1. Which statements about biological molecules are true and which are false?

Tick (✓) **one** box in each row.

Statement	True	False
Breaking one ester bond in a triglyceride produces glycerol and three fatty acids.		
Ribose is a hexose monosaccharide.		
In an alpha glucose molecule, the hydroxyl (OH) group is positioned below carbon 1.		

[2]

2. Which statement describes a feature of plasma membranes?

A Channel proteins are a type of intrinsic protein.
B Glycolipids are intrinsic proteins that have lipid molecules attached.
C Phospholipids form a rigid bilayer that membrane proteins are attached to.
D The plasma membrane forms an impermeable barrier.

Your answer ☐ **[1]**

3. The diagram shows part of a plasma membrane.

How can molecule **X** be described?

A It has a hydrophilic head and a hydrophobic tail.
B It is formed when the glycerol in a triglyceride is replaced by a phosphate.
C It is non-polar.
D The tails are joined to the head by peptide bonds.

Your answer ☐ **[1]**

4. Which statement about lipids is correct?

A Lipids are polar molecules.
B Lipids that contain fatty acids with carbon-carbon double bonds are liquid at room temperature.
C Saturated fatty acids, which are present in some lipids, contain carbon-carbon double bonds.
D The presence of carbon-carbon double bonds in fatty acids allows lipids to pack more closely together.

Your answer ☐ **[1]**

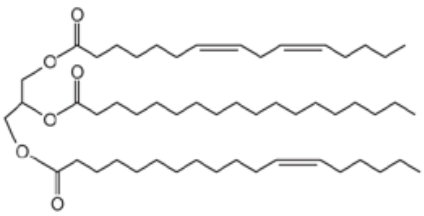
5. Lipids, polysaccharides, nucleic acids and proteins are all macromolecules.

Which statement about macromolecules is correct?

A All macromolecules are formed in hydrolysis reactions.
B Lipids are not polymers, but polysaccharides, nucleic acids and proteins are polymers.
C Lipids are polymers of fatty acids and glycerol.
D Macromolecules all consist of repeating units of monomers.

Your answer ☐ **[1]**

6. The diagram shows a triglyceride molecule found in sunflower oil.



Which option describes the structure of this triglyceride molecule?

A Contains phosphodiester bonds
B Monounsaturated
C Polyunsaturated
D Saturated

Your answer ☐ **[1]**

7. Which statement about lipids is correct?

A Phospholipids are formed by esterification of glycerol with three molecules of fatty acid.

B Phospholipids containing unsaturated fatty acids can increase the fluidity of cell membranes.

C Triglycerides are good energy stores although they release less energy than an equal mass of polysaccharide.

D Triglycerides form the bilayer of the plasma membrane.

Your answer ☐ **[1]**

8. The cells in beetroot contain a red pigment called betalain. The plasma membrane of the beetroot cell is impermeable to betalain.

