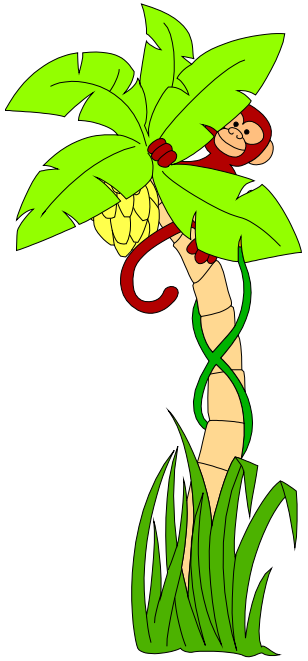
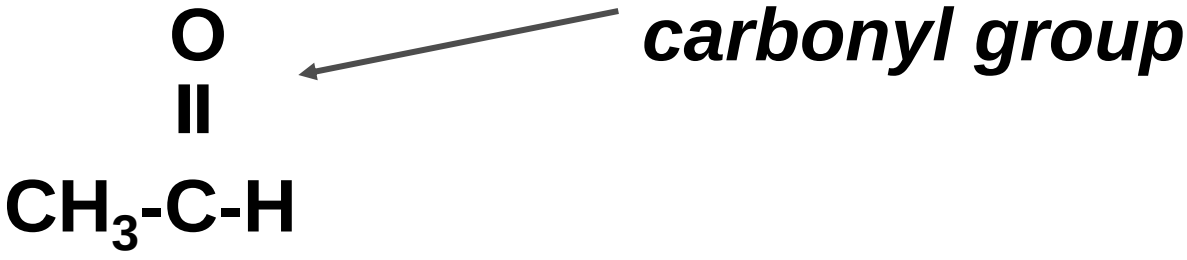
Aldehydes and Ketones

Naming, Physical Properties and Reactions

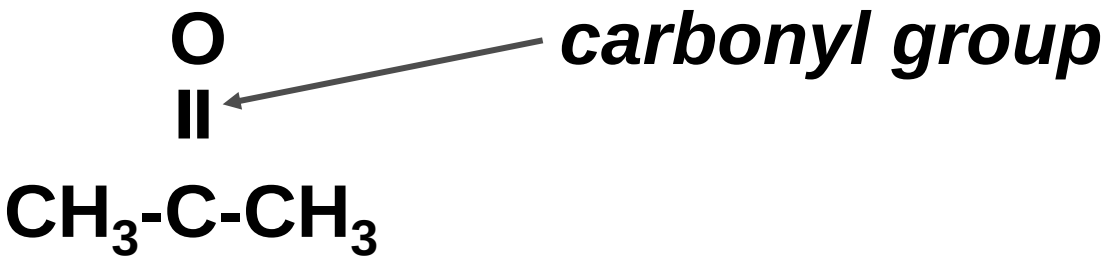


Aldehydes and Ketones

- **In an aldehyde, the double bonded oxygen is found on the end of the C chain**

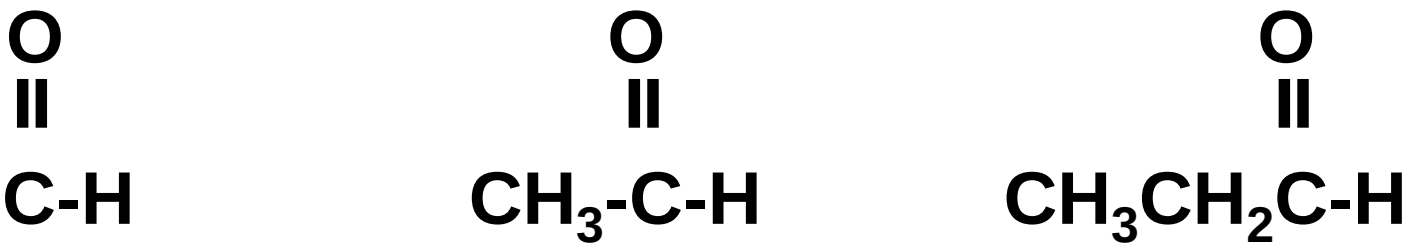


- **In a ketone, the double bonded oxygen is found in the middle of the C chain**



Naming Aldehydes

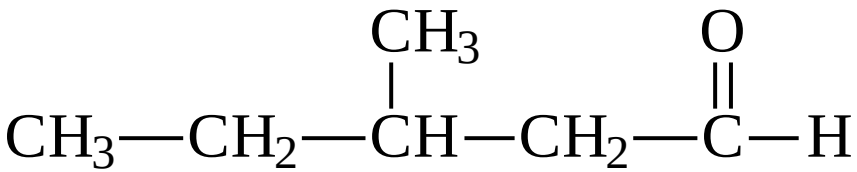
- **IUPAC Replace the -e in the alkane name with –al**



