

Unit 2

Esters

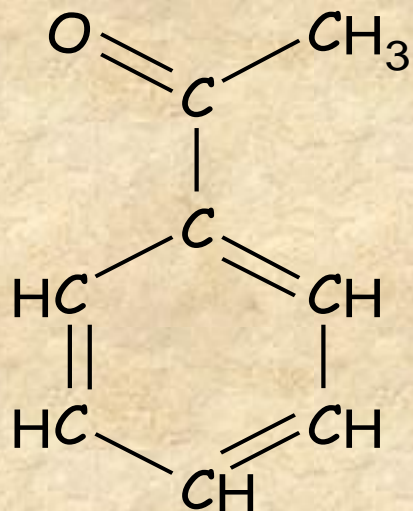
Go to question

- 1 Which of the following compounds is an ester?
- 2 The structural formula of the ester formed between ethanol and propanoic acid is.
- 3 What is the systematic name of the **acid** used to make this ester?
- 4 The ester that is an isomer of pentanoic acid is?
- 5 Esters are most likely to be used as
- 6 What type of reaction takes place when a olive oil is converted into glycerol and fatty acids?
- 7 Oleic acid is a constituent of olive oil. It's formulae is $C_{17}H_{33}COOH$. What structure of this molecule makes it different from a similar fat molecule?
- 8 When the ester glyceryl tristearate is reacted with sodium hydroxide, soap is made. The name of the soap molecule is?

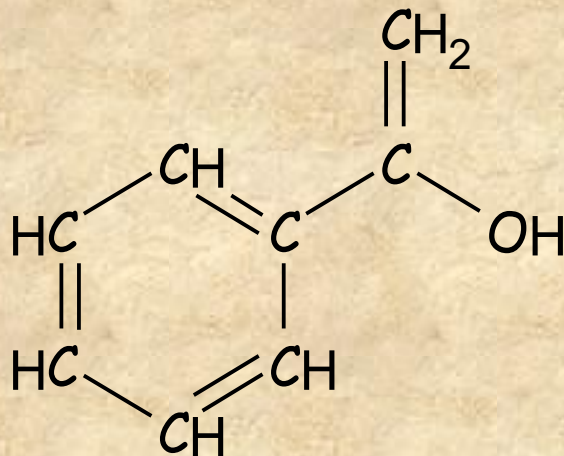


1. Which of the following compounds is an ester?

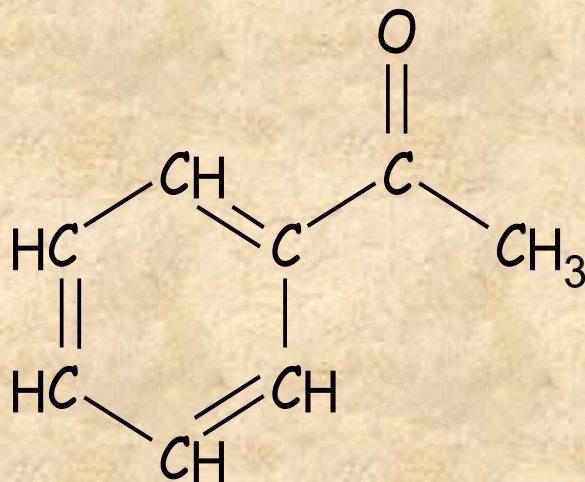
a.



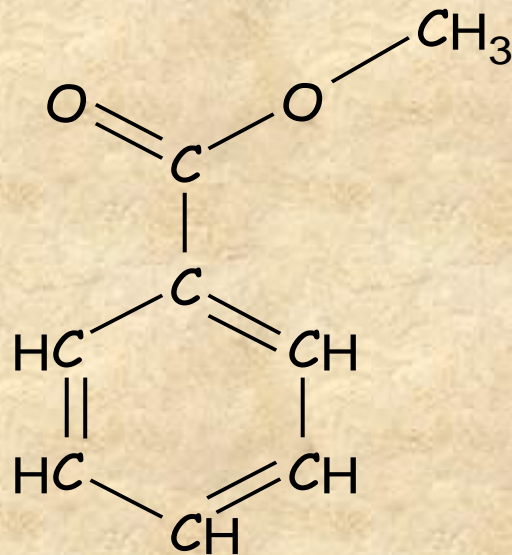
b.



c.



