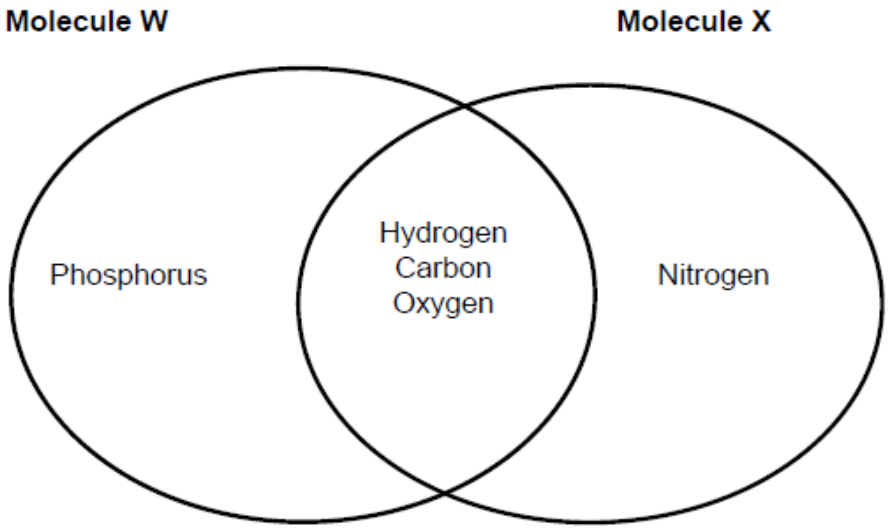
B1.1 carbohydrates and lipids [77 marks]

1. [Maximum mark: 1]

The diagram shows the elements present in two organic molecules, W and X.

Which molecules could W and X be?



	Molecule W	Molecule X
A.	monosaccharide	amino acid
B.	nucleic acid	triglyceride
C.	phospholipid	protein
D.	triglyceride	fatty acid

[1]

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2. [Maximum mark: 1]
Which molecules are produced during the hydrolysis of a triglyceride molecule?

A. Water and glycerol

B. Fatty acids and glycerol

C. Water and fatty acids

D. Water and lipids [1]

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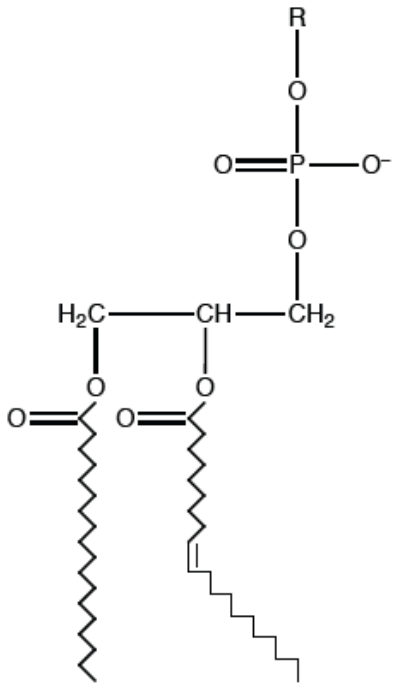
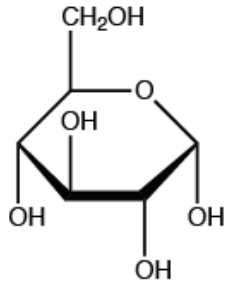
3. [Maximum mark: 1]
Which of these molecules is amphipathic?

A.

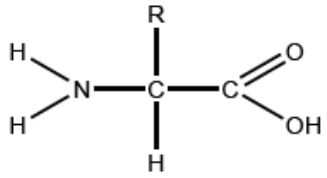

R
O
O
P
O⁻
O
H2C
CH
CH2
O
O
O
O

B.

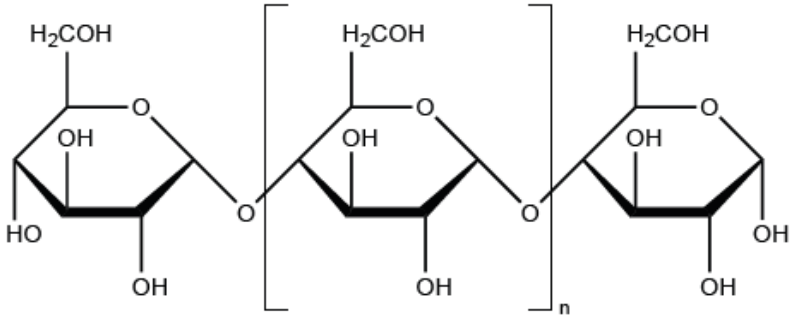

CH2OH
O
OH
OH
OH
OH

[1]

C.


