

# Triglycerides

A Level  
C C C

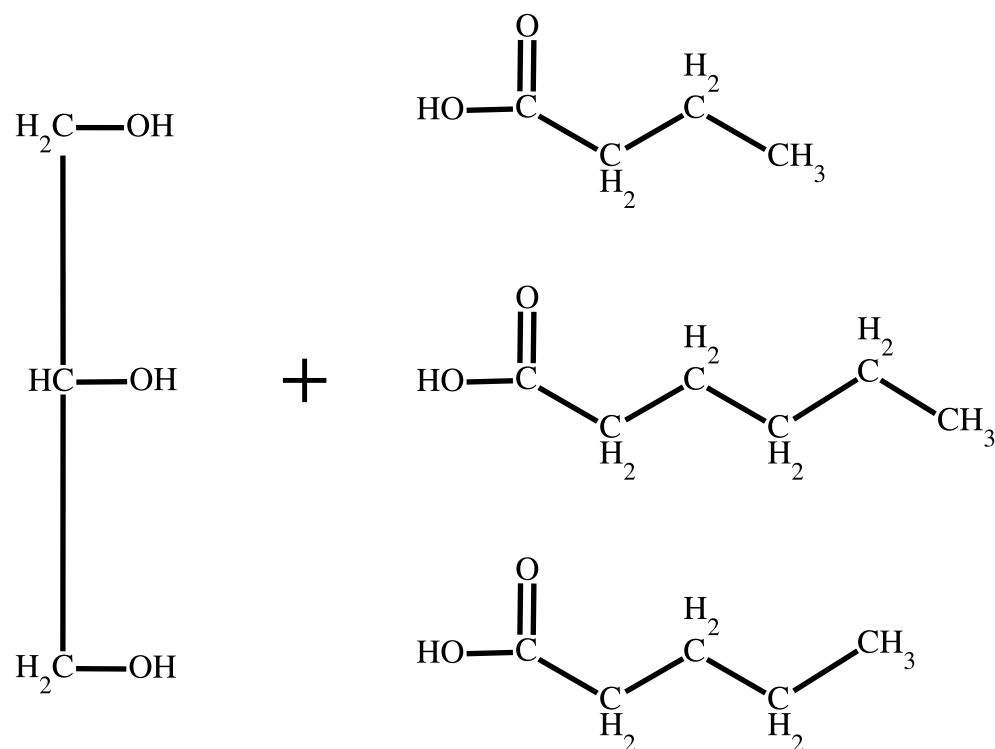
## Part A Triglyceride formation

A triglyceride is a particular type of lipid formed by a condensation reaction between one  molecule and   molecules. During condensation, the carboxyl groups of the  molecules react with the hydroxyl groups of the  molecule to form  bonds. Therefore, this condensation reaction is also called  reaction.

Items:

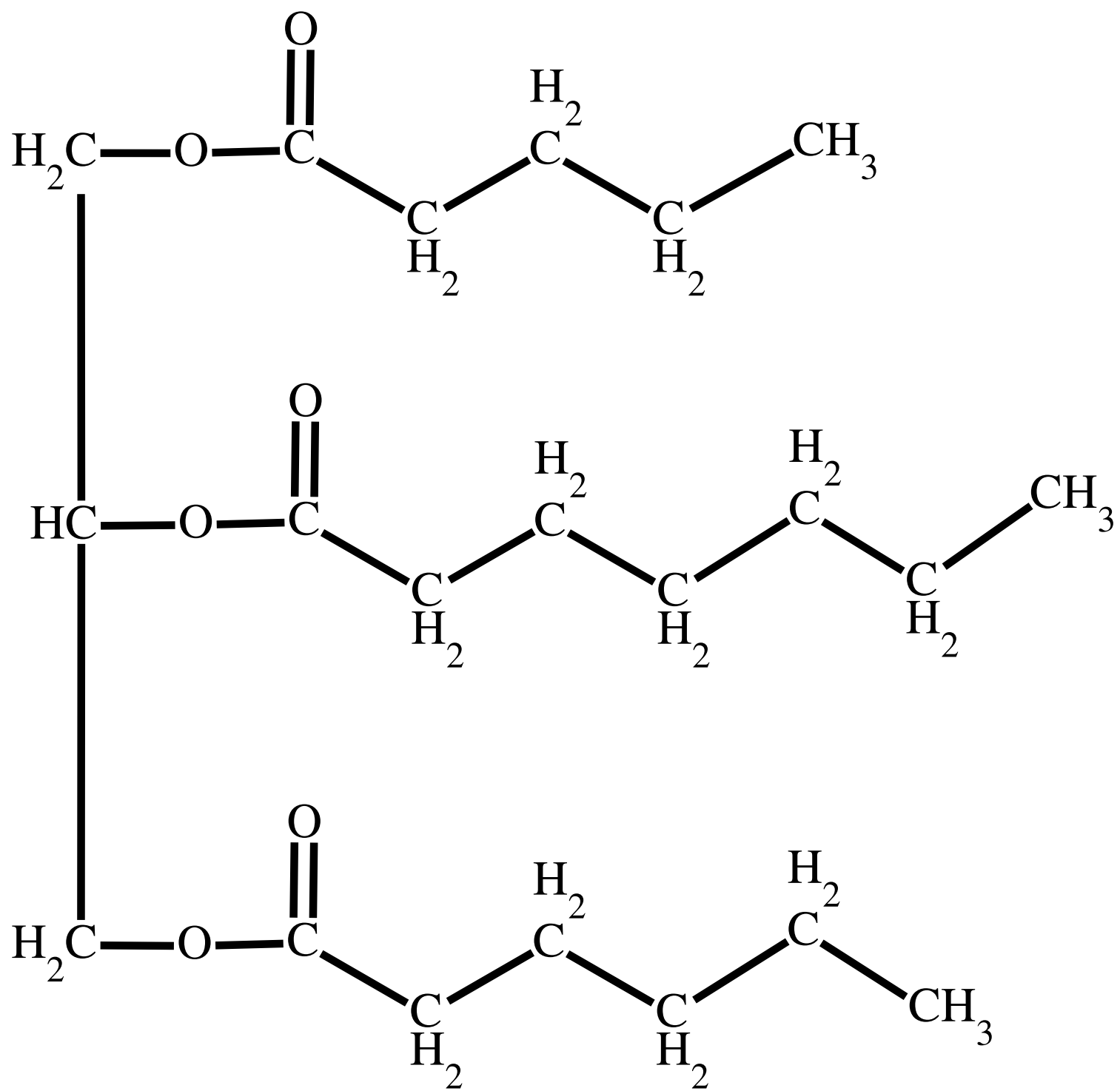
- four
- phosphate
- ester
- two
- an esterification
- fatty acid
- a phosphorylation
- glycine
- three
- glycerol

