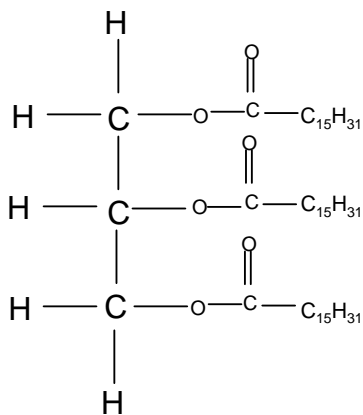


#### 4.5 Exercise 2 – carboxylic acids and esters

1. Write equations for the following reactions:
  - a) propanoic acid with sodium hydroxide
  - b) butanoic acid with sodium carbonate
  - c) sodium methanoate with hydrochloric acid
  - d) sodium ethanoate with sulphuric acid
  - e) 2-methylpropanoic acid with sodium carbonate
2. Write equations for the following reactions and name any organic products:
  - a) propanoic acid with methanol
  - b) ethanoic acid with propan-2-ol
  - c) methanoic acid with propan-1-ol
  - d) butanoic acid with butan-1-ol
3. Write equations, using displayed formulae, for the following reactions:
  - a) ethyl methanoate with conc.  $\text{H}_2\text{SO}_4$
  - b) methyl propanoate with  $\text{NaOH}$
  - c) methylethyl ethanoate with  $\text{H}_2\text{SO}_4$
  - d) propyl methanoate with  $\text{NaOH}$
4. Write equations for the reaction of the following oil:



with

- a) dilute hydrochloric acid in the presence of lipase
- b) sodium hydroxide

Suggest where each of the reactions might take place and state a use for each of the products in each case.