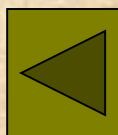
d.



a hint!!!!

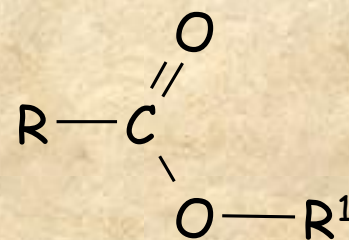
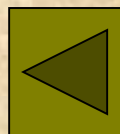
1st hint

What is the functional group in an ester?



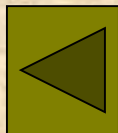
2nd hint

The functional group of an ester is



a hint!!!!

This functional group is -OH (hydroxyl)

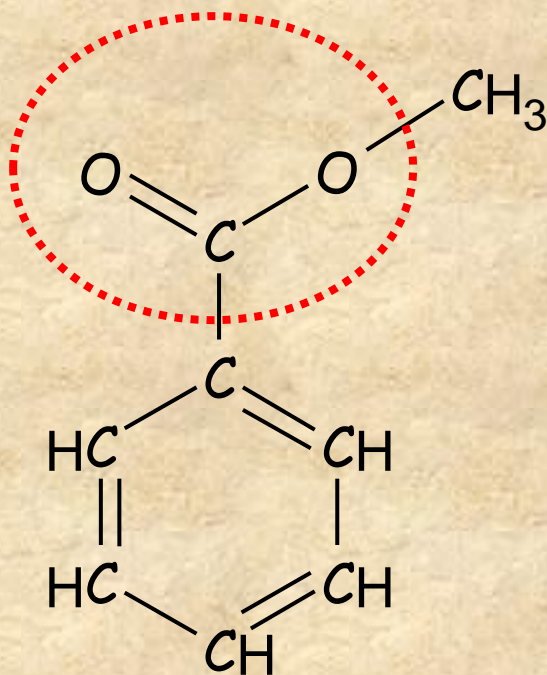


Which of the following compounds is an ester?

Correct because.....

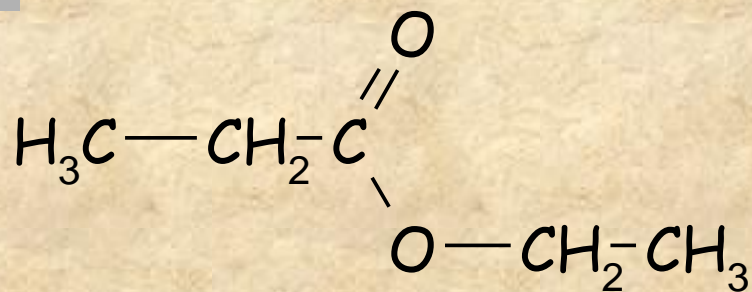
The functional group in an ester is $R-C(=O)OR^1$

d.

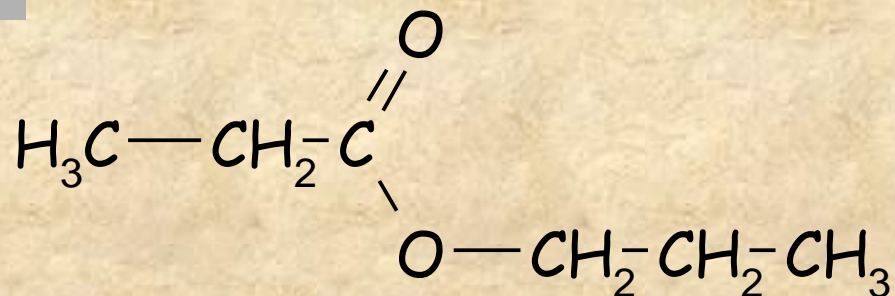


2 The structural formula of the ester formed between ethanol and propanoic acid is.

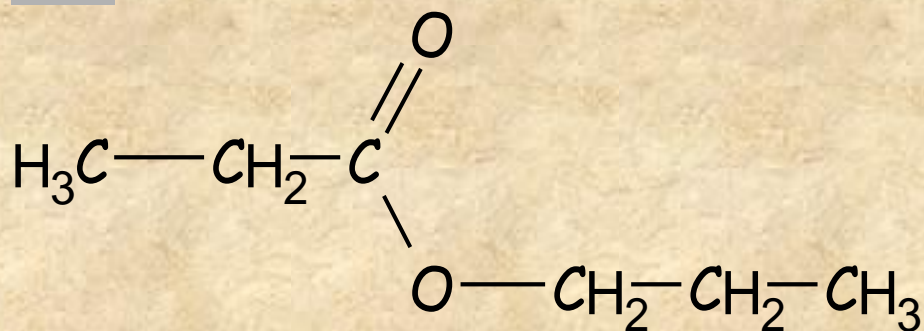
a.