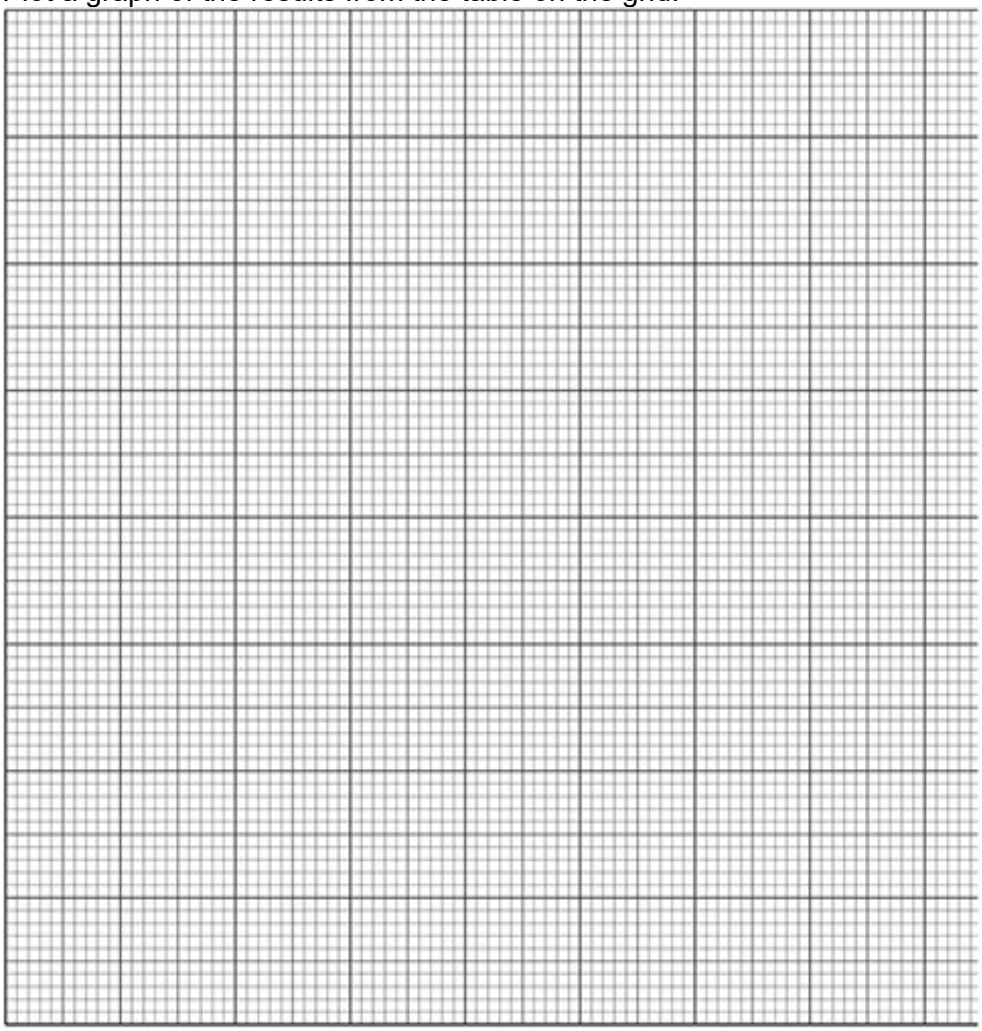
A group of students set out to investigate how temperature affects the structure and permeability of the plasma membrane of beetroot cells. The method they used is shown below.

- Cut some pieces of beetroot.
- Place them in a flask containing 100 cm^3 of distilled water.
- Stand this flask in a water bath and increase the temperature at 10 °C intervals.
- Take a sample of water from the flask 5 minutes after each new temperature is reached.
- Measure the absorbance of the water samples taken using a blue filter in the colorimeter.

i. The table shows the results obtained by the second group of students.

Temperature (°C)	Absorbance (%)			
	Trial 1	Trial 2	Trial 3	Mean
10	0	0	0	0.0
20	0	0	0	0.0
30	2	3	2	2.3
40	6	5	7	6.0
50	9	7	7	7.7
60	46	45	47	46.0
70	78	78	80	78.7

Plot a graph of the results from the table on the grid.



[3]

ii. *Explain the results between 20 °C and 70 °C using your knowledge of the structure and properties of phospholipid molecules in the plasma membrane.

[6]

Additional answer space if required.

9. Research indicates that reducing dietary intake of saturated triglycerides and cholesterol can reduce potential risk of developing cardiovascular disease (CVD) in later life.

Fig. 3.2 shows the structure of a saturated triglyceride.

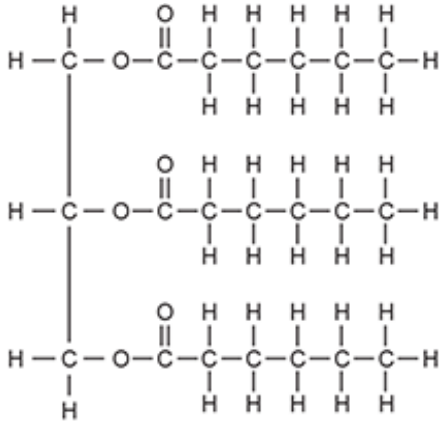


Fig. 3.2

i. Describe how the structure of a polyunsaturated triglyceride molecule would **differ** from the molecule shown in **Fig. 3.2**.