## Part B Condensation consequences



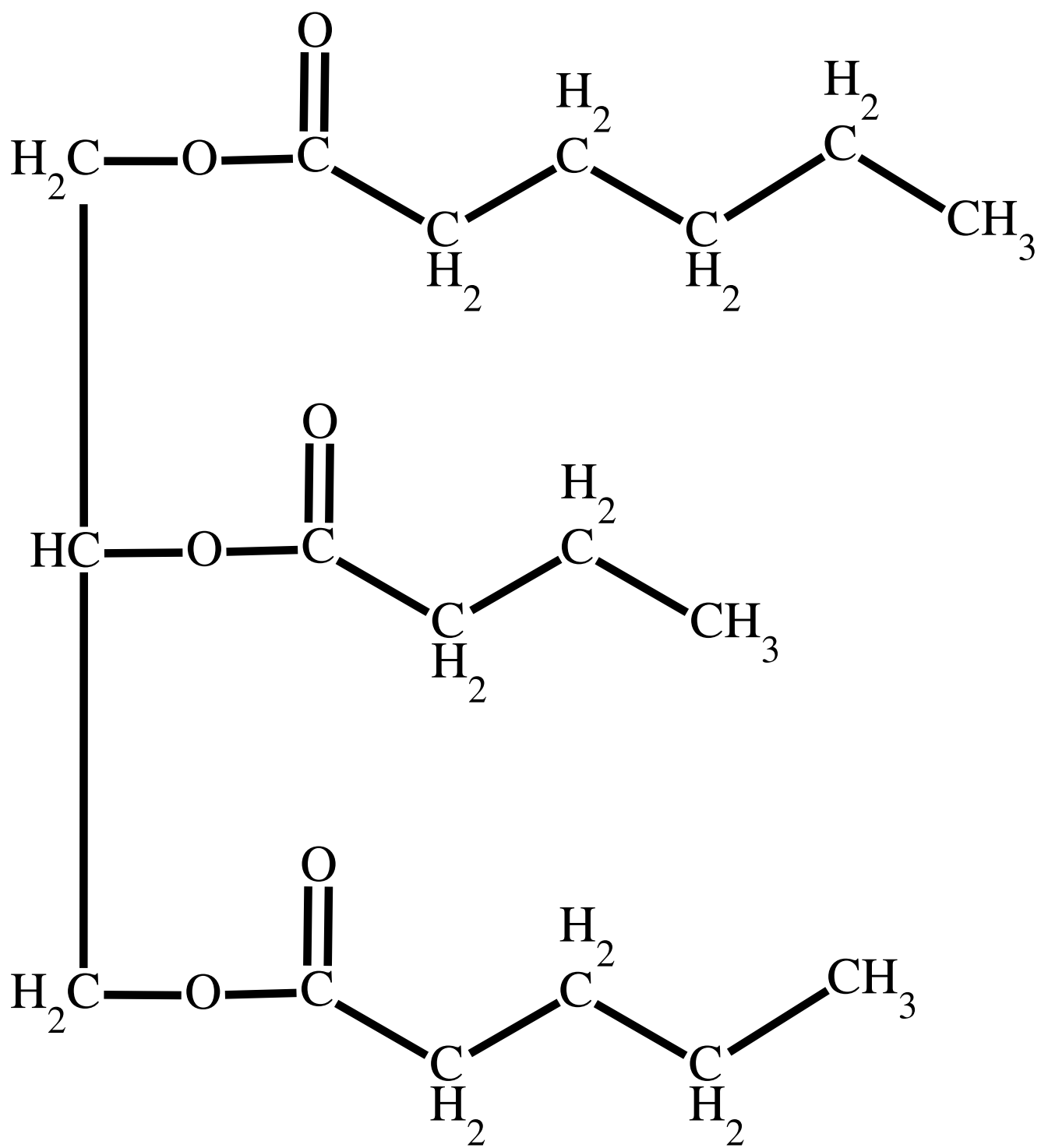
**Figure 1:** A condensation reaction between one glycerol molecule and three fatty acids.

Which of the images below represent triglycerides that could be formed in the condensation reaction shown in Figure 1? Select all that apply.



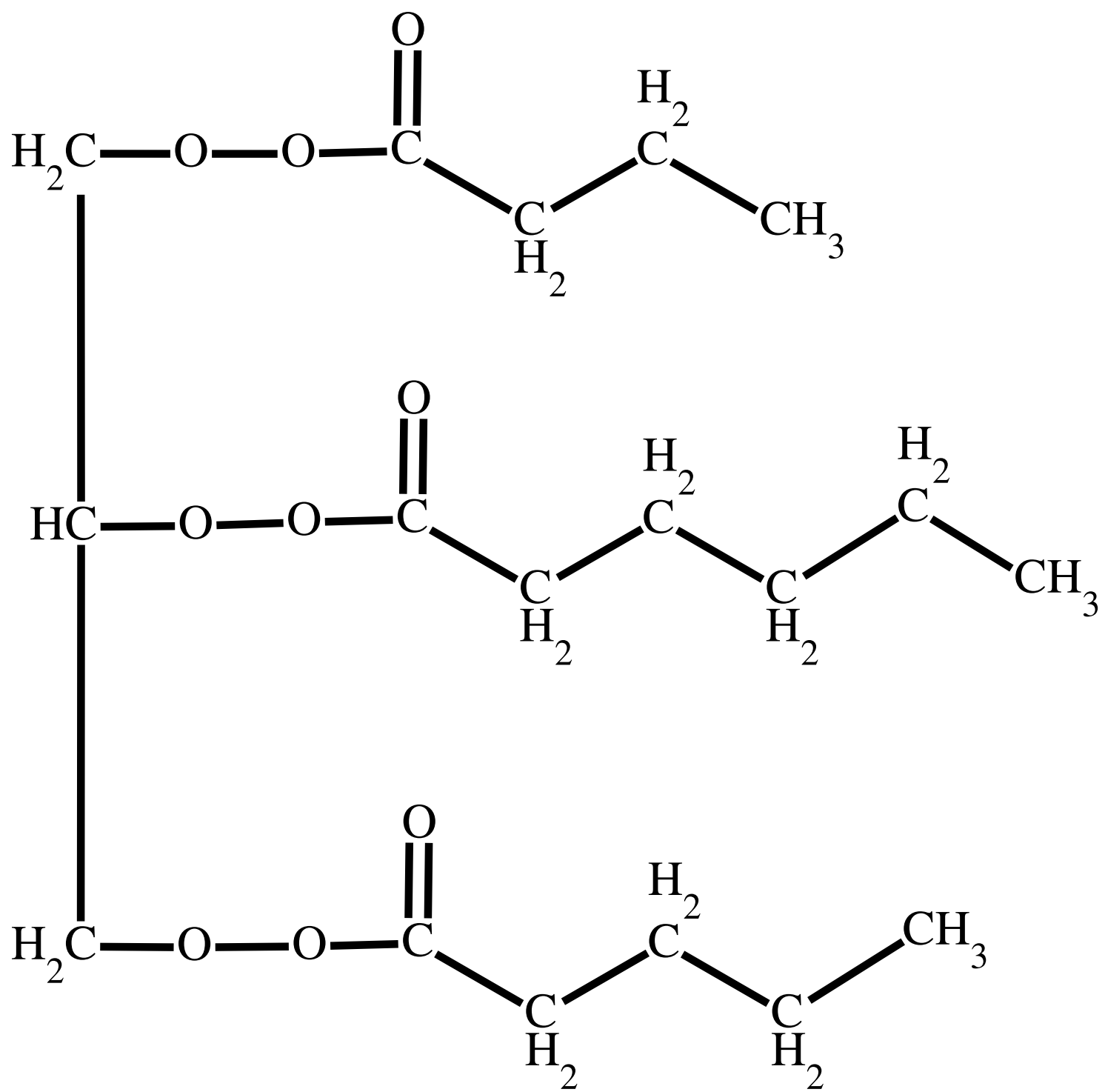
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A



