal

3-hydroxybutanal







2-pentenal
pent-2-enal

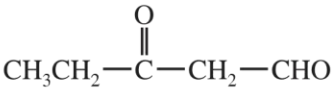
cyclohexanecarbaldehyde

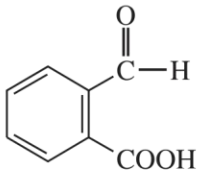
2-hydroxycyclopentane-1-carbaldehyde

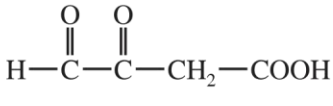
A ketone or aldehyde group can also be named as a substituent on a molecule with a higher priority functional group as its root. A ketone or aldehyde carbonyl is named by the prefix *oxo-* if it is included as part of the longest chain in the root name. When an aldehyde —CHO group is a substituent and not part of the longest chain, it is named by the prefix *formyl*. Carboxylic acids frequently contain ketone or aldehyde groups named as substituents.

Priority of Functional Groups in Naming Organic Compounds

(highest) acids
esters
aldehydes
ketones
alcohols
amines
alkenes, alkynes
alkanes
ethers
(lowest) halides







3-oxopentanal

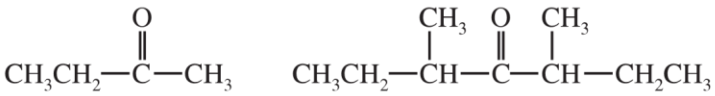
2-formylbenzoic acid

3,4-dioxobutanoic acid

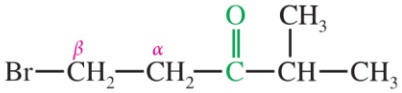
Ketones

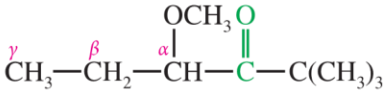
Common Names As with other classes of compounds, ketones and aldehydes are often called by common names instead of their systematic IUPAC names. Ketone common names are formed by naming the two alkyl groups bonded to the carbonyl

group. Substituent locations are given using Greek letters, beginning with the carbon *next to* the carbonyl group.

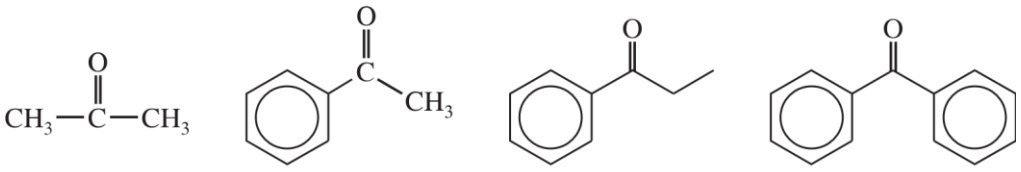

methyl ethyl ketone

di-*sec*-butyl ketone


β-bromoethyl isopropyl ketone


tert-butyl α-methoxypropyl ketone

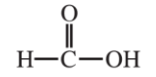
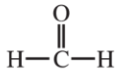
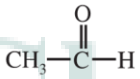
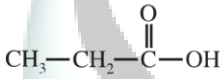
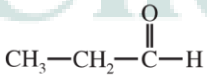
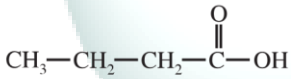
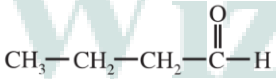
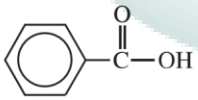
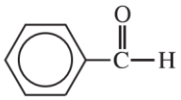
Some ketones have historical common names. Dimethyl ketone is always called *acetone*, and alkyl phenyl ketones are usually named as the acyl group followed by the suffix *-phenone*.



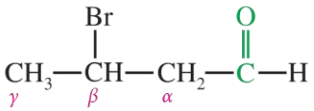
acetone | acetophenone | propiophenone | benzophenone

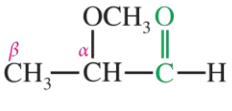
Common names of aldehydes are derived from the common names of the corresponding carboxylic acids (Table 18-2). These names often reflect the Latin or Greek term for the original source of the acid or the aldehyde. Greek letters are used with common names of aldehydes to give the locations of substituents. The first

TABLE 18-2 Common Names of Acids and Aldehydes

Carboxylic Acid	Derivation	Aldehyde
 formic acid (methanoic acid)	*formica*, ''ants''	 formaldehyde (methanal)
 acetic acid (ethanoic acid)	*acetum*, ''sour''	 acetaldehyde (ethanal)
 propionic acid (propanoic acid)	*protos pion*, ''first fat''	 propionaldehyde (propanal)
 butyric acid (butanoic acid)	*butyrum*, ''butter''	 butyraldehyde (butanal)
 benzoic acid	*gum benzoin*, ''blending''	 benzaldehyde

letter (α) is given to the carbon atom *next to* the carbonyl group, which is C2 in the IUPAC name.

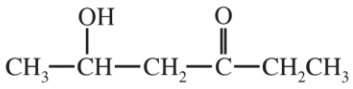


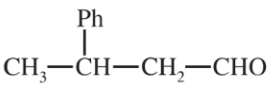


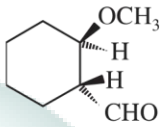
Common name:	β-bromobutyraldehyde	α-methoxypropionaldehyde
IUPAC name:	3-bromobutanal	2-methoxypropanal

PROBLEM 18-1

Give the IUPAC name and (if possible) a common name for each compound.

(a) 

(b) 

(c) 

(d)