R
H
N
C
C
O
H
H
OH
H

D.


H2COH
O
OH
HO
OH
O
H2COH
O
OH
OH
O
H2COH
O
OH
OH
OH
n

4. [Maximum mark: 1]

What is the function of cellulose in plant cells?

A. It increases the strength of cell walls.

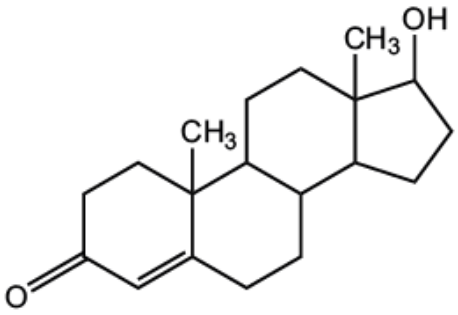
B. It is a source of energy for plants.

C. It maintains the structure of the vacuole.

D. It increases the permeability of the cell membranes. [1]

5. [Maximum mark: 1]

A simplified diagram of molecule X is shown.



What describes molecule X?

A. Lipid able to pass through the bilayer of membranes

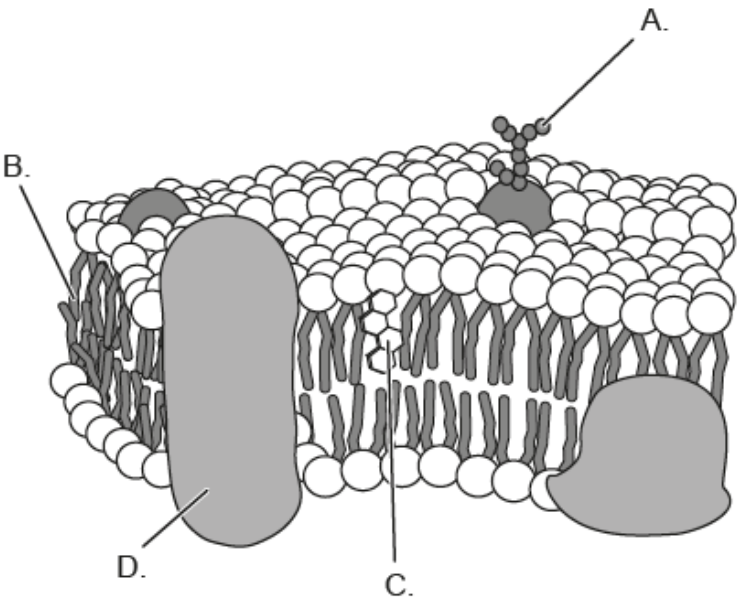
B. Lipid used for energy storage in mammals

C. Carbohydrate transported in the blood

D. Carbohydrate used for energy storage in plants [1]

6. [Maximum mark: 1]

Which part of the membrane allows cell recognition?

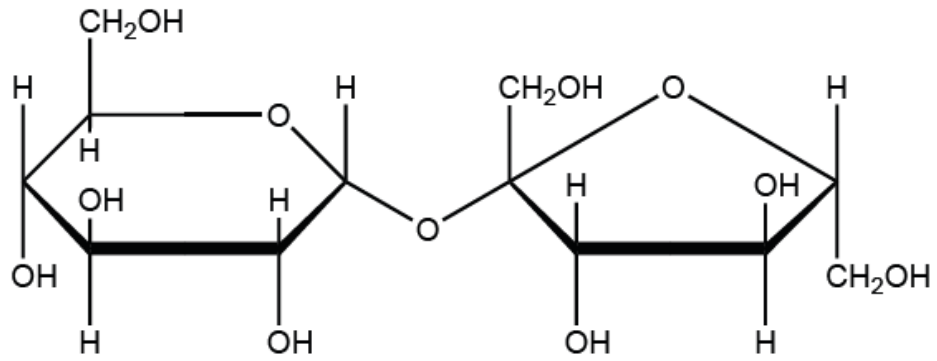


[Source: LadyofHats, 2007. Cell membrane detailed diagram. [image online] Available at: https://commons.wikimedia.org/wiki/File:Cell_membrane_detailed_diagram_en.svg [Accessed 26 July 2024]. Source adapted. Public domain.]