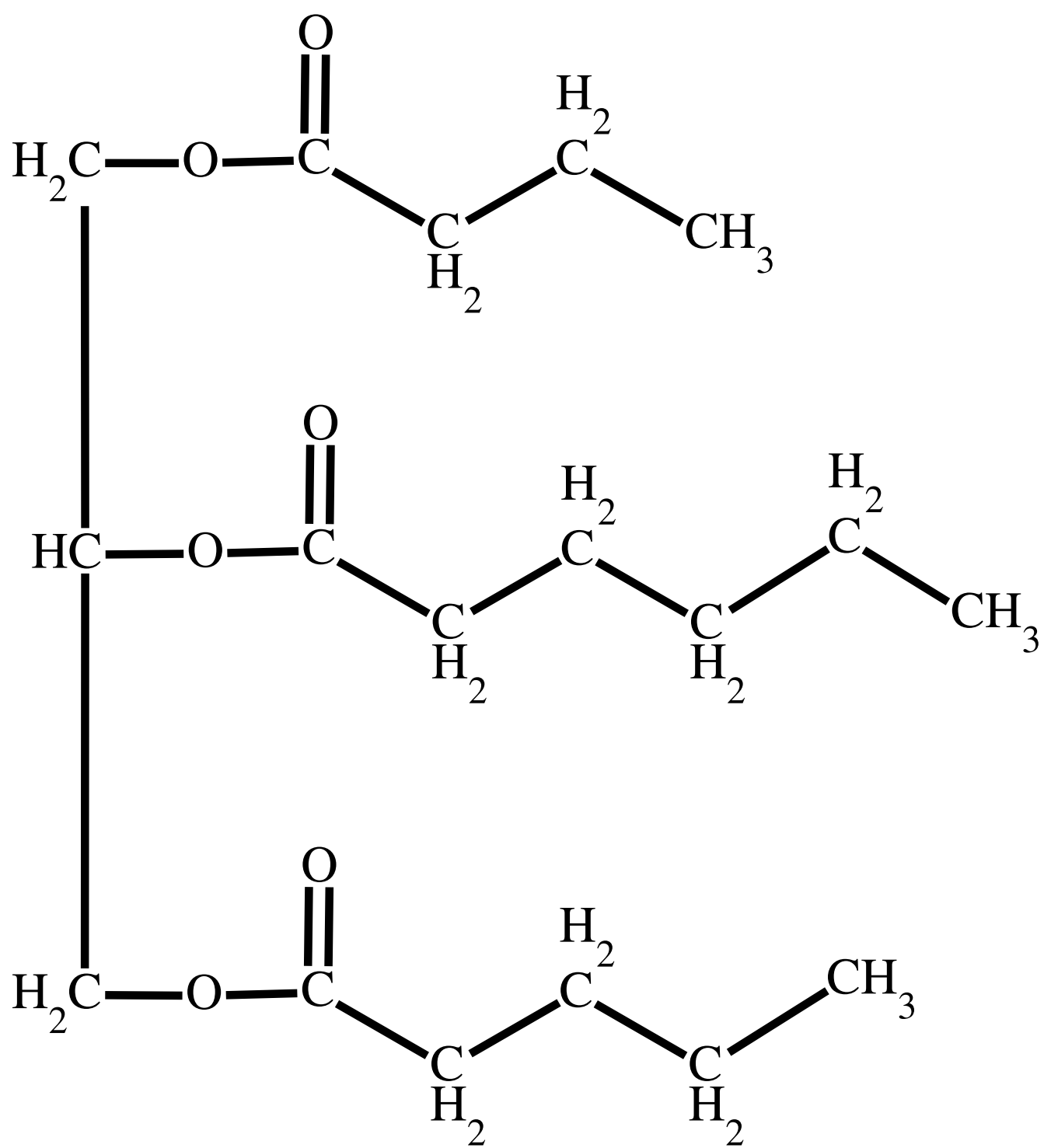
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B