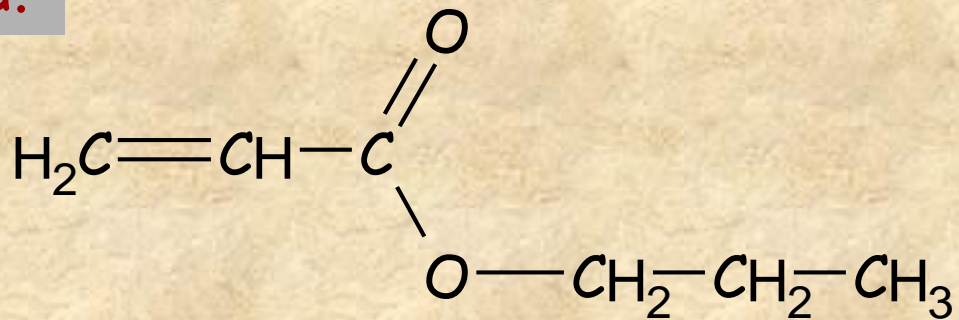
b.



c.



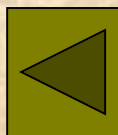
d.



a hint!!!!

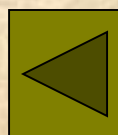
1st hint

Propanoic acid forms the functional group of the ester



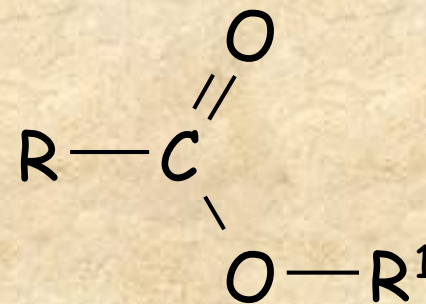
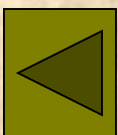
2nd hint

The functional group of an ester -oate.



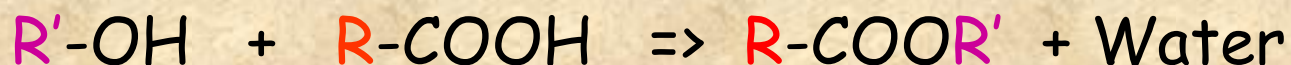
3rd hint

The ethyl group is R¹



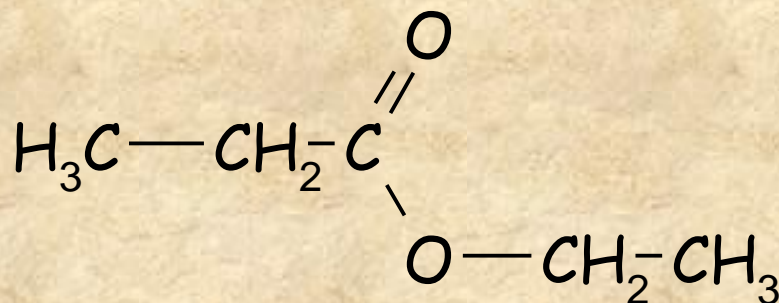
The structural formula of the ester formed between ethanol (R) and propanoic acid (R) is.

Correct because.....



Ethanol gives the ethyl and the propanoic acid gives the propanoate. $C_2H_5COOC_2H_5$ ethyl propanoate.

a.