[1]

7. [Maximum mark: 5]

The image shows the molecular structure of sucrose, which the body digests in order to absorb the monosaccharides glucose and fructose.



Sucrose

(a) State the type of reaction that produces monosaccharides from disaccharides. [1]

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(b) Describe how capillaries are adapted for exchange of monosaccharides. [2]

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(c) Outline how fructose could be transported by facilitated diffusion across cell membranes. [2]

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8. [Maximum mark: 15]

Carbon is an essential element for life on Earth and must be distributed and recycled within ecosystems.

(a) Outline the chemical properties of carbon that allow it to form diverse compounds. [4]

(b) Describe the processes involved in the transfer of carbon in an ecosystem. [4]

(c) Explain the impact of anthropogenic activity on climate change. [7]

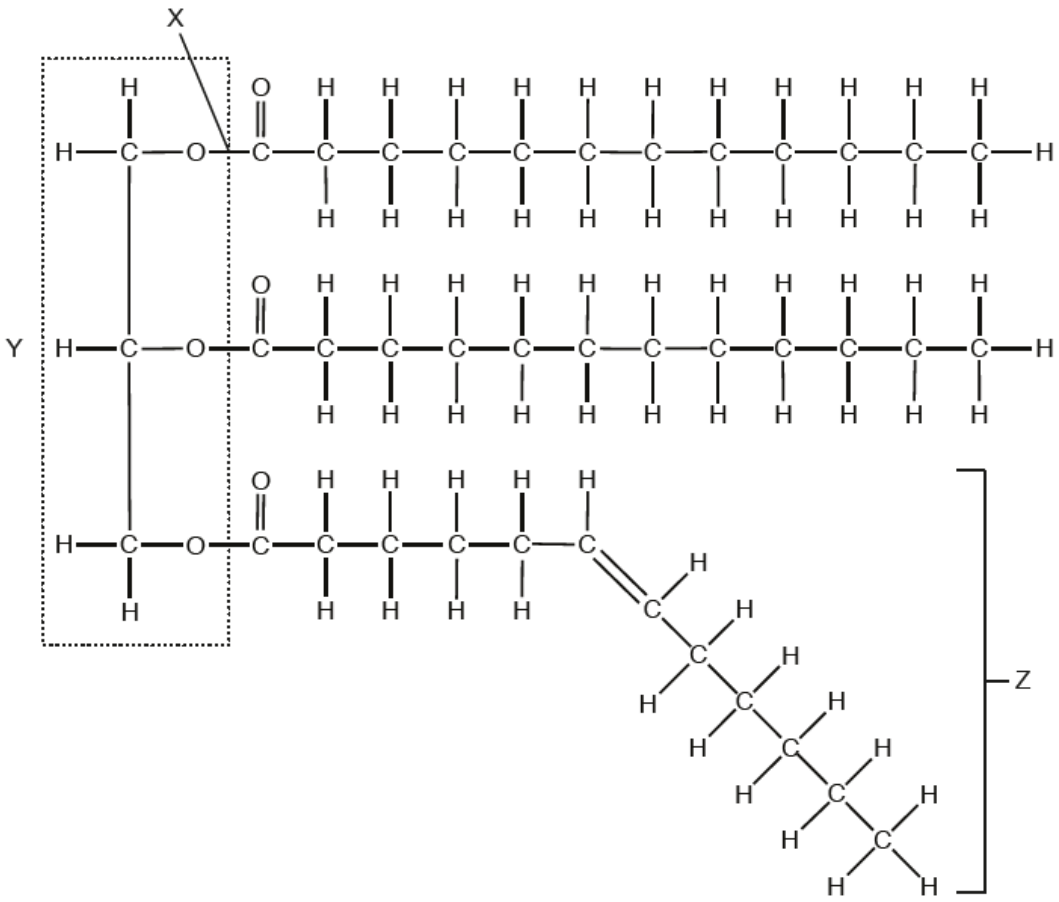
9. [Maximum mark: 15]
All living organisms require energy to survive.

(a) Outline **three** characteristics of polysaccharides that make them efficient compounds to store energy in organisms. [3]

(b) Describe how energy passes through a food chain. [4]

(c) Explain the need for energy in cells and how energy is released through cell respiration. [8]

10. [Maximum mark: 5]
The diagram shows the structure of a triglyceride.