Common names:

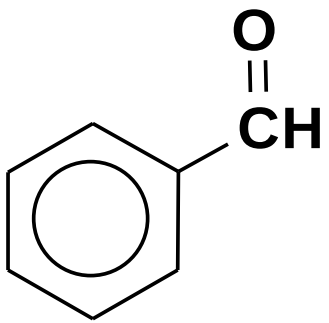
(formaldehyde) (acetaldehyde) (propionaldehyde)

Example

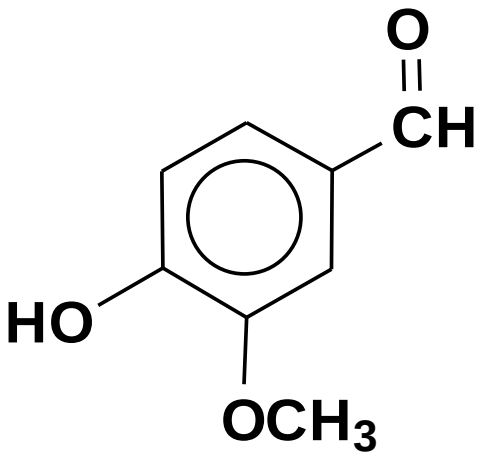


3-methylpentanal

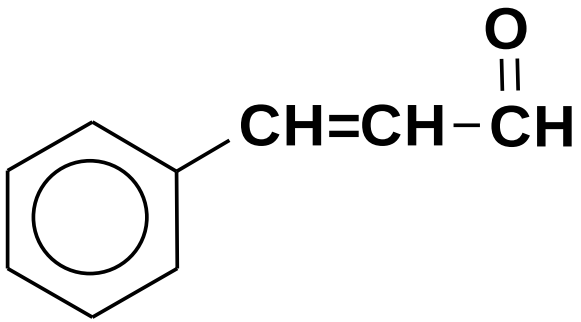
Aldehydes as Flavorings



Benzaldehyde (almonds)

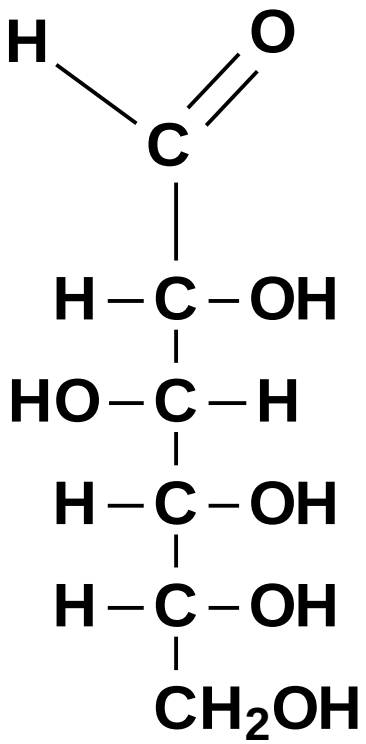


Vanillin (vanilla beans)



Cinnamaldehyde (cinnamon)

