

WJEC (Wales) Chemistry A-level

Topic 2.7 - Alcohols and Carboxylic Acids

Flashcards

This work by [PMT Education](https://www.pmt.education) is licensed under [CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/)



What is the functional group of alcohols?



What is the functional group of alcohols?

-OH



What is the general formula for alcohols?



What is the general formula for alcohols?



What are the conditions for the industrial production of ethanol from ethene?



What are the conditions for the industrial production of ethanol from ethene?

Hydration of ethene:

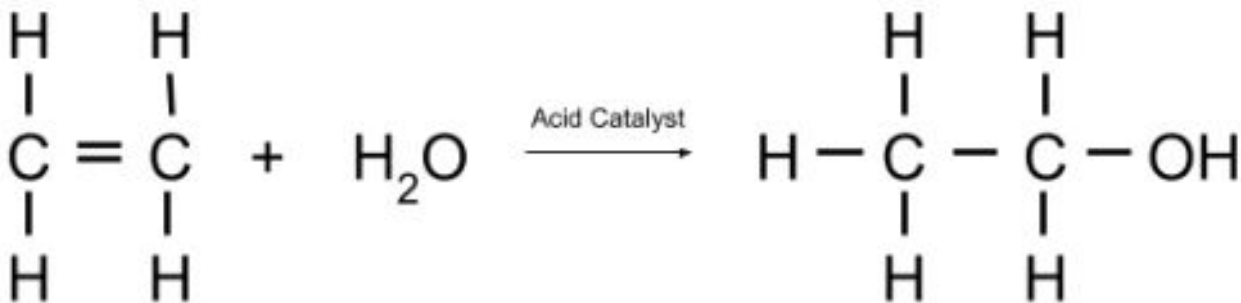
- Phosphoric acid catalyst (aqueous)
- Temperature of 300°C and high pressure



Write the chemical equation for the hydration of ethene



Write the chemical equation for the hydration of ethene



How can ethanol be produced from a renewable source?



How can ethanol be produced from a renewable source?

Ethanol can be produced from the fermentation of sugars. In crops, enzymes break down starch into sugars which can then undergo fermentation to form ethanol.



What conditions are required for the fermentation of glucose to form ethanol?



What conditions are required for the fermentation of glucose to form ethanol?

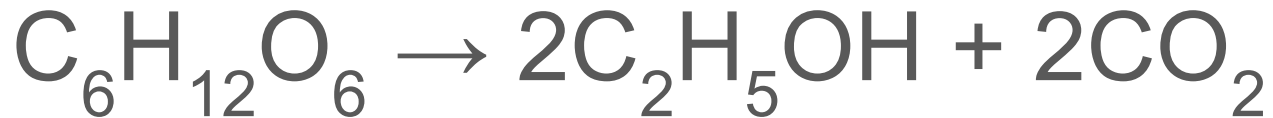
- Carried out with yeast
- 30-40°C temperature
- Anaerobic conditions (no oxygen)



What is the chemical equation for the fermentation of glucose to form ethanol?



What is the chemical equation for the fermentation of glucose to form ethanol?



After fermentation, how can ethanol be separated from the rest of the reaction mixture?



After fermentation, how can ethanol be separated from the rest of the reaction mixture?

Distillation



Why is the production of ethanol fuel from glucose said to be 'carbon neutral'?



Why is the production of ethanol fuel from glucose said to be 'carbon neutral'?

A process is carbon neutral if it contributes no net increase to the amount of carbon dioxide in the atmosphere.

Ethanol fuel, produced from glucose, is carbon neutral because the crops take in carbon dioxide during photosynthesis which balances out the amount of carbon dioxide that is released when the fuel is burned.



Why might someone argue that the production of ethanol fuel from glucose is not carbon neutral?



Why might someone argue that the production of ethanol fuel from glucose is not carbon neutral?

Energy is required to power the machinery to make fertilisers for the crops and to harvest the crops, which releases carbon dioxide. Similarly, more carbon dioxide is released during the transportation of the ethanol.



What is formed when alcohols undergo dehydration?



What is formed when alcohols undergo dehydration?

Alkenes



How do alcohols undergo dehydration reactions?



How do alcohols undergo dehydration reactions?

Alcohols undergo dehydration reactions to form an alkene and a water molecule.

There are two ways to carry out dehydration:

- Heat with strong acid catalyst.
- Pass alcohol vapour over Al_2O_3 powder.



What is the chemical equation for the dehydration of propan-2-ol to form prop-2-ene?



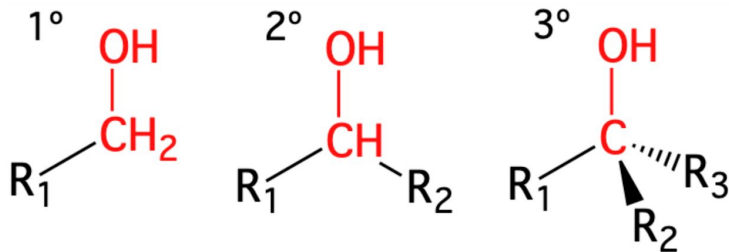
What is the chemical equation for the dehydration of propan-2-ol to form prop-2-ene?