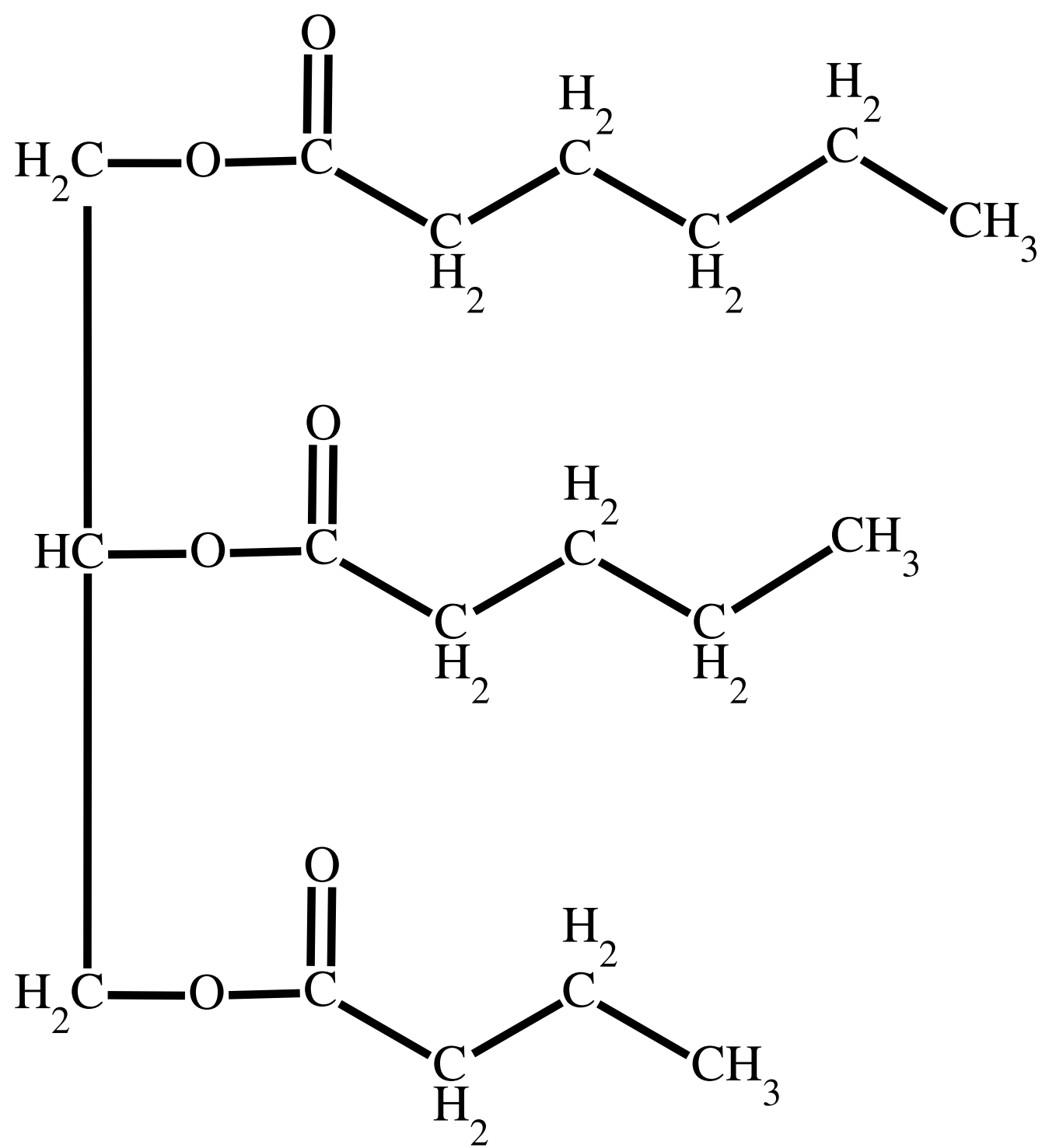
---

c

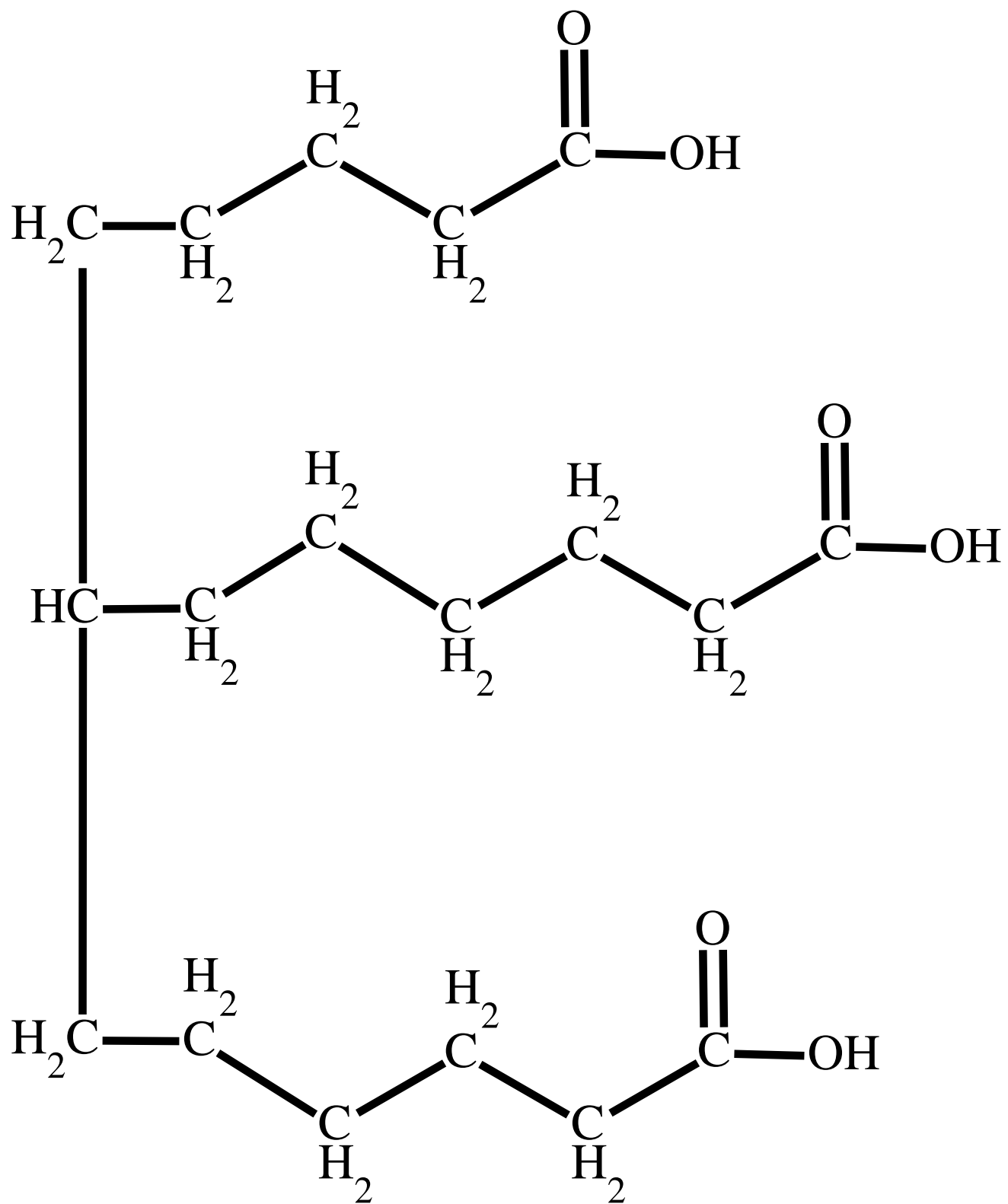


---

D



E



F

- ☐ A
- ☐ B
- ☐ C
- ☐ D
- ☐ E
- ☐ F



## Part C Triglyceride functions

Which of the following are functions of triglycerides? Select all that apply.

- ☐ act as biological catalysts
  - ☐ primary component of cell membranes
  - ☐ energy storage
  - ☐ insulation & protection
  - ☐ precursor for steroid hormones
- 

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# Phospholipids

A Level



## Part A Phospholipid structure

A phospholipid is a particular type of lipid that contains one  molecule,  , and one phosphate group. It is, therefore, very similar in structure to a triglyceride, except that one of the  have been replaced by a .

Items:

**fatty acids**

**glycerol**

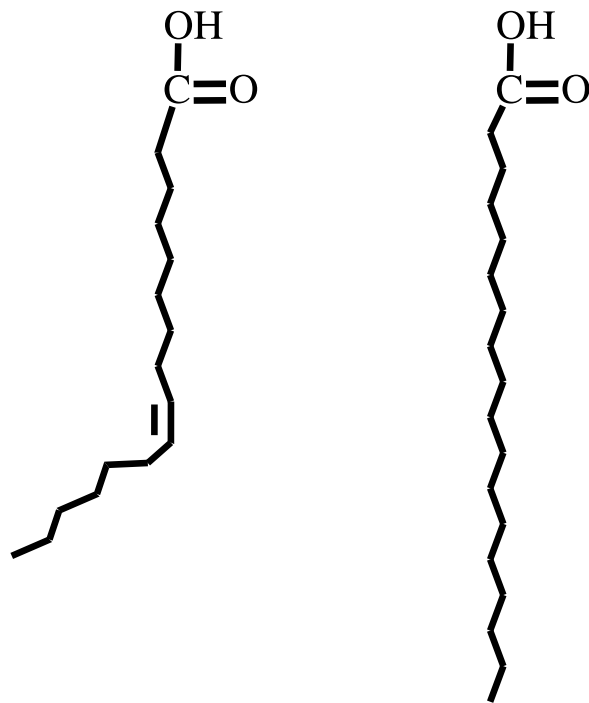
**phosphate group**

**two**

**three**

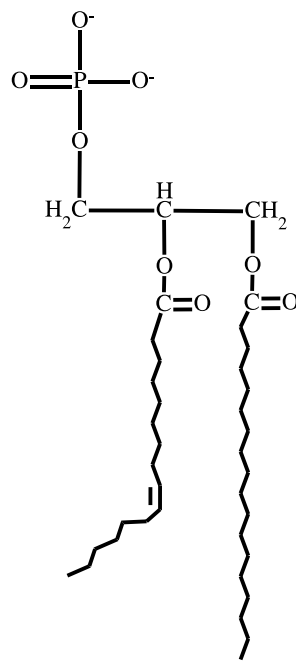
**four**

## Part B Phospholipid possibilities

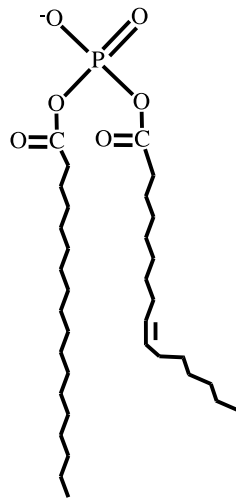


**Figure 1:** The simplified structures of two fatty acids are shown.

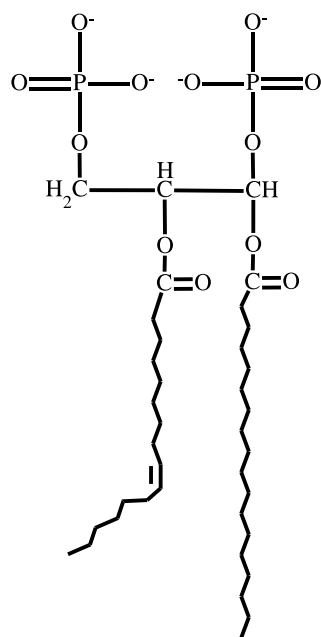
Which of the images below represent a phospholipid that could be formed from the fatty acids shown in Figure 1? Select all that apply.



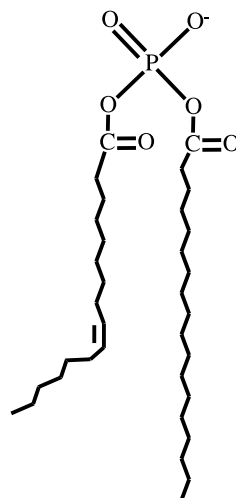
A



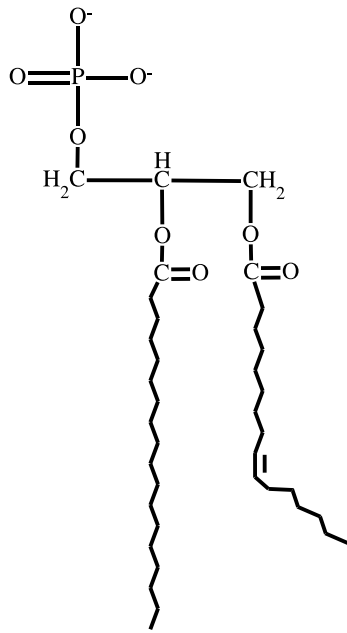
B



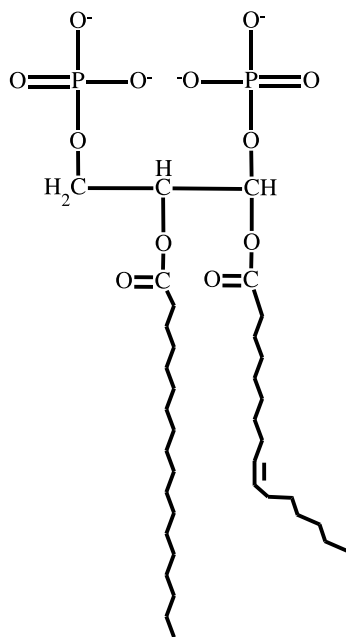
C



D



E



F

☐ A

☐ B

☐ C

☐ D

☐ E

☐ F

## Part C Phospholipid properties

The "head" of a phospholipid (composed of the ) is charged and therefore . The "tail" (composed of the ) is non-polar and therefore . Phospholipids are therefore described as  (molecules that contain both a hydrophilic and a hydrophobic part).

Items:

hydrophobic

phosphate group

amphipathic

fatty acids

hydrophilic

## Part D Phospholipid function

Which of the following is the main function of phospholipids?

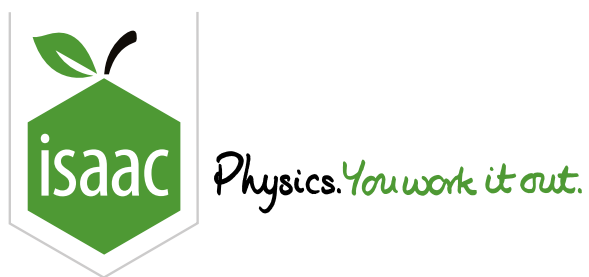
- ☐ act as biological catalysts
- ☐ energy storage
- ☐ forming cell and organelle membranes
- ☐ insulation & protection
- ☐ precursor for steroid hormones

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Gameboard:

**STEM SMART Biology Week 6 - Lipids**

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# Sterols

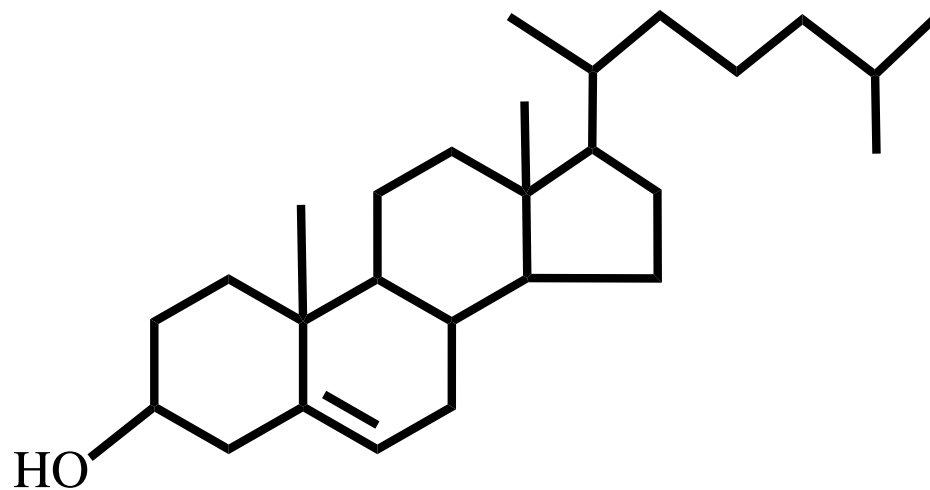
A Level



Sterols are a type of lipid that have very different structures from other lipids. However, they are also classed as lipids because they are not water-soluble.

