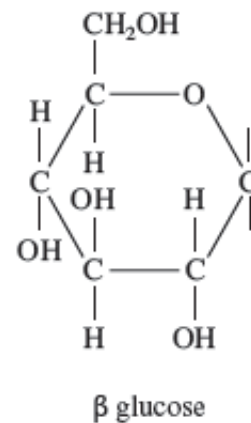
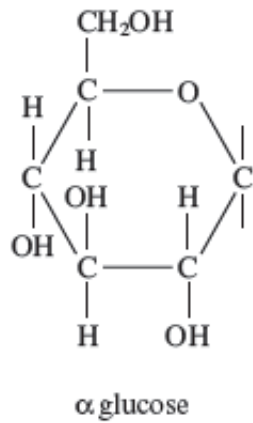


WJEC (Wales) Biology A-level
Topic 1.1: Biological
Compounds
Questions by Topic

1. Carbohydrate molecules contain the chemical elements carbon, hydrogen and oxygen only.

(a) The diagrams below show structural formulae of two isomers of glucose. Complete the drawings to distinguish between the α and β isomers.



(b) (i) Starch and cellulose are both polymers of glucose, but they are formed from different isomers. State the isomer which is found in:

Cellulose Starch

(ii) Explain how the structures of starch and cellulose are related to their functions as storage and structural molecules respectively.

[4]

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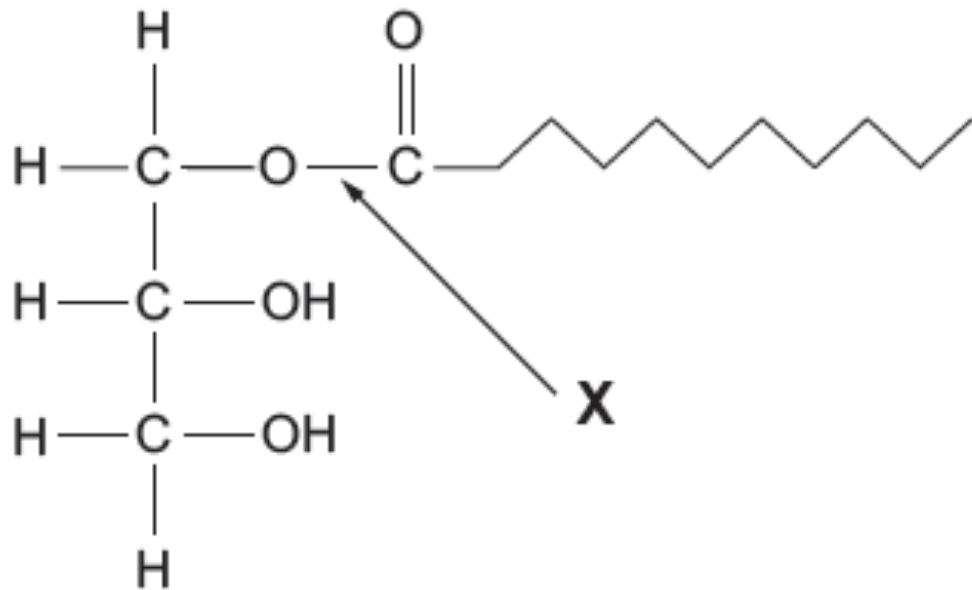
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2. (a) The diagram below shows a monoglyceride.



During the digestion of monoglycerides, the bond labelled **X** is broken down by the enzyme lipase.

(i) Name the bond labelled **X** in the diagram above.

[1]

(ii) State the **type** of reaction involved in the breakdown of the monoglyceride.

[1]

(iii) In the space below **draw** and **name** the products of the breakdown of the monoglyceride.

[2]

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(iv) Explain why triglycerides are not considered to be polymers.

[1]

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(b) (i) Two fatty acids which are common in triglycerides are stearic acid and oleic acid. Stearic acid has the chemical formula of $C_{17}H_{35}COOH$ and oleic acid has the chemical formula of $C_{17}H_{33}COOH$.
What type of fatty acid is oleic acid? Give a reason for your answer. [2]

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(ii) Apart from energy storage, state **two** functions of triglycerides in a mammal.

[2]

