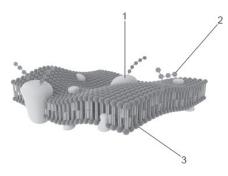
## **Biological Molecules: Lipids**

**1.** The diagram below shows part of a plasma membrane.



Which of the label lines points to a structure that could contain a sulfur atom?

- A 1, 2 and 3
- B Only 1 and 2
- C Only 2 and 3
- D Only 1

Your answer

[1]

- 2. Which of the following processes involves the formation of ester bonds?
  - 1 synthesis of polynucleotides
  - 2 synthesis of triglycerides
  - 3 synthesis of polypeptides
- **A** 1, 2 and 3
- B Only 1 and 2
- C Only 2 and 3
- D Only 1

Your answer

[1]

**3.** Lipids are a diverse group of chemicals that are neither polar nor charged and hence are insoluble in water. The (1) nature of the heads of phospholipids allows them to form membranes. (2) also contain fatty acids and form part of the membrane. Lipids can be used for energy storage in the form of (3). Some hormones are also lipids and they are similar in structure to (4).

Which row shows the correct sequence of missing words?

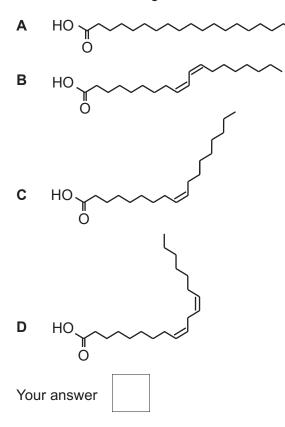
	1	2	3	4
Α	hydrophilic	glycolipids	triglycerides	cholesterol molecules
в	hydrophilic	triglycerides	cholesterol molecules	glycolipids
С	hydrophobic	cholesterol molecules	triglycerides	bile
D	hydrophobic	cholesterol molecules	triglycerides	glycolipids

Your answer

[1]

4. Oleic acid is a monounsaturated fatty acid found in vegetable oil.

Which of the following, A to D, is the correct structure for oleic acid?



[1]

5. Human pancreatic lipase breaks the bonds between fatty acids and glycerol.

What name is given to this reaction?

- A condensation
- **B** esterification
- **C** hydration
- D hydrolysis

Your answer

[1]

6. Which option, A to D, describes the role of cholesterol in cell surface membranes in the human body?

- A Cholesterol binds to phospholipid phosphate heads, increasing the packing of the membrane, therefore reducing the fluidity of the membrane.
- **B** Cholesterol binds to phospholipid fatty-acid tails, reducing the packing of the membrane, therefore increasing the fluidity of the membrane.
- **C** Cholesterol absorbs ATP, preventing active transport across the membrane.
- D Cholesterol binds to phospholipid fatty-acid tails, increasing the packing of the membrane, therefore reducing the fluidity of the membrane.

Your answer

[1]

7. Which of the following formulae of fatty acids represents a saturated fatty acid?

Statement 1: Palmitic acid, C15H31COOH Statement 2: Oleic acid, C<sub>17</sub>H<sub>33</sub>COOH Statement 3: Linoleic acid, C<sub>17</sub>H<sub>31</sub>COOH

- A. 1, 2 and 3
- B. Only 1 and 2C. Only 2 and 3
- D. Only 1

Your answer

[1]

8. Triglycerides contain three elements.



i. M and N are formulae for two macromolecules,

Which of the formulae, M or N, corresponds to a triglyceride? Explain your answer.

Formula .....

Because

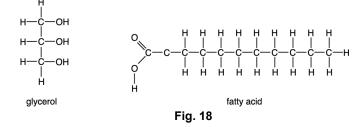
	[1]
 	h.d.

ii. Phospholipid molecules are similar to triglycerides but they also contain the element phosphorus as part of a phosphate group.

Explain how the structure of phospholipids allows them to form the bilayer of a plasma membrane.

\_\_\_\_\_ [3]  ${\bf 9(a)}.$  Triglycerides consist of glycerol combined with three fatty acids.

Fig. 18 shows a glycerol molecule and a fatty acid molecule.

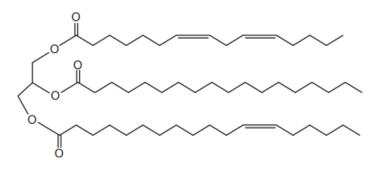


i. In the space below draw a monoglyceride molecule.