A sterol is a molecule with a core composed of four hydrocarbon rings. This core is connected to a hydroxyl (OH) group at one end and to a hydrocarbon chain at the opposite end.

**Figure 1** shows the structure of cholesterol, the main sterol in animals, which is a component of animal cell membranes. Different sterols share the same basic structure, but they differ in the structure of the hydrocarbon chain and in the number/location of carbon-carbon double bonds in the core.



**Figure 1:** Cholesterol structure.

Part A Cholesterol polarity

Fill in the table below to describe each part of a cholesterol molecule and how cholesterol sits within the phospholipid bilayer.

Part	Polar or non-polar	Hydrophilic or hydrophobic	Membrane position
core (4 hydrocarbon rings)	<input type="text"/>	<input type="text"/>	<input type="text"/>
hydroxyl group	<input type="text"/>	<input type="text"/>	<input type="text"/>
hydrocarbon chain	<input type="text"/>	<input type="text"/>	<input type="text"/>

Items:

- polar
- non-polar
- hydrophilic
- hydrophobic
- among phospholipid heads
- among phospholipid tails

Part B Cholesterol functions

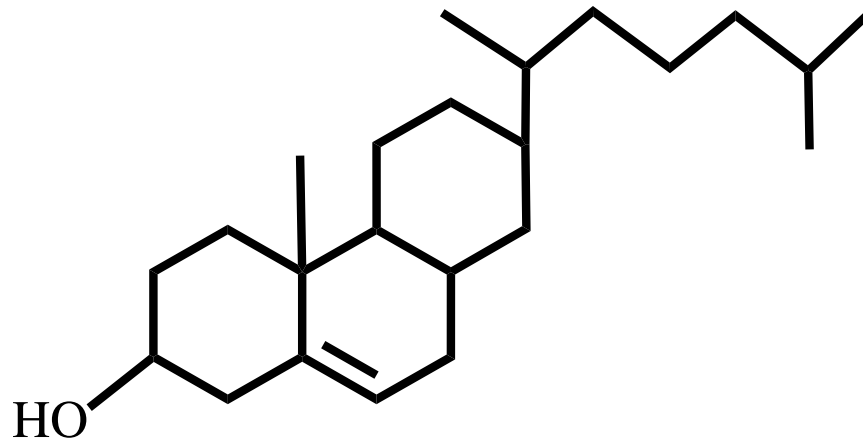
Cholesterol is an important sterol in animals. Which of the following are functions of cholesterol? Select all that apply.

- ☐ insulation & protection
- ☐ precursor for steroid hormones
- ☐ energy storage
- ☐ regulates membrane fluidity
- ☐ acts as a biological catalyst

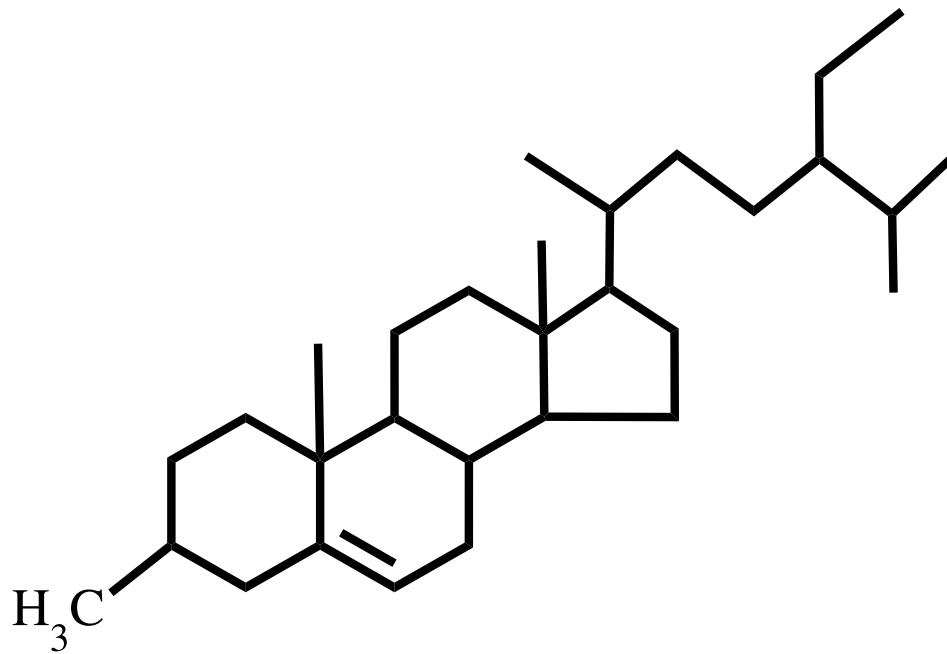


## Part C Identify the sterols

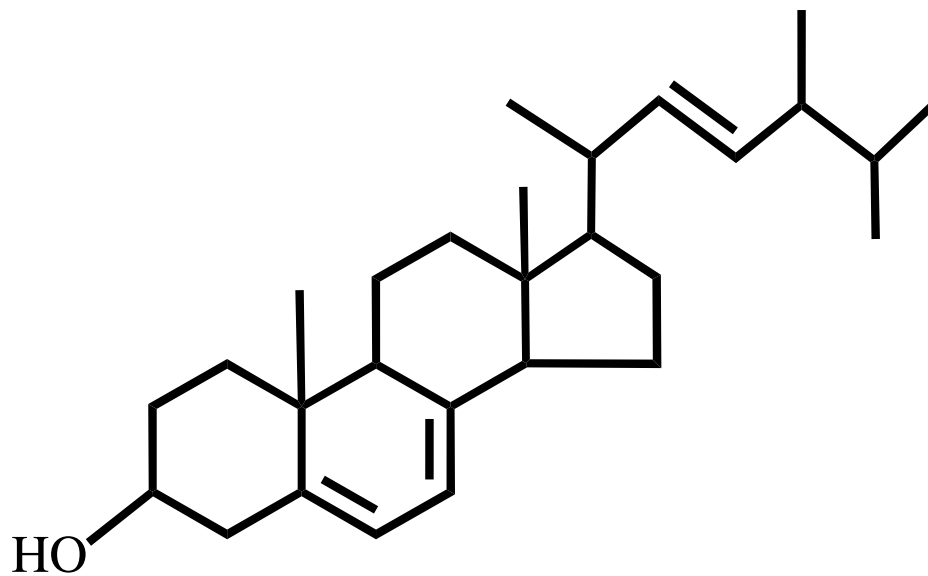
Which of the images below are sterols?