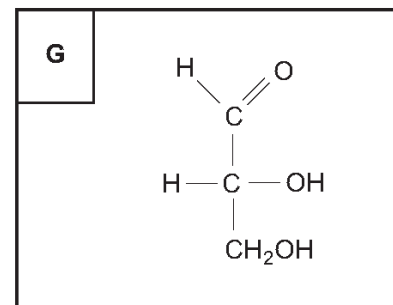
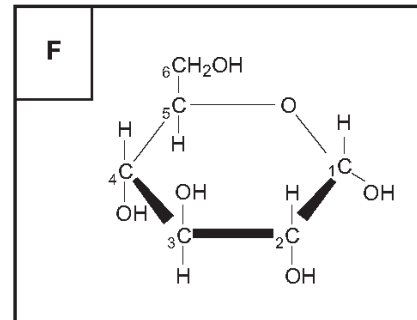
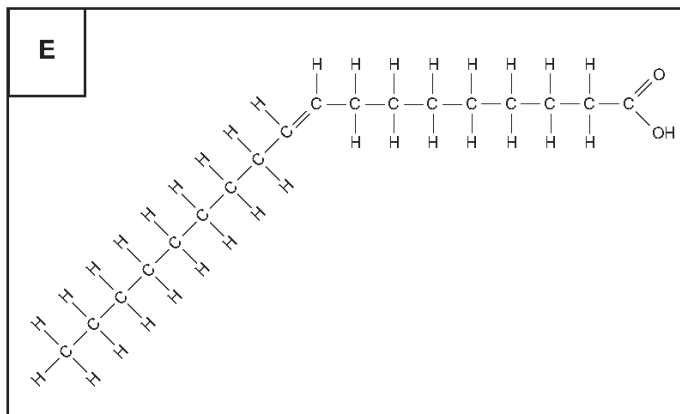
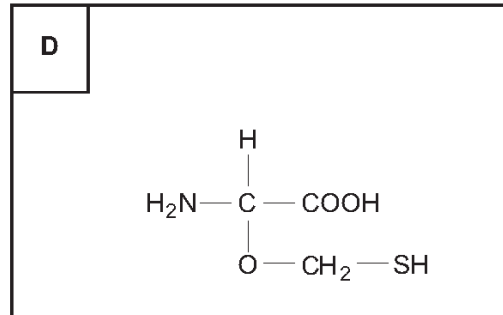
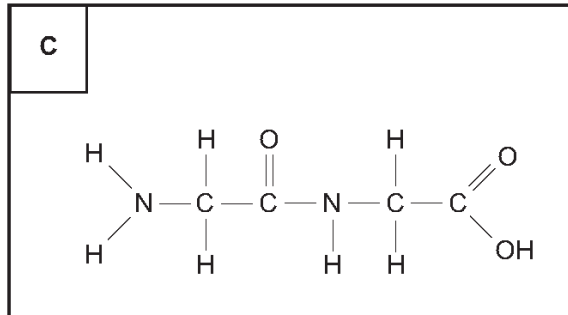
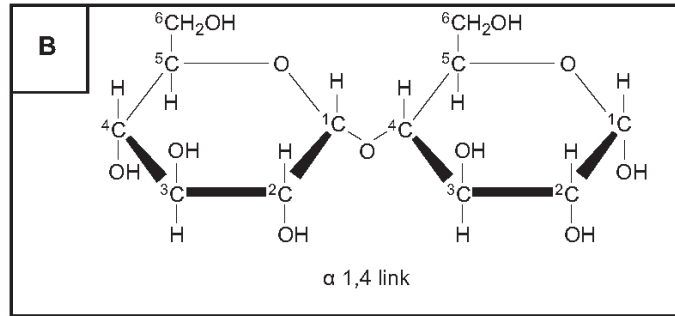
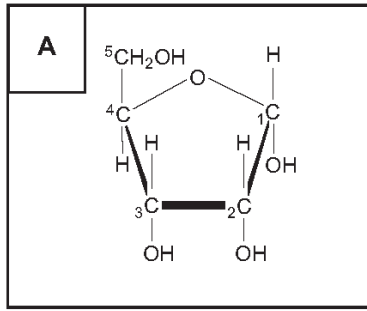
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3.

The following diagrams represent the structure of some common organic molecules.



- (a) Using letters **A-G**, complete the table below. You may use each letter once, more than once or not at all. [7]

Statement	Letter(s)
is a monosaccharide	
is a dipeptide	
would be found in nucleic acids	
contains C=C bonds	
contains a glycosidic bond	
is a triose sugar	

- (b) (i) Describe a biochemical test for the presence of glucose in a solution. [2]

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- (ii) Explain why a positive result is seen with glucose but not for sucrose. [1]

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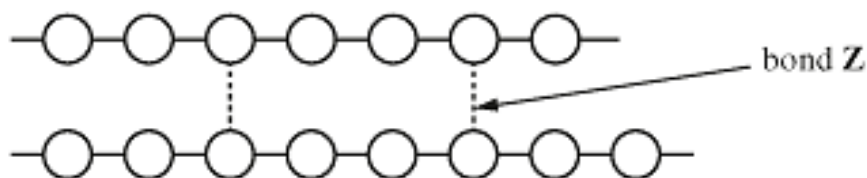
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4. Inorganic ions are needed by living organisms. Complete the table below to give a function for each of the four ions. [4]

<i>Ion</i>	<i>Function</i>
Magnesium	
Iron	
Phosphate	
Calcium	

5. The diagram represents part of a cellulose molecule.



(a) (i) Name bond **Z** as shown on the diagram. [1]

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(ii) Explain the importance of bond **Z** in the role of cellulose in plant cell walls. [2]

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(b) (i) Name the chemical reaction by which monomers join together to form cellulose. [1]

.....