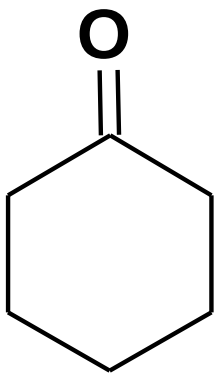
Glucose is an aldehyde

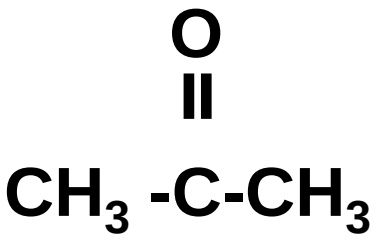


glucose

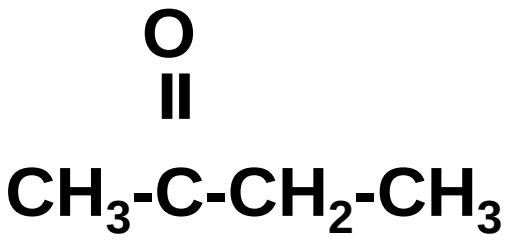
Naming Ketones

- **In the IUPAC name, the -e in the alkane name is replaced with –one**





Propanone



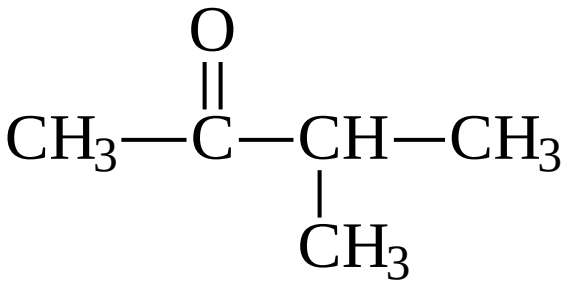
2-Butanone

Cyclohexanone

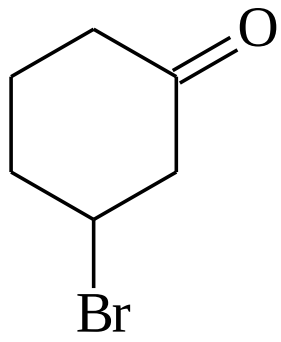
Common names:

(Dimethyl ketone) (Ethyl methyl ketone)

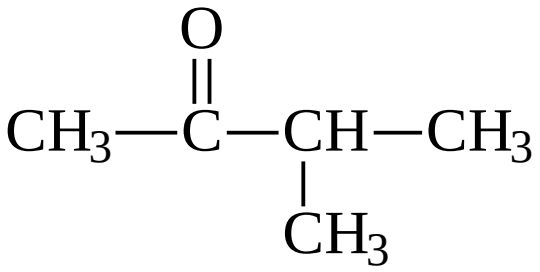
Examples



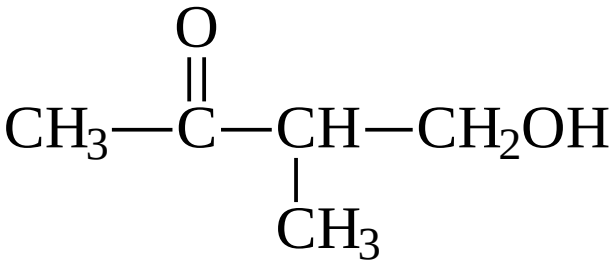
3-methyl-2-butanone



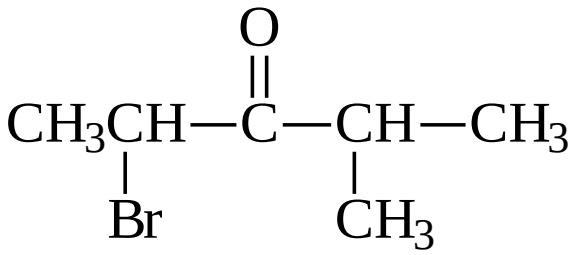
3-bromocyclohexanone



3-methyl-2-butanone



4-hydroxy-3-methyl-2-butanone



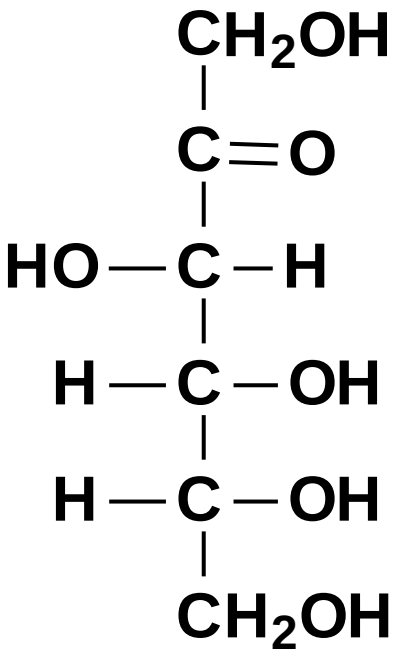
2-bromo-4-methyl-3-pentanone

Ketones

Butter flavor $CH_3-\overset{\overset{O}{\|}}{C}-\overset{\overset{O}{\|}}{C}-CH_3$ **butanedione**