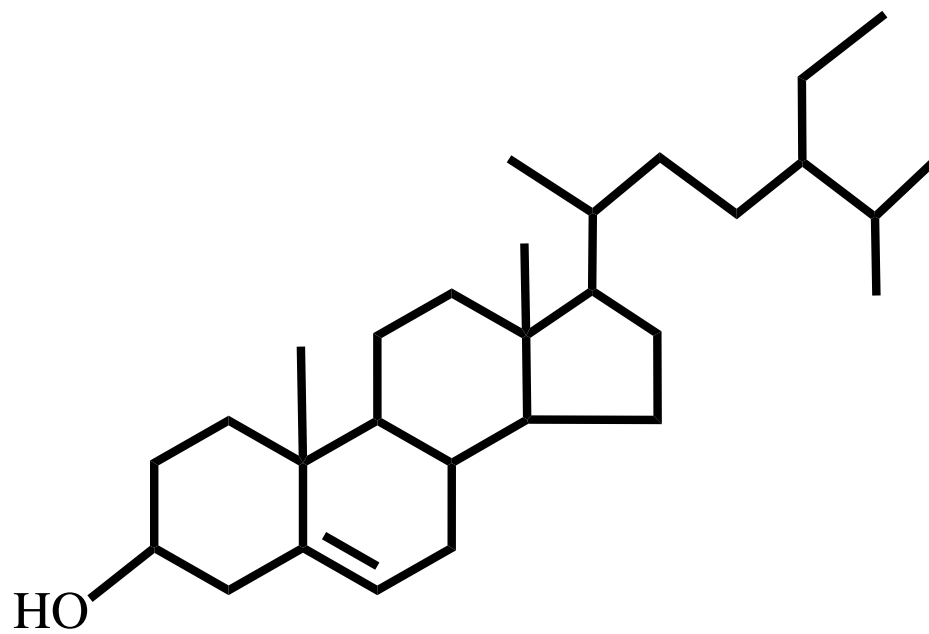
A



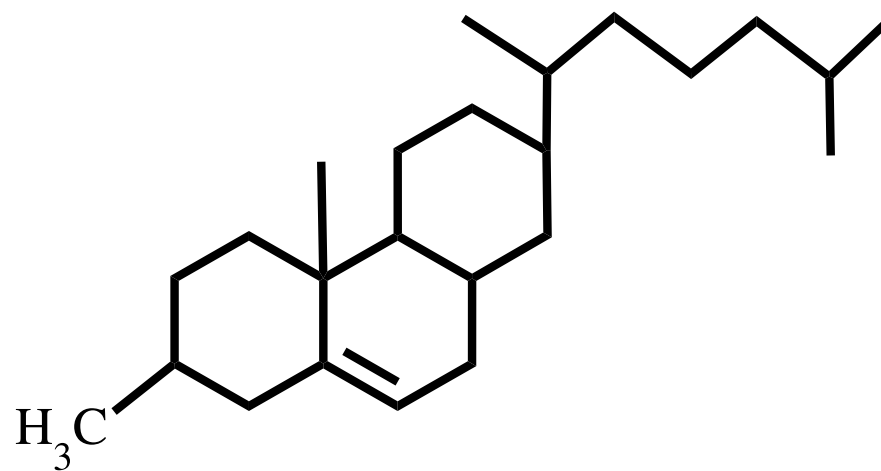
B



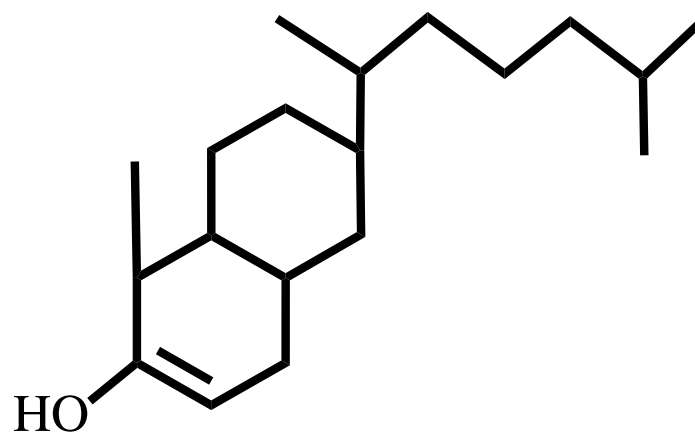
C



D



E



F

☐ A☐ B

☐ C

☐ D

☐ E

☐ F

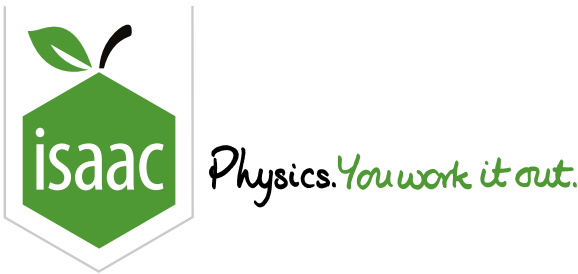
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# Fatty Acid Saturation

A Level

c

c

c

Stearic acid is a fatty acid. It contains 18 carbon atoms and zero carbon–carbon double bonds. It can be represented by the notation C18 : 0, where 18 is the number of carbons and 0 is the number of carbon–carbon double bonds present.

Oleic acid can be represented by C18 : 1.

Linoleic acid can be represented by C18 : 2.

A triglyceride was formed using one of each of the three fatty acids.

## Part A   Saturation and melting points

Match the saturation type and relative melting point to the fatty acid.

Fatty acid	Saturation type	Melting point (relative)
Stearic acid	<div></div>	<div></div>
Oleic acid	<div></div>	<div></div>
Linoleic acid	<div></div>	<div></div>

Items:

- polyunsaturated
- intermediate
- lowest
- unsaturated
- saturated
- highest

## Part B Hydrogen numbers

Within the triglyceride, how many hydrogen atoms does the stearic acid chain have?

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Within the triglyceride, how many hydrogen atoms does the oleic acid chain have?

---

Within the triglyceride, how many hydrogen atoms does the linoleic acid chain have?

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## Part C Oxygen numbers

How many oxygen atoms does the triglyceride have?

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Part D Identify the fatty acids