(a) Identify the type of reaction used to form the covalent bond indicated by X. [1]

.....

(b) Identify the molecule that was used to form part Y of the triglyceride. [1]

.....

(c) State the type of fatty acid shown as Z. [1]

.....

(d) Explain how the properties of triglycerides make them suitable for energy storage. [2]

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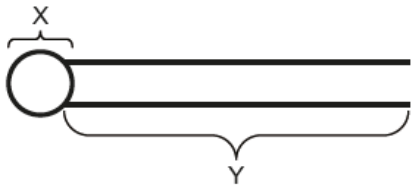
11. [Maximum mark: 1]

The diagram shows a phospholipid molecule.



What are properties of X and Y?

	X	Y
A.	hydrophilic	negatively charged
B.	hydrophilic	non-polar
C.	hydrophobic	non-polar
D.	hydrophobic	negatively charged

[1]

12. [Maximum mark: 1]

Cellulose is the main component of leaf cell walls. What are properties of cellulose?

A. Cellulose is insoluble in water, but water adheres to it.

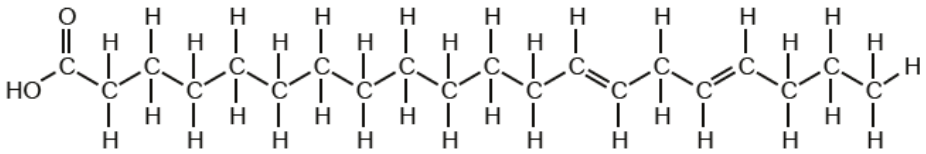
B. Cellulose is insoluble in water, and water does not adhere to it.

C. Cellulose is soluble in water, but water does not adhere to it.

D. Cellulose is soluble in water, and water adheres to it. [1]

13. [Maximum mark: 1]

The diagram shows a fatty acid molecule.



What type of fatty acid is this?

A. Saturated

B. Monounsaturated

C. Cis unsaturated

D. Trans unsaturated [1]

14. [Maximum mark: 15]

Biological membranes separate the interior of a cell from the external environment and create a boundary between one part of the cell and another.

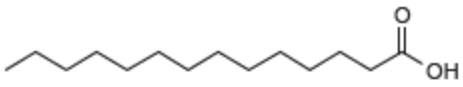
(a) Outline how the amphipathic properties of phospholipids help determine membrane structure. [4]

(b) Describe how substances cross the cell membrane by facilitated diffusion. [4]

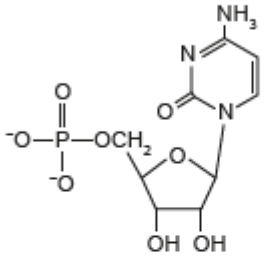
(c) Explain how nerve impulses are transmitted along neurons. [7]

15. [Maximum mark: 1]
The diagrams show the molecular structure of carbon compounds found in living organisms. Which one is found in phospholipids?

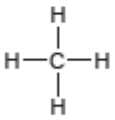
A.



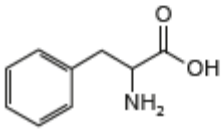
B.



C.

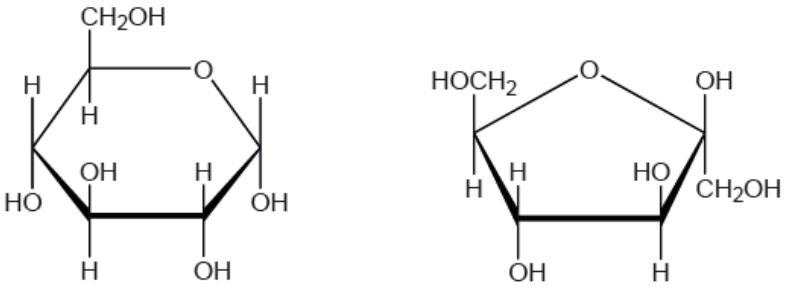


D.



[1]

16. [Maximum mark: 1]
The diagram shows two molecules which can be linked by a condensation reaction.



What would be the product(s) of this reaction?

A. Water and sucrose

B. Water and maltose

C. A dipeptide

D. Lactose

[1]

17. [Maximum mark: 1]

What is a common feature of all polysaccharides and triglycerides?

