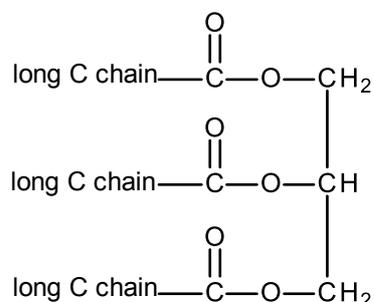


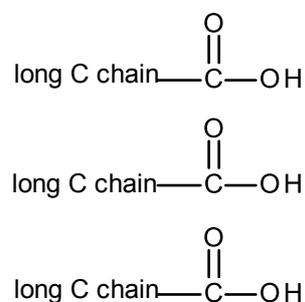


# LIPIDS

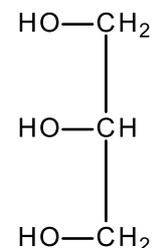
- Lipids (fats and oils) are naturally occurring esters. They consist of three long carboxylic acids (known as fatty acids) joined through the alcohol propane-1,2,3-triol (known as glycerol) which has three alcohol groups.



**LIPID**

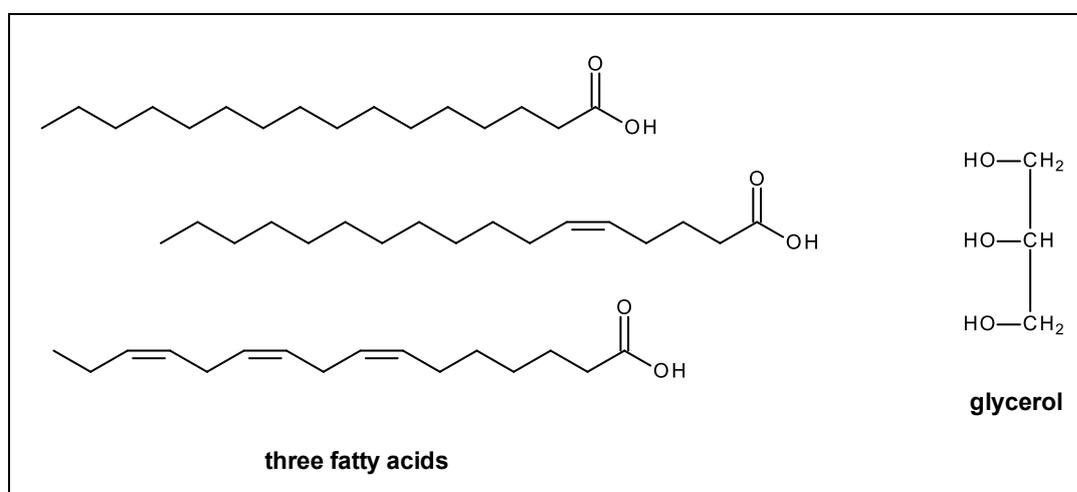
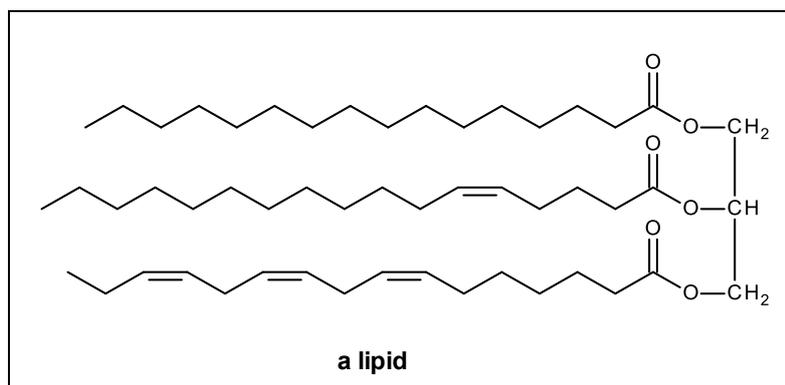