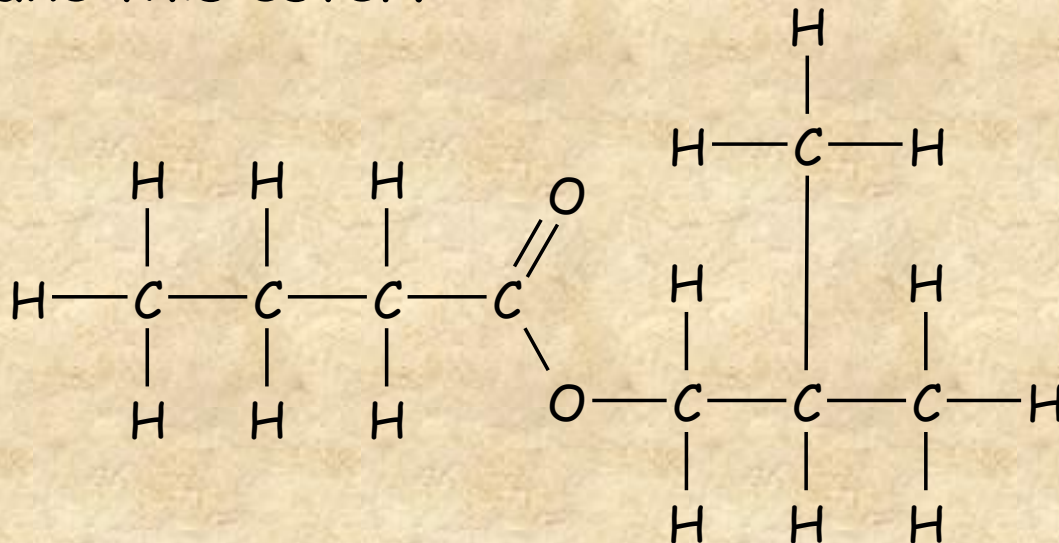


R

R'



3 What is the systematic name of the **acid** used to make this ester?



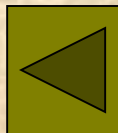
- a. 2-methylpropanoic acid
- b. 3-methylpropanoic acid
- c. Butanoic acid
- d. 2-methylethanoic acid



a hint!!!!

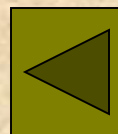
1st hint

Look at the functional group and the carbon chains attached to it



2nd hint

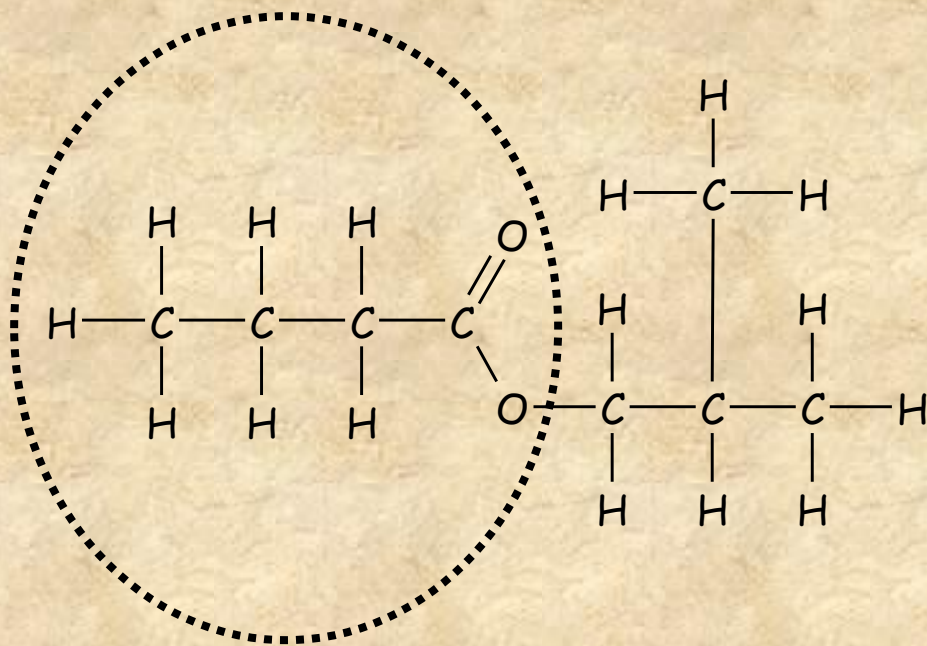
The carbon chain that produces the -yl part of the name comes from the **alcohol** used to make the ester.



What is the systematic name of the acid used to make this ester?

Correct because.....

The name of this ester is **butyl 2-methyl propanoate**.