[1]

ii. Hypercholesterolemia is a condition in which an individual has a high blood cholesterol level.

Studies were carried out in the USA over several decades, looking at the overall death rates from cardiovascular disease (CVD) and the percentage of the population with hypercholesterolemia in different age groups.

Fig. 3.3 shows data from these studies.

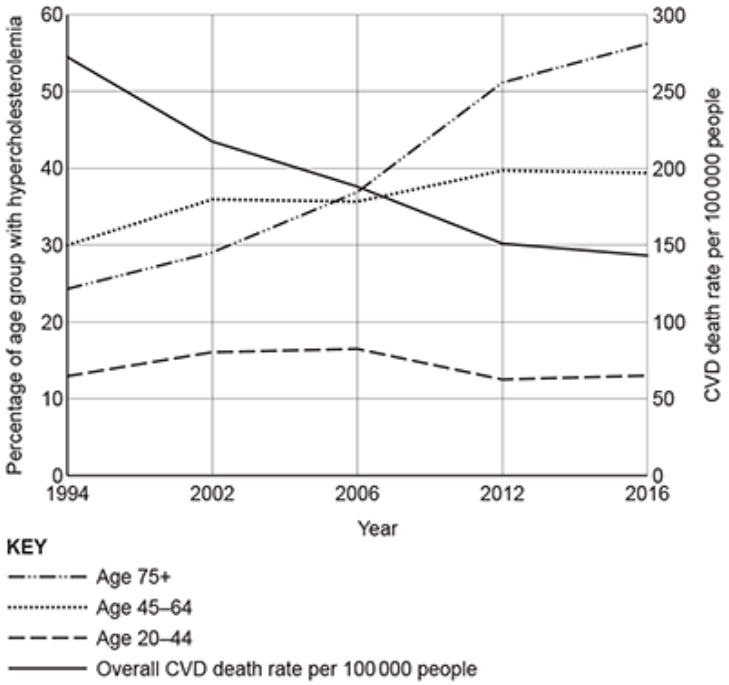


Fig. 3.3

A student looking at this data made the following statement:

'A fall in death rate from cardiovascular disease is due to a reduction in the percentage of people with hypercholesterolemia.'

With reference to the **20–44 age group** in **Fig. 3.3**, discuss whether the student's statement is correct.

[3]

10. Which statement describes the properties or functions of cholesterol?

A It increases the fluidity of the phospholipid bilayer at high temperatures.
B It is an unsaturated fatty acid because it contains carbon–carbon double bonds.
C It is used to produce some hormones.
D It is very hydrophilic so is attracted to the fatty acid tails in the membrane.

Your answer ☐ **[1]**

11. Which statement describes triglycerides?

A They are broken down by condensation reactions.
B They are polymers of glycerol and fatty acids.
C They contain ester bonds.
D They contain glycosidic bonds.

Your answer ☐ **[1]**

12. Kendal Mint Cake is made from sugar, flavoured with peppermint, and was famously taken on the 1953 ascent of Mount Everest.

Which statement describes why climbers now prefer to take chocolate?

A Chocolate contains fat. Fat stores and releases less energy per gram than sugar.
B Chocolate contains fat. Fat stores and releases more energy per gram than sugar.
C Fat contains more oxygen than glucose.
D Glucose can be digested more rapidly than fat.

Your answer ☐ **[1]**

13. An enzyme hydrolyses a phospholipid molecule to release a fatty acid.

What is the name of the bond that is broken in this hydrolysis reaction?

A Ester
B Glycosidic
C Peptide
D Phosphodiester

Your answer ☐ **[1]**

END OF QUESTION PAPER