

# OCR (A) Chemistry A-level

## Topic 6.1.2 - Carbonyl Compounds

### Flashcards

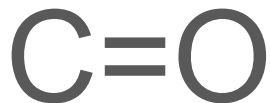
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# What is the carbonyl group?



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What is the functional group  
and general formula for an  
aldehyde?



What is the functional group and general formula for an aldehyde?

RCHO (C double bonded to O, single bond to H and R)



# What is the functional group for a ketone?



What is the functional group for a ketone?

RCOR' (C double bonded to O)



# How do you name aldehydes?





# How do you name aldehydes?

-al suffix (C=O is on the end of a chain)



# How do you name ketones?



# How do you name ketones?

-one suffix (designate number for which carbon  $C=O$  is on)



What kind of intermolecular forces do molecules with the carbonyl group have? Why?



What kind of intermolecular forces do molecules with the carbonyl group have? Why?

Permanent dipole-dipole due to the polar C=O bond (O is  $\delta^-$ )



How soluble are they in water? What influences solubility?



How soluble are they in water? What influences solubility?

Yes - form hydrogen bonds between water molecules and oxygen of C=O. As C chain length increases, solubility decreases.



Which bond in carbonyl compounds is usually involved in reactions? Why?





Which bond in carbonyl compounds is usually involved in reactions? Why?

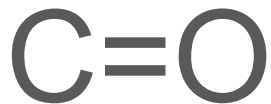
C=O, due to the polarity of the bond (large difference in electronegativity between C and O)



# What is the strongest bond in carbonyl compounds?



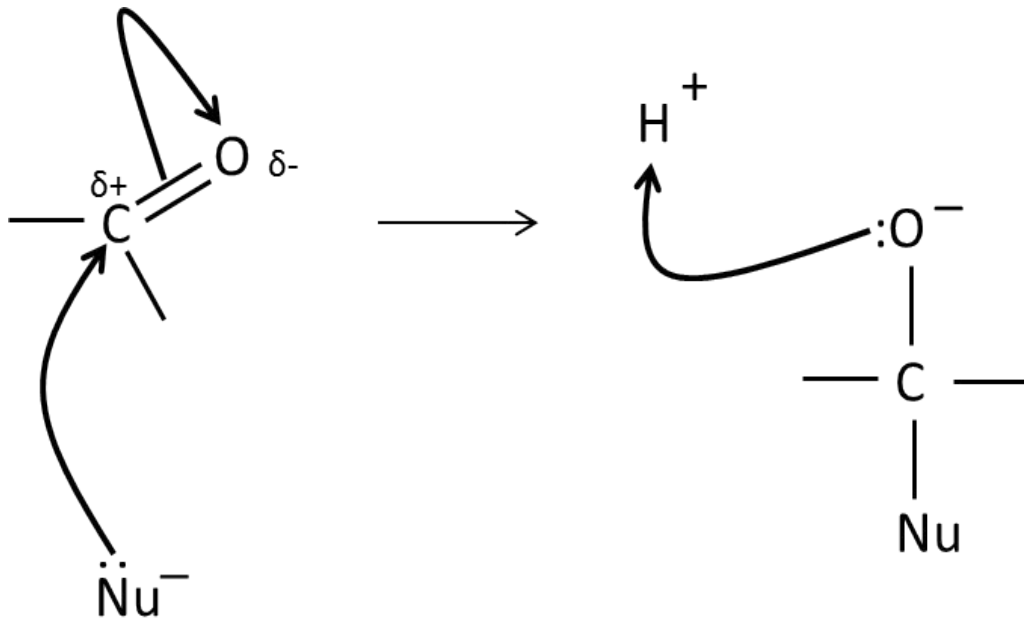
What is the strongest bond in carbonyl compounds?



Draw a mechanism for the nucleophilic addition of a carbonyl compound, using  $:\text{Nu}^-$  to represent the nucleophile.