Explain the classification of alcohols



Explain the classification of alcohols



- Primary, 1° - The carbon bonded to the hydroxyl group is bonded to one R group only.
- Secondary, 2° - The carbon bonded to the hydroxyl group is bonded to two R groups.
- Tertiary, 3° - The carbon bonded to the hydroxyl group is bonded to three R groups.

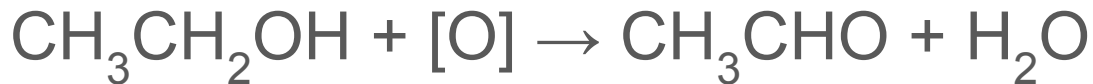


How are primary alcohols oxidised to aldehydes?



How are primary alcohols oxidised to aldehydes?

If you heat a primary alcohol with acidified potassium dichromate(VI), the alcohol will be oxidised to form an aldehyde:



The acidified potassium dichromate(VI) will change colour from orange to green.

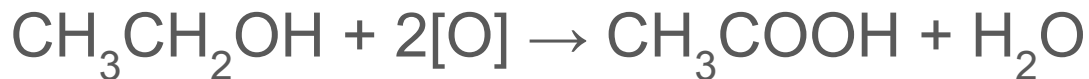


How are primary alcohols oxidised to carboxylic acids?



How are primary alcohols oxidised to carboxylic acids?

If a primary alcohol is heated under reflux with acidified potassium dichromate(VI), the alcohol will be oxidised form a carboxylic acid.



The acidified potassium dichromate(VI) will change colour from orange to green.



How are secondary alcohols oxidised to ketones?



How are secondary alcohols oxidised to ketones?

If a secondary alcohol is heated under reflux with acidified potassium dichromate (VI), the alcohol will be oxidised to form a ketone:



The acidified potassium dichromate(VI) will change colour from orange to green.



What qualitative test can be carried out to test for primary and secondary alcohols?



What qualitative test can be carried out to test for primary and secondary alcohols?

Add acidified potassium dichromate(VI):

The solution will change colour from orange to green if a primary or secondary alcohol is present.



What qualitative test can be carried out to test for carboxylic acids?



What qualitative test can be carried out to test for carboxylic acids?

Add sodium hydrogencarbonate (NaHCO_3):

The solution will effervesce and carbon dioxide will be produced if a carboxylic acid is present. The gas released can be tested with limewater to identify it as carbon dioxide.



What is produced when carboxylic acids react with bases?



What is produced when carboxylic acids react with bases?

Salt and water



What is the chemical equation for the reaction of ethanoic acid with sodium hydroxide?



What is the chemical equation for the reaction of ethanoic acid with sodium hydroxide?



What is produced when carboxylic acids react with carbonates?



What is produced when carboxylic acids react with carbonates?

Salt, carbon dioxide and water



What is the chemical equation for the reaction of methanoic acid with sodium carbonate?



What is the chemical equation for the reaction of methanoic acid with sodium carbonate?



What is produced when carboxylic acids react with hydrogencarbonates?



What is produced when carboxylic acids react with hydrogencarbonates?

Salt, carbon dioxide and water



What is the chemical equation for the reaction of ethanoic acid with sodium hydrogencarbonate?



What is the chemical equation for the reaction of ethanoic acid with sodium hydrogencarbonate?



How do alcohols react with carboxylic acids?



How do alcohols react with carboxylic acids?

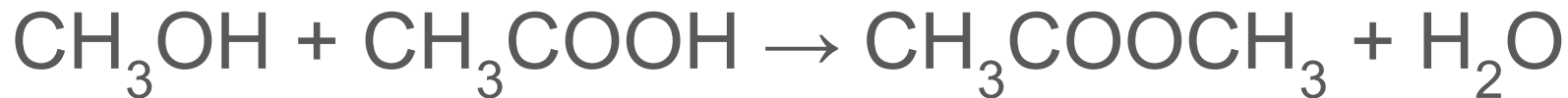
Alcohols react with carboxylic acids to form esters. This process is called esterification and requires heating with a sulfuric acid catalyst.



What is the chemical equation for the reaction between methanol and ethanoic acid? Give the name of the ester formed



What is the chemical equation for the reaction between methanol and ethanoic acid? Give the name of the ester formed



Product $\text{CH}_3\text{COOCH}_3$ is methyl ethanoate.



Explain how ethanol can be separated from water



Explain how ethanol can be separated from water

Ethanol and water have different boiling points so they can be separated by distillation:

- The mixture is heated until the ethanol evaporates.
- The ethanol vapours enter the condenser where they condense and run into a beaker.