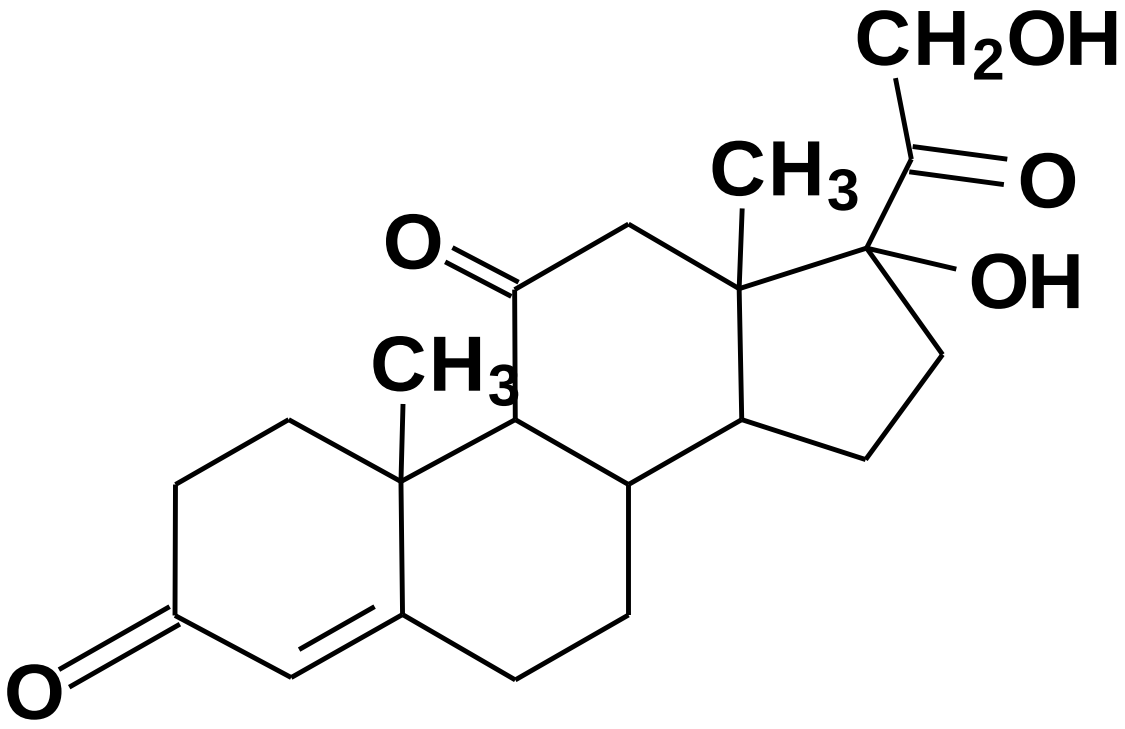
Clove flavor $CH_3-\overset{\overset{O}{\|}}{C}-CH_2CH_2CH_2CH_2CH_3$ **2-heptanone**

Fructose is a Ketone



D-Fructose

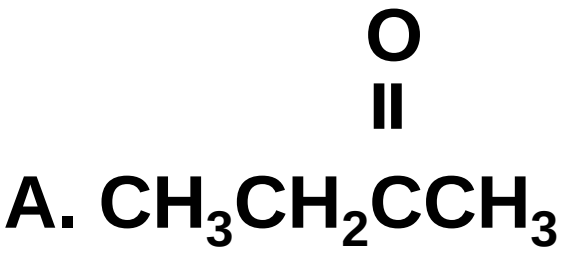
Ketones as Hormones



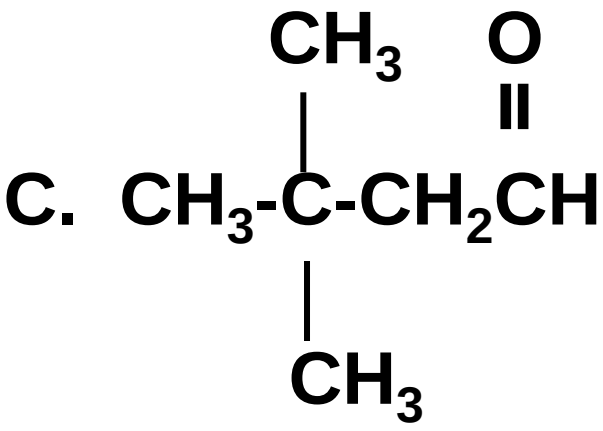
Cortisone

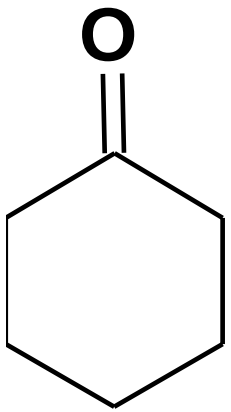
Learning Check

Classify each as an aldehyde (1), ketone (2) or neither(3).

A. 

B. 

C. 

D. 

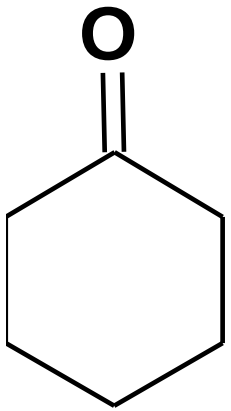
Solution

Classify each as an aldehyde (1), ketone (2) or neither(3).

