

## 6.0 Aldehydes and Ketones



Aldehydes and ketones both contain the carbonyl group - a carbon atom double bonded to an oxygen atom.

**Carbonyl group**

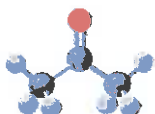
The difference between aldehydes and ketones is the location of the carbonyl group.

An aldehyde contains a carbonyl group that is bonded to at least one hydrogen atom.

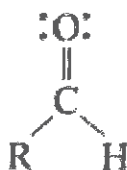
A ketone contains a carbonyl group bonded to two carbon atoms.



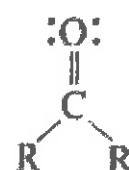
**Aldehydes**



**Ketones**

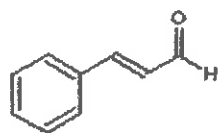


**an aldehyde**

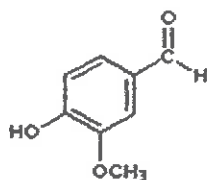


**a ketone**

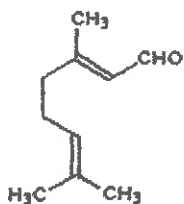
Aldehydes and ketones are widespread in nature, often combined with other functional groups.



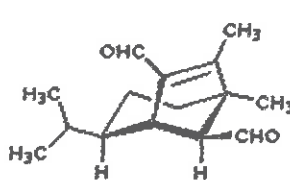
cinnamaldehyde  
(cinnamon bark)



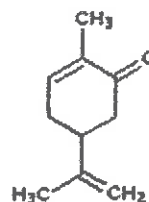
vanillin  
(vanilla bean)



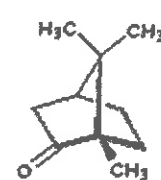
citral  
(lemongrass)



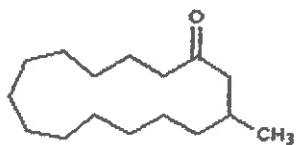
helminthosporal  
(a fungal toxin)



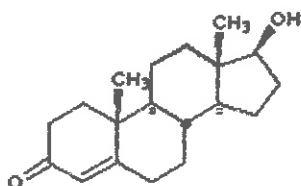
carvone  
(spearmint & caraway)



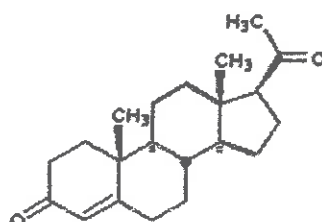
camphor  
(camphor tree)



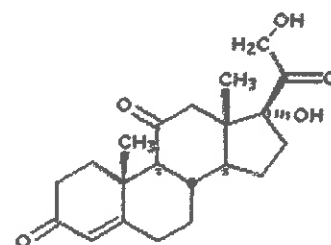
muscone  
(musk deer)



testosterone  
(male sex hormone)



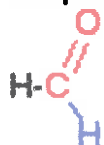
progesterone  
(female sex hormone)



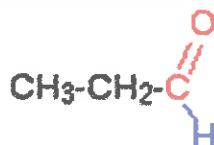
cortisone  
(adrenal hormone)

### Naming Aldehydes

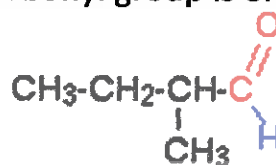
- Use the suffix -al
- Always number the parent chain so that the carbonyl group is on carbon 1



methanal

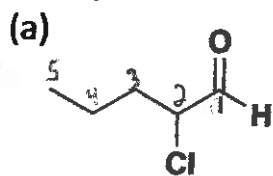


propanal

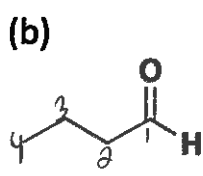


2-methylbutanal

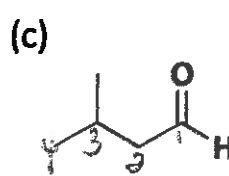
Examples: Name the following.