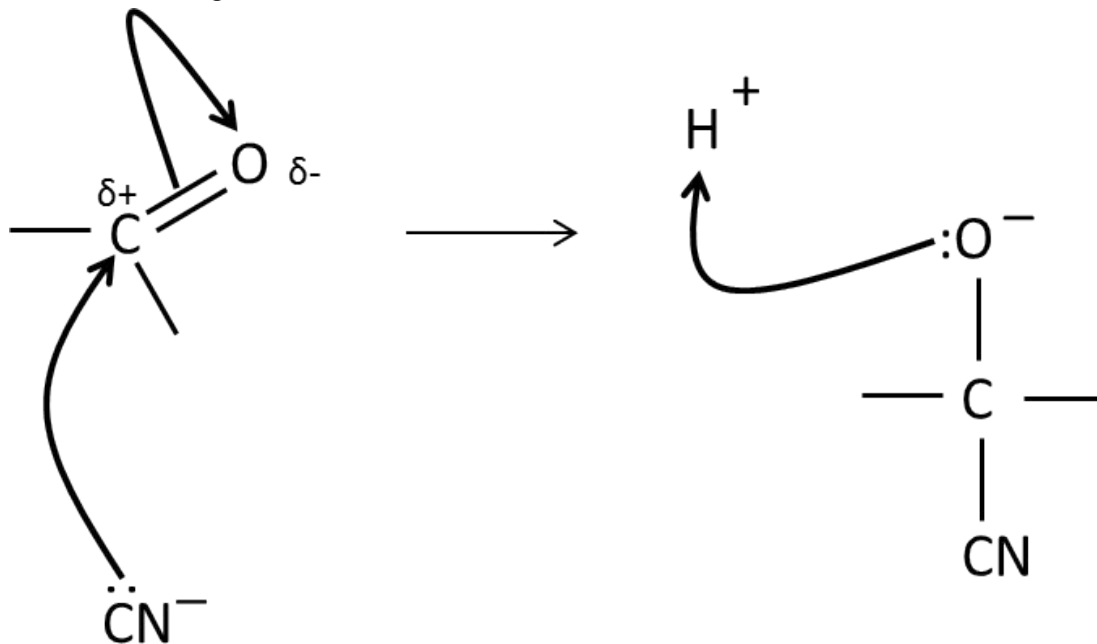
Draw a mechanism for the nucleophilic addition of a carbonyl compound, using  $\text{:Nu}^-$  to represent the nucleophile.



Draw a mechanism for the nucleophilic addition of HCN to a carbonyl compound.



Draw a mechanism for the nucleophilic addition of HCN to a carbonyl compound.



# Why is the addition of HCN important?





# Why is the addition of HCN important?

Increases the length of the carbon chain by one carbon atom allowing more useful molecules to be made.



Will the product of HCN  
added to a carbonyl  
compound have optical  
isomers? Why?



Will the product of HCN added to a carbonyl compound have optical isomers? Why?

Yes they will. In the aldehyde/ketone, the carbonyl carbon is planar, so the  $\text{:CN}^-$  can attack from either above or below, forming two enantiomers.



What is the name of the product when HCN is added to a carbonyl compound?



What is the name of the product when HCN is added to a carbonyl compound?

Hydroxynitriles (have OH and CN groups)



# What is Fehling's solution? What colour is it?



What is Fehling's solution? What colour is it?

Copper complex ions, blue



# What happens when an aldehyde is added to Fehling's solution?





What happens when an aldehyde is added to Fehling's solution?

Reduced to  $\text{Cu}^+$  ions  $\rightarrow$  colour change to brick red ppt



What happens when a  
ketone is added to Fehling's  
solution?



What happens when a ketone is added to Fehling's solution?

No visible change → stays blue



# How do you test for a carbonyl compound?



How do you test for a carbonyl compound?

Use Brady's reagent -  
2,4-dinitrophenylhydrazine

If a carbonyl compound is present an orange precipitate is formed



# What is in Tollens' reagent?



# What is in Tollens' reagent?

Silver complex ions in colourless solution.



# What happens when an aldehyde is added to Tollen's reagent?





What happens when an aldehyde is added to Tollen's reagent?