A. $CH_3CH_2\overset{\overset{O}{\|}}{C}CH_3$ **2**

B. $CH_3\text{-}O\text{-}CH_3$ **3**

C. $CH_3\text{-}\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}\text{-}\overset{\overset{O}{\|}}{C}H_2CH$ **1**

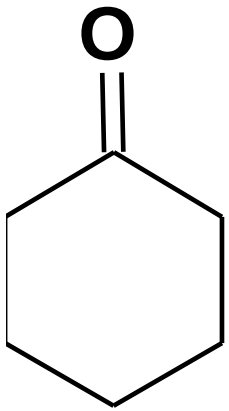
D.  **2**

Learning Check

Name the following

A. $CH_3CH_2\overset{\overset{O}{\|}}{C}CH_3$

B.



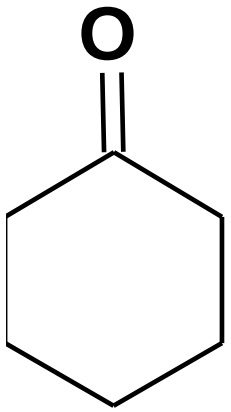
C.

$$CH_3\text{-}\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}\text{-}CH_2CH\overset{\overset{O}{\|}}{}$$

Solution

A. $CH_3CH_2\overset{\overset{O}{\|}}{C}CH_3$

2-butanone (ethyl methyl ketone)

B. 

cyclohexanone

C. $CH_3\text{-}\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}\text{-}\overset{\overset{O}{\|}}{C}H_2CH$

3,3-dimethylbutanal

Learning Check

Draw the structural formulas for each:

A. 4-methylpentanal

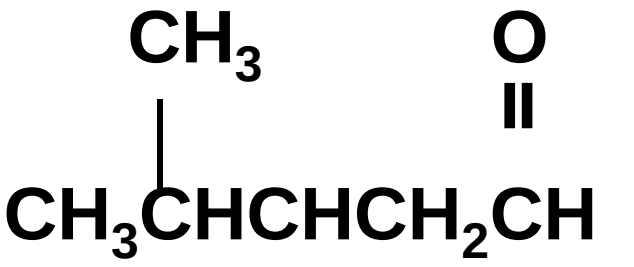
B. 2,3-dibromopropanal

C. 3-methyl-2-butanone

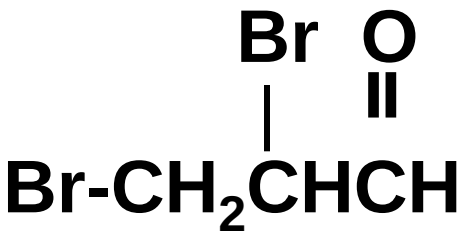
Solution

Draw the structural formulas for each:

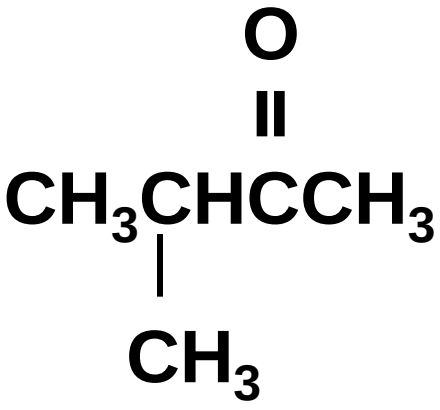
A. 4-methylpentanal



B. 2,3-dibromopropanal



C. 3-methyl-2-butanone

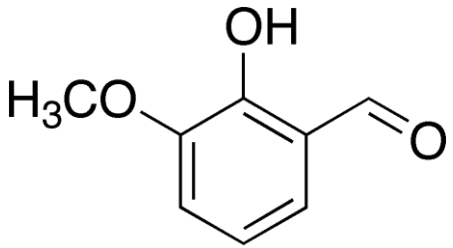


Properties of Ketones and Aldehydes

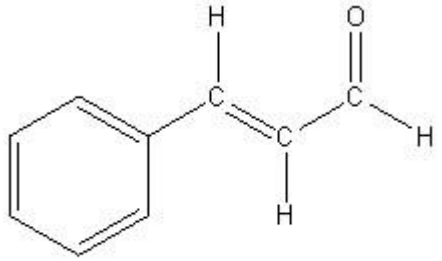
- Boiling and melting points are between alkanes and alcohols
- Very reactive
- Slightly polar
- Distinctive odours
- Only short-chain ones are soluble in water

Uses of Ketones and Aldehydes

- Solvents ex. Propanone (acetone)
- Flavourings ex. Vanillin, cinnamaldehyde, almond flavour



vanillin



trans-cinnamaldehyde
C_9H_8O

- Used in the manufacture of plastics and adhesives
- Preservative for biological specimens ex. Methanal or formaldehyde