A. They are polymers.

B. They are energy stores in humans.

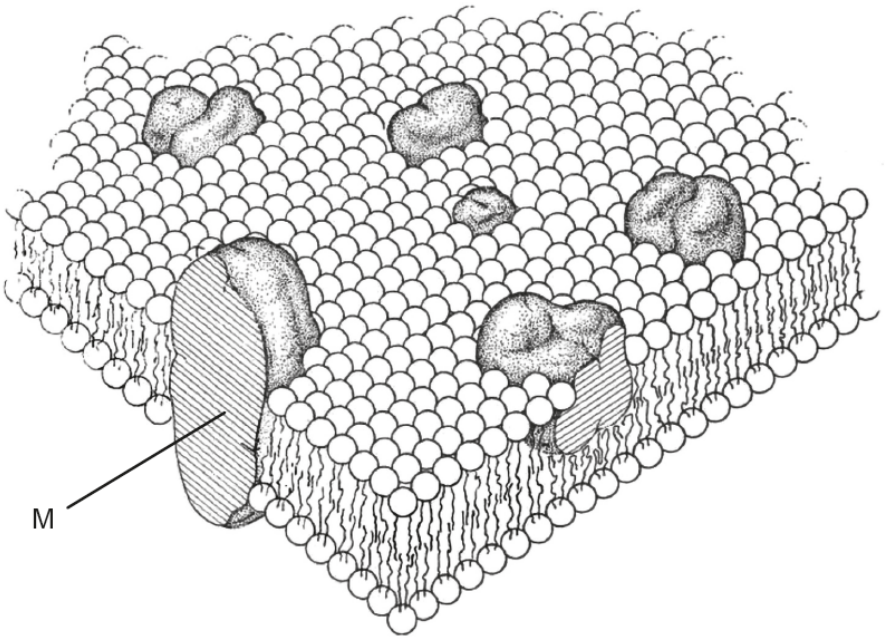
C. They are formed by condensation.

D. Their carbon-to-oxygen ratio is 1:1.

[1]

18. [Maximum mark: 5]

The diagram shows the original drawing of the cell membrane made in 1972 by Singer and Nicolson.



[Source: Martin, L., 2022. *Discovering the Structure of the Plasma Membrane*. [online] Available at: https://archive.org/details/cnx-org-col10470/page/n19/mode/2up [Accessed 13 April 2023]. Source adapted.]

(a) Label with the letter H part of a phospholipid molecule that is hydrophilic. [1]

(b) Distinguish between this model of the cell membrane and the Davson–Danielli model. [1]

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(c) Explain the role of molecules such as M in sodium–potassium pumps. [3]

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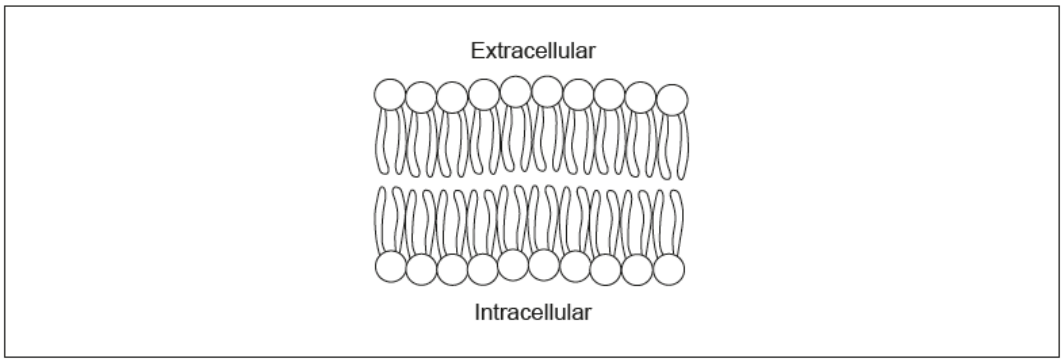
19. [Maximum mark: 5]

The image shows a phospholipid bilayer that is a component of the cell membrane.



[Source: Boundless Learning. Course Hero. *Phospholipids*. [diagram online] Available at: https://www.coursehero.com/study-guides/introchem/phospholipids/ [Accessed 1 November 2021].]

(a) Annotate the diagram to illustrate the amphipathic nature of phospholipids. [2]

(b) Outline a function of cholesterol in cell membranes. [1]

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(c) Describe **two** pieces of evidence that show that eukaryotic cells originated by endosymbiosis. [2]

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