Silver mirror forms as  $\text{Ag}^+$  reduced to  $\text{Ag}$  (s)



What happens when a ketone is added to Tollen's reagent?



What happens when a ketone is added to Tollen's reagent?

No visible change



What is another oxidising agent for alcohols and aldehydes? What change in colour does this undergo?



What is another oxidising agent for alcohols and aldehydes? What change in colour does this undergo?

Acidified potassium dichromate (VI) -  $\text{H}_2\text{SO}_4$  and  $\text{K}_2\text{Cr}_2\text{O}_7$ . Colour change from orange to green.



What is a reducing agent for aldehydes and ketones?  
What ions does this release in solution?



What is a reducing agent for aldehydes and ketones? What ions does this release in solution?

$\text{NaBH}_4$  (sodium tetrahydridoborate (III)),  
releases an  $\text{H}^-$  ion



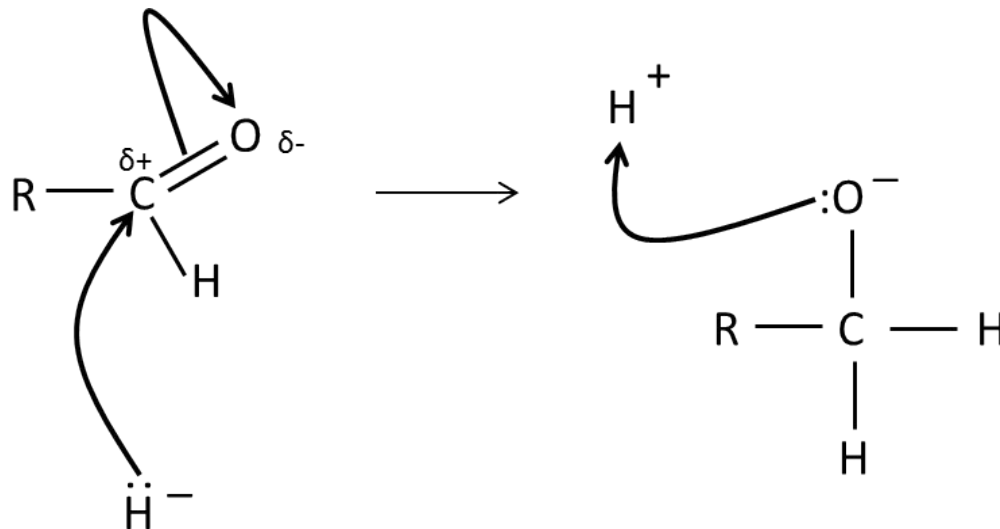
Draw and name a  
mechanism for the reduction  
of an aldehyde.





Draw and name a mechanism for the reduction of an aldehyde.

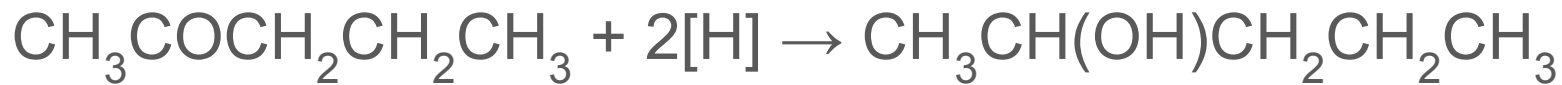
Nucleophilic addition



Write an equation for the reduction of pentan-2-one and for 3-methylbutanal.



Write an equation for the reduction of pentan-2-one and for 3-methylbutanal.



How do you convert an  
aldehyde to form a  
carboxylic acid?



How do you convert an aldehyde to form a carboxylic acid?

Oxidation of aldehydes using  $\text{Cr}_2\text{O}_7^{2-}/\text{H}^+$  (i.e.  
 $\text{K}_2\text{Cr}_2\text{O}_7/\text{H}_2\text{SO}_4$ )



Write out the mechanism for the nucleophilic substitution reaction of carbonyl compound with  $\text{NaBH}_4$ ?



Write out the mechanism for the nucleophilic substitution reaction of carbonyl compound with  $\text{NaBH}_4$ ?