2-chloropentanal

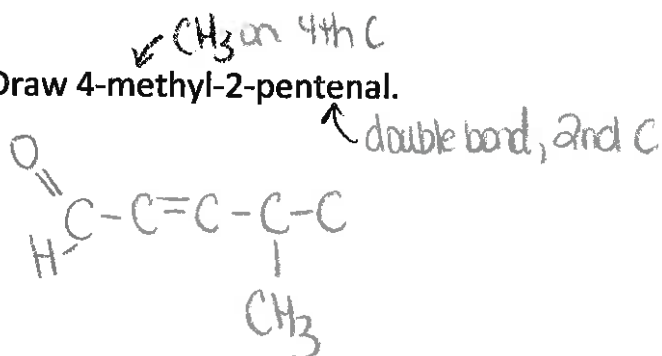


butanal

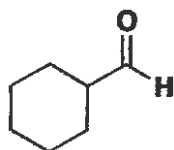


3-methylbutanal

Example: Draw 4-methyl-2-pentenal.



- When the -CHO functional group is attached to a ring the suffix -carbaldehyde is added, and the carbon attached to that group is C1.

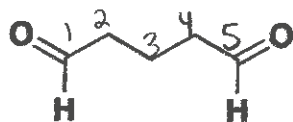


cyclohexanecarbaldehyde

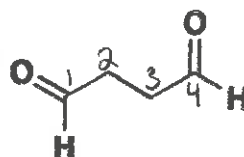


3,3 -dibromocyclopentanecarbaldehyde

- If there is two carbonyl groups add the suffix -dial. The location numbers for both carbonyls are omitted because the aldehyde functional groups are expected to occupy the ends of the parent chain.



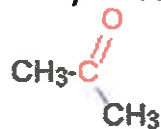
pentanedial



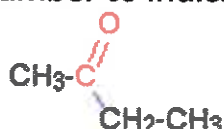
butanedial

### Naming Ketones

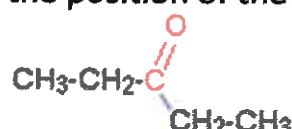
- Use the suffix -one
- Number the parent chain so that the carbonyl group has the lowest number possible
- It may be necessary to use a number to indicate the position of the carbonyl group



propanone



butanone



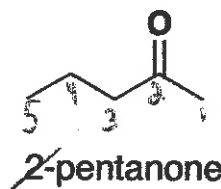
pentan-3-one

*assume its on second C*

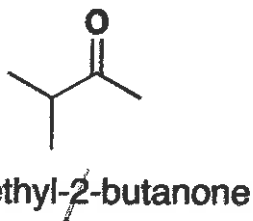
*(if not on second C)*

Examples: Name the following.

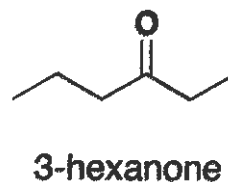
(a)



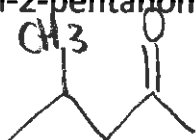
(b)



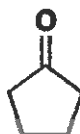
(c)



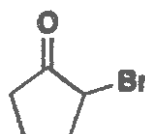
Example: Draw 4-methyl-2-pentanone.



- In cyclic ketones the carbonyl group is assigned location position #1, and this number is not included in the name, unless more than one carbonyl group is present.

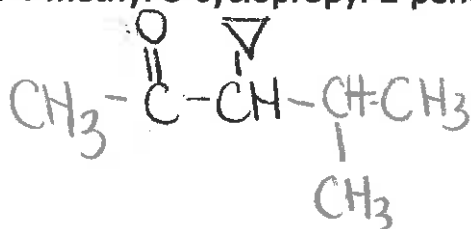


cyclopentanone

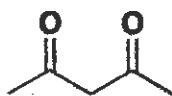


2-bromocyclopentanone

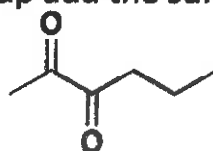
Example: Draw 4-methyl-3-cyclopropyl-2-pentanone.



- If there is more than one carbonyl group add the suffix -dione (2) or -trione (3)



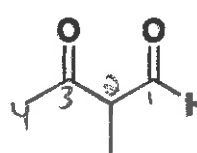
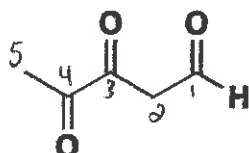
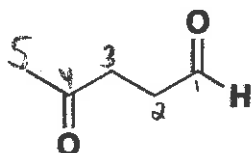
2,4-pentanedione



2,3-hexanedione

### Naming Aldehydes and Ketones in the Same Molecule

- Name as aldehyde and give the ketone the name "oxo"
- The ketone will require a number to identify its location.



Handwritten note: "the need this one" with an arrow pointing to the structure of 2-methyl-3-oxobutanal.