Butanoic acid

The portion that carries the COO group would be the butyl part of the ester.



4 Which ester is an isomer of pentanoic acid?

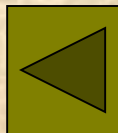
- a. Ethyl methanoate
- b. Ethyl propanoate
- c. Propyl methanoate
- d. Methyl propanoate



a hint!!!!

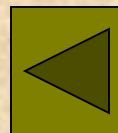
1st hint

What is the link between isomers and molecular formula?



2nd hint

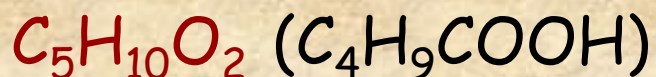
Isomers have the same molecular formula.



The ester that is an isomer of pentanoic acid is?

Correct because

The molecular formula for pentanoic acid is



a. Ethyl methanoate : Molecular formula $C_3H_6O_2$
 $HCOOC_2H_5$

b. Ethyl propanoate : Molecular formula $C_5H_{10}O_2$
 $C_2H_5COOC_2H_5$

c. Propyl methanoate: Molecular formula $C_4H_8O_2$
 $HCOOC_3H_7$

d. Methyl propanoate: Molecular formula $C_4H_8O_2$
 $C_2H_5COOCH_3$



5 Esters are most likely to be used as

- a. Making a polyester
- b. Making industrial acids
- c. As solvents
- d. As preservatives



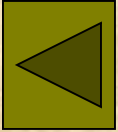
a hint!!!!

Polyesters are condensation polymers made from the reaction between two monomers, a diol and a diacid.



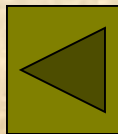
a hint!!!!

Salts of carboxylic acids are used as preservatives
e.g. sodium benzoate.



a hint!!!!

Industrial acids, e.g. HNO_3 , HCl , H_2SO_4 , CH_3COOH are not made from esters.



Esters are most likely to be used as

Correct because.....

Solvents

Esters are more volatile than carboxylic acids. Their intermolecular forces are weaker. They cannot form hydrogen bonds. This volatility helps give them their characteristic pleasant, fruity smells.

This property of their volatility is used in solvents for glues. E.g. Polystyrene cement consists of polystyrene dissolved in ethyl ethanoate.



6 What type of reaction takes place when a olive oil is converted into glycerol and fatty acids?

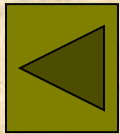
- a. Dehyrdration
- b. Hydrogenation
- c. Condensation
- d. Hydrolysis



a hint!!!!

1st hint

Olive oil is a triglyceride, it has three ester links.



2nd hint

Water can react with these ester links.



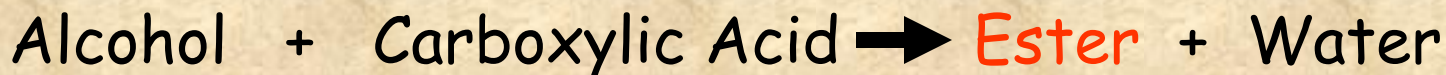
What type of reaction takes place when an olive oil is converted into glycerol and fatty acids?

Correct because.....

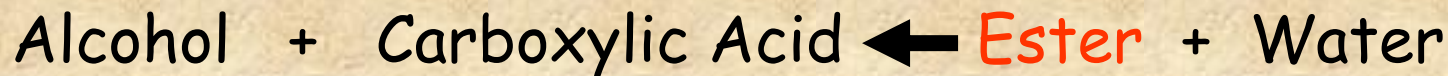
Hydrolysis

Oils, like fats are naturally occurring esters. Like all esters, they can be hydrolysed.

Condensation



Hydrolysis



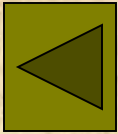
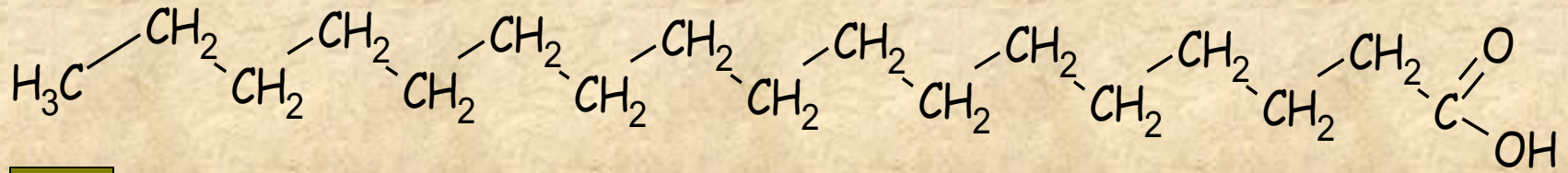
7 Oleic acid is a constituent of olive oil. Its formula is $C_{17}H_{33}COOH$. What structure of this molecule makes it different from a similar molecule which is a constituent of beef fat?