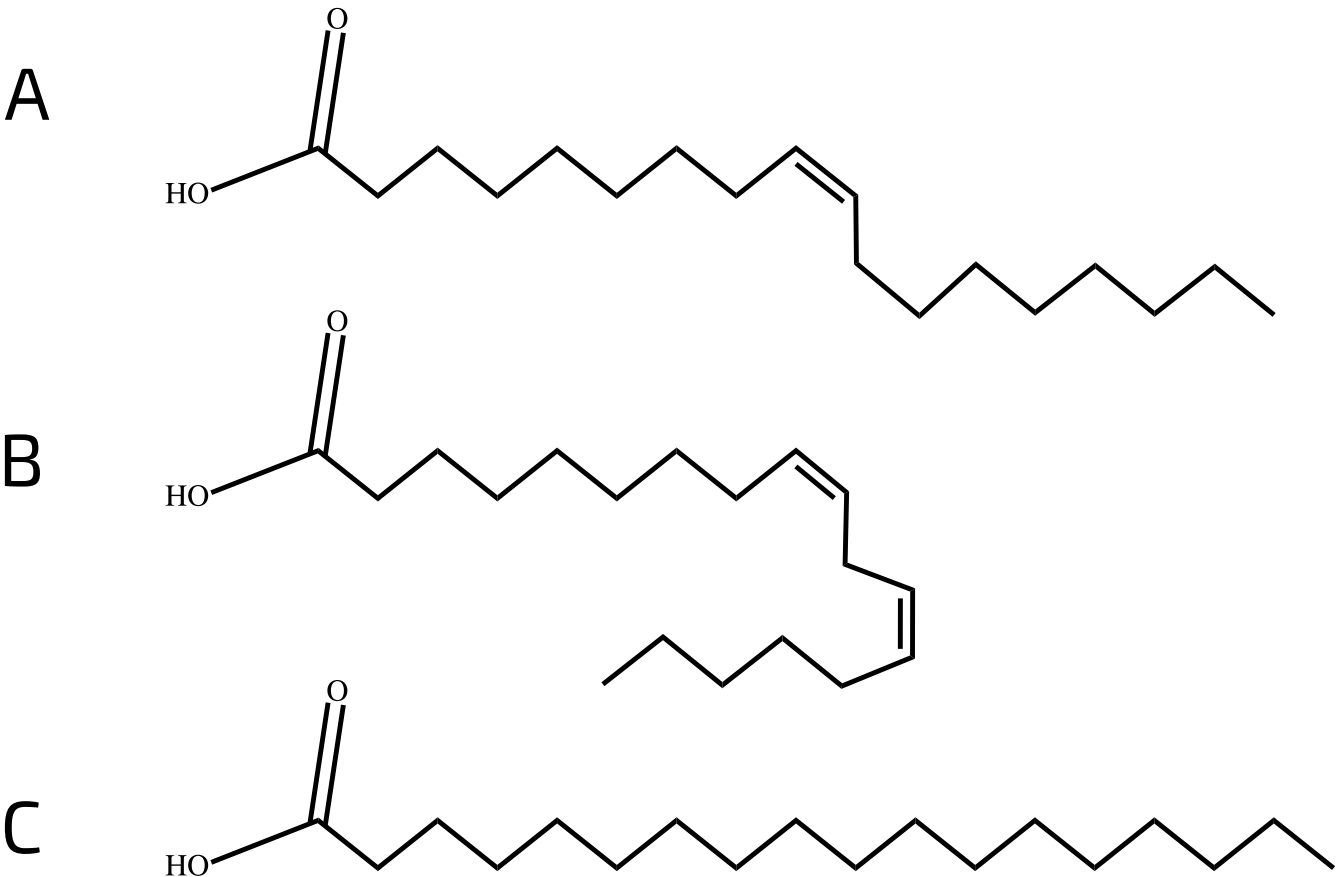


Figure 1: Structures of three fatty acids.

Match the fatty acids to the labels in Figure 1.

Letter	Fatty acid
A	<input type="text"/>
B	<input type="text"/>
C	<input type="text"/>

Items:

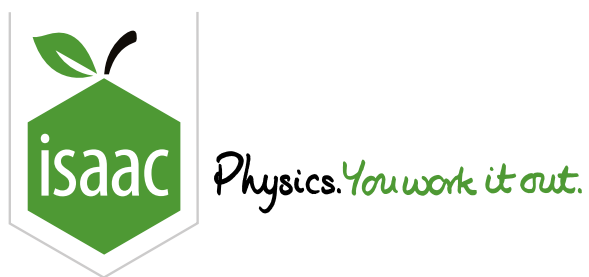
- stearic acid
- oleic acid
- linoleic acid

Question elements adapted with permission from NSAA 2022 Specimen Paper Section 2 Q21

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# Testing For Lipids

A Level



The test used to determine if lipids are present in a sample is . This involves adding  and water to the sample and shaking. If the solution remains clear then there are  in the sample. If  forms, then there are  in the sample.

Items:

Benedict's test

no lipids

a white emulsion

Benedict's reagent

ethanol

lipids

the emulsion test

a red colour

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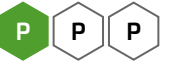


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# Lipids Overview

A Level



## Part A Lipid definition

What is the defining characteristic of a lipid?

- ☐ form bilayers
- ☐ soluble in water
- ☐ insoluble in water
- ☐ form part of cell membranes
- ☐ composed of amino acids
- ☐ contains a hydrophilic region and a hydrophobic region
- ☐ contains glycerol and one or more fatty acid
- ☐ composed of monosaccharides



Part B Lipid properties

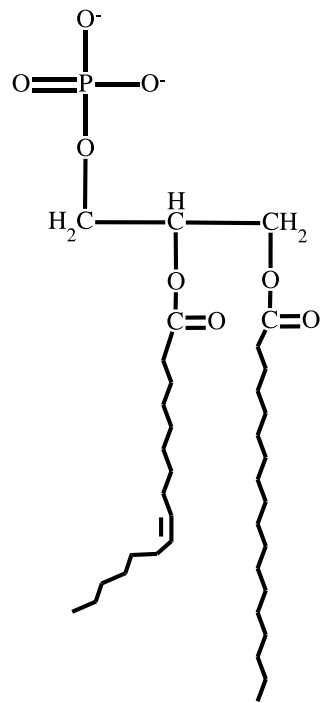
Match the lipids to their properties.

Lipid	Components	Polarity	Functions
<div></div>	glycerol, 3 fatty acids	<div></div>	energy storage, insulation, protection
<div></div>	glycerol, 2 fatty acids, phosphate group	<div></div>	<div></div>
<div></div>	4 carbon rings, hydrocarbon chain, hydroxyl group	<div></div>	regulate membrane fluidity, precursor for steroid hormones

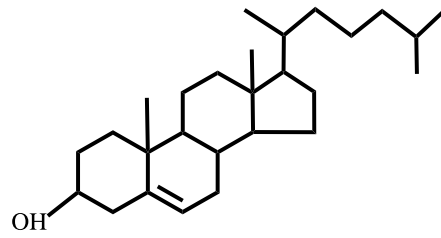
Items:

- Sterols
- Triglycerides
- hydrophobic
- Phospholipids
- amphipathic
- form membranes

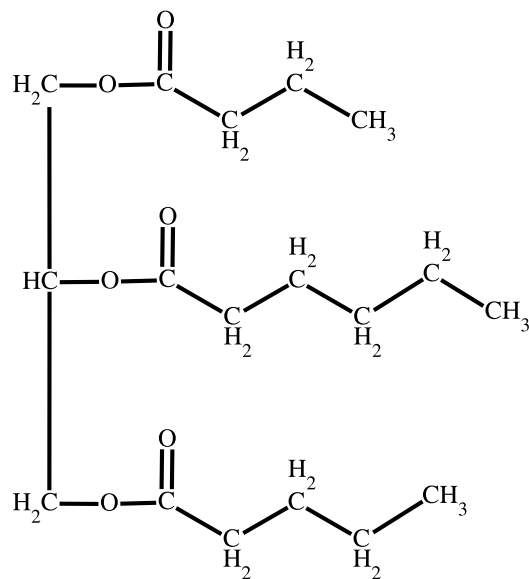
## Part C Lipid structures



A



B



C

Match the type of lipid to the image above.

A:

B:

C:

Items:

- sterol
- glycolipid
- phospholipid
- triglyceride
- proteolipid
- diglyceride

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