	[2]
ii. Name the bond formed between the glycerol and the fatty acid.	541
iii. Name the other molecule formed when this bond is made.	<u>[1]</u>
	[1]
(b). *Describe and explain how the structure and properties of different carbohydrate and lip molecules suit them to their role as energy storage molecules in plants and animals.	bid

[9]
 <u>[ə]</u>

10(a). Fig. 22 shows a triglyceride molecule found in sunflower oil.





On Fig. 22 circle an ester bond.

[Answer on Fig. 22]

[1]

(b). Sunflower oil is used to make biodiesel, which contains methyl esters. The fatty acids in the triglyceride molecule are reacted with methanol in a process called transesterification.

After the reaction, two liquid products form which naturally separate from each other. The methyl esters float on top of a more dense liquid.

Name the part of the molecule seen in Fig. 22 that forms this more dense liquid.



(c). Living organisms have many uses for triglycerides, one of which is the production of phospholipids.

i. Name three **other** functions of triglycerides in living organisms.

1	
2	
3	
-	[3]

ii. Table 22 shows the melting points of some of the methyl esters made from the transesterification of sunflower oil fatty acids.

Methyl ester	Formula	Melting point (°C)
Methyl sterate	$C_{19}H_{38}O_2$	39.1
Methyl oleate	C <sub>19</sub> H <sub>36</sub> O <sub>2</sub>	-19.9
Methyl linoleate	C <sub>19</sub> H <sub>34</sub> O <sub>2</sub>	-35.0

## Table 22

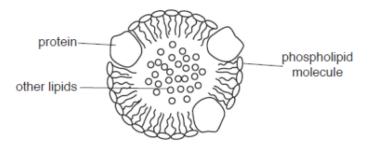
Describe and explain the pattern of the melting points of these three methyl esters.

[2	21
	24

(d). Phospholipid molecules also contain fatty acids.
Explain how the fatty acids in phospholipids allow the formation of membranes.

**11(a).** Lipoproteins are roughly-spherical structures that transport lipids in the blood.

Fig. 21 shows a simplified drawing of a section from the widest part of a lipoprotein.





i. Calculate the number of phospholipid molecules in the outer surface of the lipoprotein shown in Fig. 21.

Assume that the pattern of proteins and phospholipids shown in Fig. 21 is continued across the whole surface of the lipoprotein.

Use the formula: Surface area of sphere =  $4\pi r^2$ 

	Lipoproteins wit		proteins. number of p	hospholip	oids but less	s protein are	known as
	low density lipo						
	Use this information animals.	ation to exp	olain why lip	ids can in	crease the	buoyancy o	f aquatic
							[1
(h) (	Complete the pass	age by cho	osina the m	ost appro	priate word	from the lis	t.
(D). C	semplete and poles						
(b). C		age af ene	g				
( <b>b</b> ). C		bile	carbon		ogen	insoluble	
(0). (			Ū.		ogen	insoluble	
(0).	nitrogen		carbon	hydr	ogen production		soluble
(1). (		bile oxygen	carbon permea	hydr ability p	production	solid	
(1).		bile oxygen	carbon	hydr	production	solid	
		bile oxygen s	carbon permea	hydr ability p storage	production	solid ns	soluble
Lipids	nitrogen have many roles i	bile oxygen s	carbon permea tability anisms. Sol	hydr ability p storage me are us	vitami	solid ns gy	soluble
Lipids adipos	nitrogen have many roles i se cells. Unsaturat	bile oxygen s in living org	carbon permea tability anisms. Sou	hydr ability p storage me are us at least on	vitami sed for ener	solid ns gy	<b>soluble</b>
Lipids adipos	nitrogen have many roles i se cells. Unsaturat	bile oxygen s in living org ted fatty aci ms and so o	carbon permea tability anisms. So ds contain a contain fewo	hydr ability p storage me are us at least on er	vitami sed for ener	solid ns gy ond betweer atoms. All	<b>soluble</b>  n two lipids are
Lipids adipos	nitrogen have many roles i se cells. Unsaturat	bile oxygen sin living org ted fatty aci ms and so o water so ne	carbon permea tability anisms. So ds contain a contain fewo	hydr ability p storage me are us at least on er nsported	vitami sed for ener ne double be in the blood	solid ns gy ond betweer atoms. All d by lipoprot	soluble n two lipids are eins.

[6]

(c). Triglycerides are a type of lipid molecule that can be broken down during hydrolysis reactions.

Using the structure of triglyceride molecules as an example, explain what is meant by hydrolysis.

[2]

**12.** Cells are surrounded by a plasma membrane that contains phospholipids.

Explain how the structure of phospholipid molecules allows for the formation of plasma membranes.

[3]