



Answer all the questions below as fully as you can then check your answers

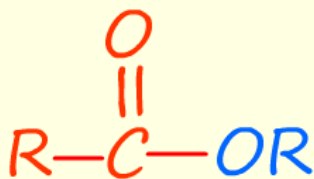
1. What is a condensation reaction?
2. Draw the ester functional group.
3. What two groups of substances can be reacted with a diol to form polyesters?
4. Draw the displayed formula for ethane-1,2-diol.
 - a. Draw the displayed formula for benzene-1,4-dicarboxylic acid.
 - b. Draw the molecule formed when one molecule of ethane-1,2-diol and one molecule of benzene-1,4-dicarboxylic acid react.
 - c. Draw the repeat unit of the condensation polymer Terylene formed when ethane-1,2-diol and benzene-1,4-dicarboxylic acid react.
5. Draw the displayed formula for lactic acid.
 - a. What is the IUPAC name for lactic acid?
 - b. Draw a diagram to show 3 molecules of lactic acid reacting to form part of the polymer PLA.
 - c. Name two uses of PLA.
 - d. Suggest a reason why PLA is a better choice to make disposable coffee cups from than expanded polystyrene.

Answers

1. What is a condensation reaction?

A reaction where two small molecules react and join together to form a larger molecule with the release or elimination of a small molecule; usually water, methanol or hydrogen chloride gas.

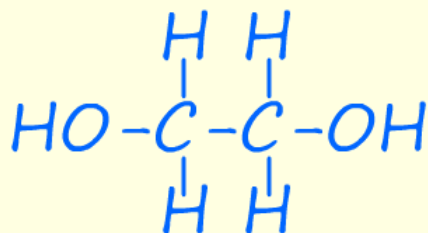
2. Draw the ester functional group.



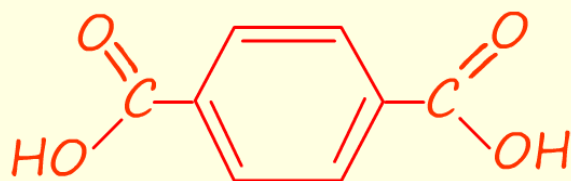
R can be alkyl or aryl groups to give aliphatic or aromatic esters.

3. What two groups of substances can be reacted with a diol to form polyesters?
diacid chlorides or diacyl dichlorides and dicarboxylic acids

4 Draw the displayed formula for ethane-1,2-diol.

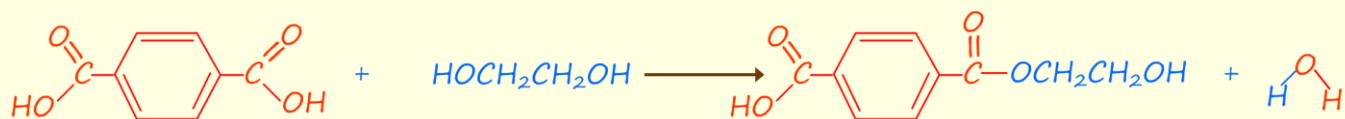


a. Draw the displayed formula for benzene-1,4-dicarboxylic acid.

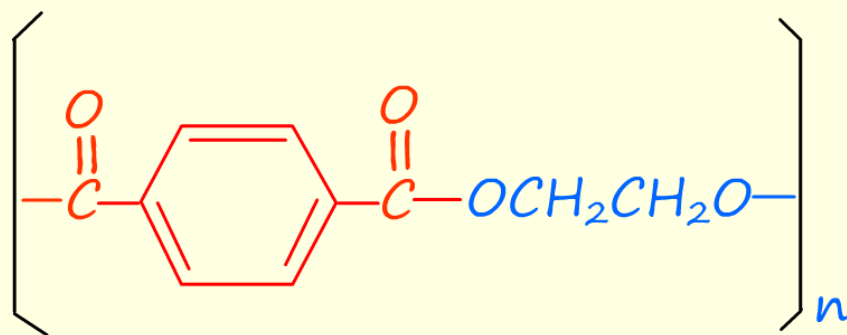


- b. Draw the molecule formed when one molecule of ethane-1,2-diol and one molecule of benzene-1,4-dicarboxylic acid react.