**3 FATTY ACIDS**



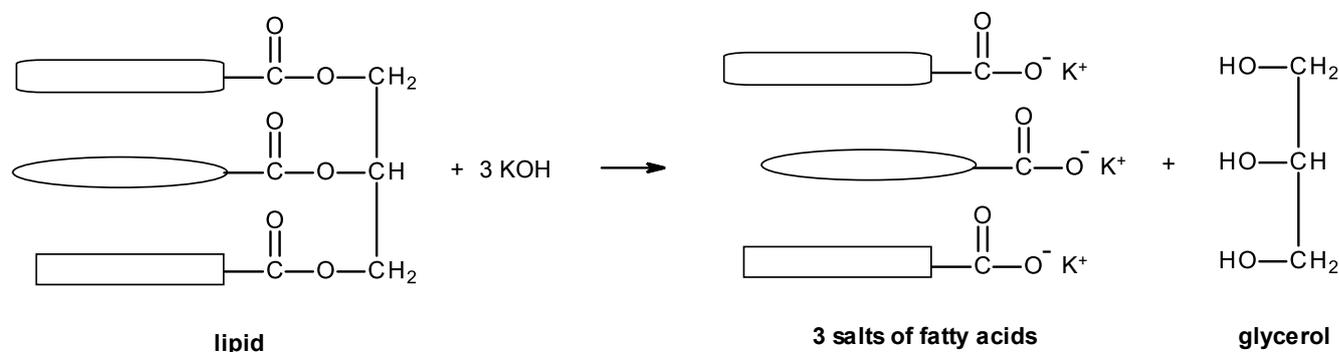
**GLYCEROL**

- The fatty acids may be saturated or unsaturated.
- Lipids that are liquids at room temperature are called **oils** and tend to contain unsaturated fatty acids.
- Lipids that are solids at room temperature are called **fats** and tend to contain saturated fatty acids.



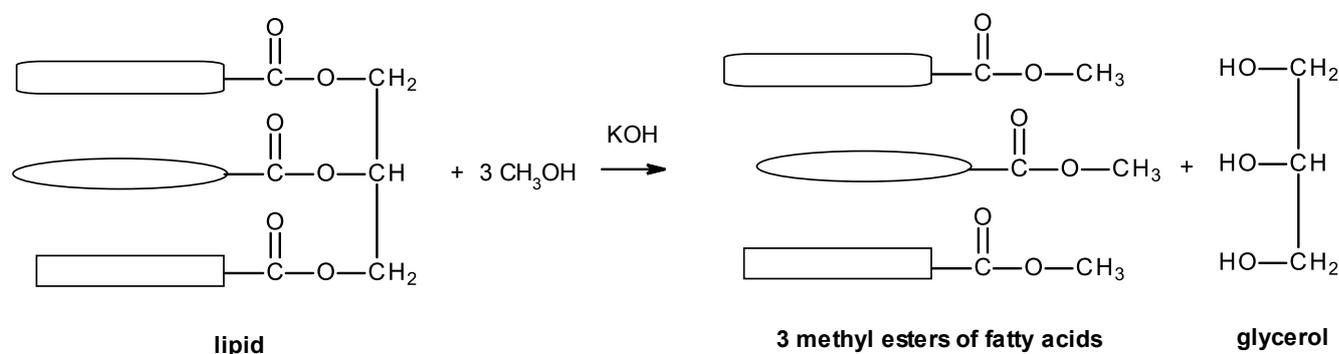
## SOAP MAKING

- Saponification of lipids produces salts of fatty acids and glycerol.
- This mixture is used as soap and is often made by boiling lipids with potassium hydroxide.



## BIODIESEL

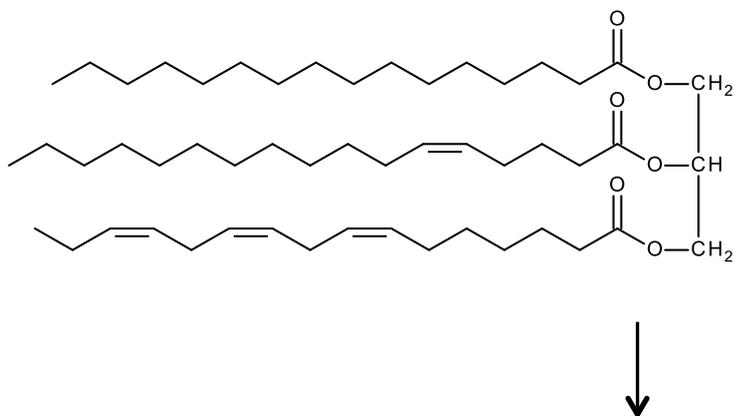
- Biodiesel can also be made from lipids.
- In this reaction, the lipid is broken down into three fatty acids and glycerol by reaction with potassium hydroxide, but then these fatty acids are converted into three new esters using methanol.
- Overall the potassium hydroxide is not used up and so acts as a catalyst.



- Biodiesel can be used in most diesel engines in place of diesel made from crude oil. The diesel sold in the UK is actually 95% crude oil diesel and 5% biodiesel.
- In the UK, biodiesel is usually made from rapeseed oil.
- Biodiesel is potentially a carbon neutral fuel (no net release of CO<sub>2</sub> to the atmosphere as the same amount of CO<sub>2</sub> is released when the fuel is burned as the crops it was made from absorbed for photosynthesis).
- Biodiesel is also a renewable fuel, but its production uses a lot of farm land instead of using it for food production.

**TASK** Complete balanced equations to show the production of soap and biodiesel from the lipid shown.

**Making soap**



**Making biodiesel**