- a. Stearic acid have much longer carbon chains
- b. These molecules do not have carbonyl groups.
- c. Oleic acid is unsaturated.
- d. Oleic acid forms straight hydrocarbon chains in olive oil.



a hint!!!!

Stearic acid is a fatty acid.



a hint!!!!

$C_nH_{2n+1}COOH$ is the general formula for a saturated fatty acid.

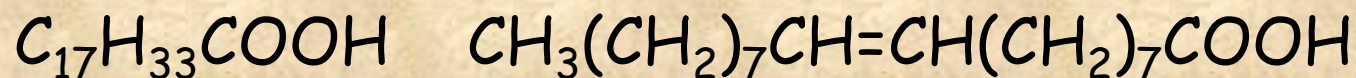


Oleic acid is a constituent of olive oil. Its formula is $C_{17}H_{33}COOH$. What structure of this molecule makes it different from a similar molecule which is a constituent of beef fat??

Correct because.....

Oleic acid is unsaturated.

The general formula for an saturated fat is $C_nH_{2n+1}COOH$
This means that there are no $C=C$ bonds in its structure.



Oleic acid (from olive oil) **is unsaturated**



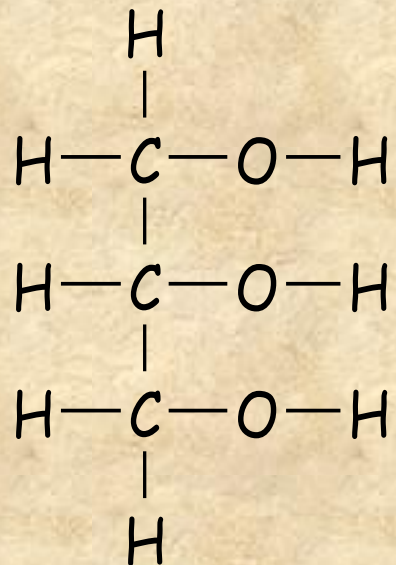
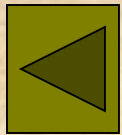
8 When the ester glyceryl tristearate is reacted with sodium hydroxide, soap is made. The name of the soap molecule is?

- a. Sodium tristearate
- b. Sodium glycerate
- c. Sodium stearate
- d. Sodium triglycerate



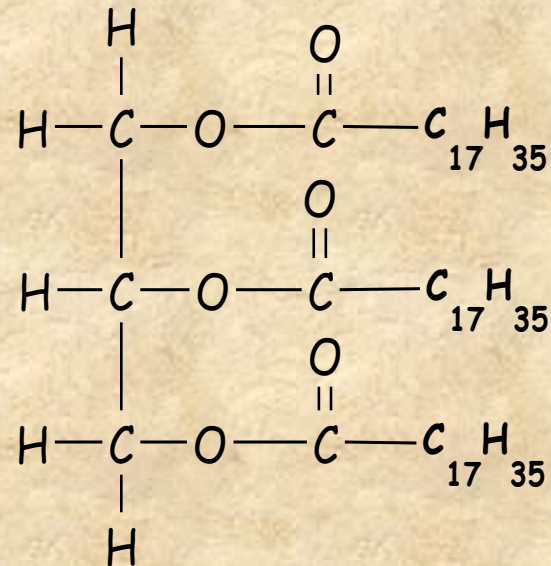
a hint!!!!

Glycerol's structural formula is



a hint!!!!

The ester glyceryl tristearate structural formula is



When the ester glyceryl tristearate is reacted with sodium hydroxide, soap is made. The name of the soap molecule is?

Correct because

Sodium stearate

Glyceryl tristearate molecule consists of 3 stearate fatty acid chains