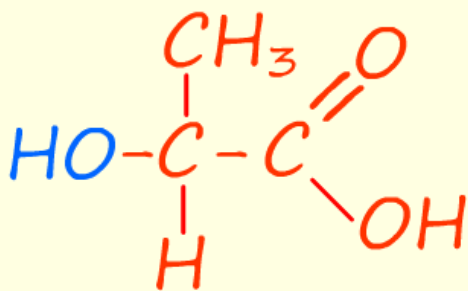
Equation below shows the formation of the ester when the diol and the diacid react.



- c. Draw the repeat unit of the condensation polymer Terylene formed when ethane-1,2-diol and benzene-1,4-dicarboxylic acid react.

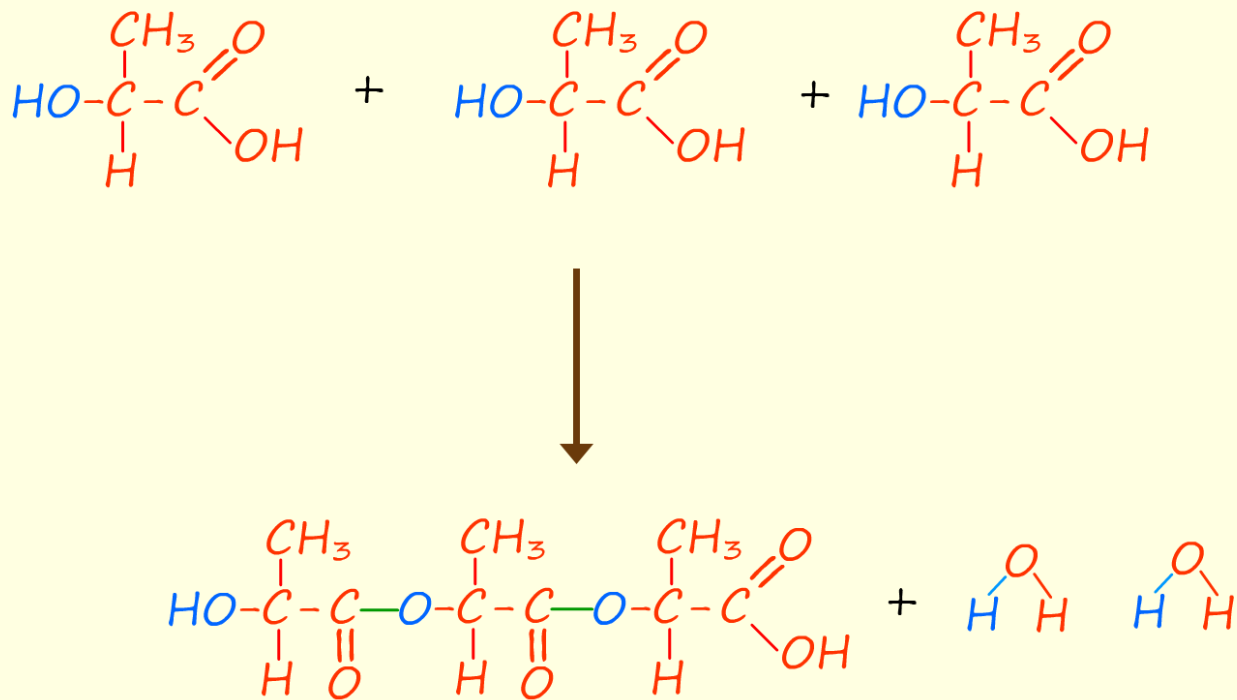


5. Draw the displayed formula for lactic acid.



- a. What is the IUPAC name for lactic acid?
2-hydroxypropanoic acid

b. Draw a diagram to show 3 molecules of lactic acid reacting to form part of the polymer PLA.



c. Name two uses of PLA.

- Used in 3d printers to produce a large number of varied products.
- Food packaging.
- Disposable cups and cutlery.
- Compostable bags.
- Feminine hygiene products and baby's nappies.
- Agricultural mulches to suppress weeds and agricultural netting for crops.
- Car parts such as mats and plastic panels.

d. Suggest a reason why PLA is a better choice to make disposable coffee cups from than expanded polystyrene.

PLA is biodegradable and will rot down in the environment; it is also made from renewable resources. Polystyrene is made from a finite resource; crude oil, It's also not biodegradable.