(ii) Chitin has many chemical and structural similarities to cellulose. In chitin what additional compound replaces one of the $-OH$ groups in each of its monosaccharides? [1]

.....

(iii) State the structural role of chitin in insects and describe its properties that make it suitable for this role. [1]

6. (a) When a triglyceride molecule is broken down name:

(i) the products formed; [2]

.....

(ii) the type of bond broken and describe the process. [3]

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(b) Describe **two** functions of lipids in plants. [2]

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(c) Other polysaccharides have a storage function.
Name a storage polysaccharide found in:

(i) animal cells; [1]

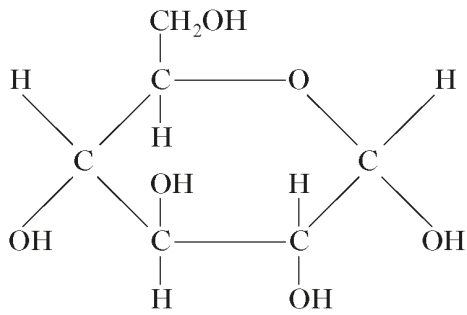
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(ii) plant cells. [1]

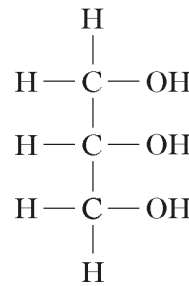
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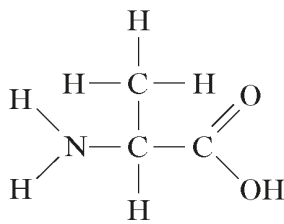
7. The following diagrams represent the structure of four biologically important compounds.



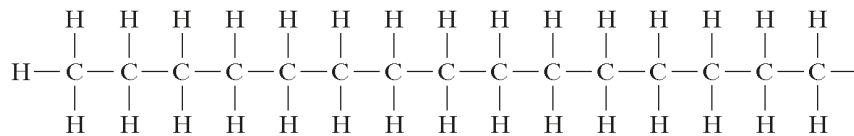
A



B



C



D

(a) A chemical element found in a molecule of compound **C** is not found in molecules of the other three compounds. **Name** this element. [1]

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(b) A reducing sugar in solution can be detected in the laboratory.

(i) Describe the biochemical test you would use to show that the solution contained a reducing sugar. [2]

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(ii) Which of the compounds **A** to **D** will give a positive result with this biochemical test? [1]

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(d) (i) Which of the compounds **A** to **D** is a fatty acid? [1]

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(ii) State how the structure of a saturated fatty acid differs from the structure of an unsaturated fatty acid. [2]

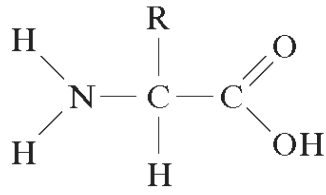
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8. Complete the following passage by inserting the correct terms in the spaces provided. [6]

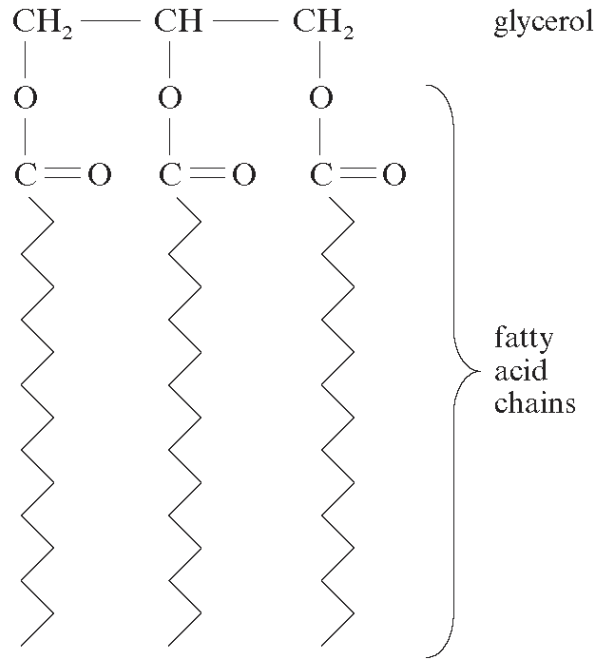
Cellulose is a fibrous molecule. It is a carbohydrate and is the main component of the of plants. Cellulose consists of chains of glucose molecules which are joined together by 1-4 bonds. Each adjacent glucose molecule is rotated by ° resulting in a chain. Chains are held together by bonds forming groups of chains known as

(Total 6 marks)

9. The diagrams below show two molecules, **A** and **B**, which are found in living organisms.



molecule **A**



molecule **B**

(a) (i) Name molecules **A** and **B**. [2]

A

B

(ii) Name an element found in molecule **A** that is not found in molecule **B**. [1]

.....

(b) Many molecules of **A** can join together to form a long chain. Name the process that joins the molecules together and the bond formed when they join. [2]

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(c) (i) Describe a suitable test that could be performed to show that a solution contained polymers of molecule **A**. [2]

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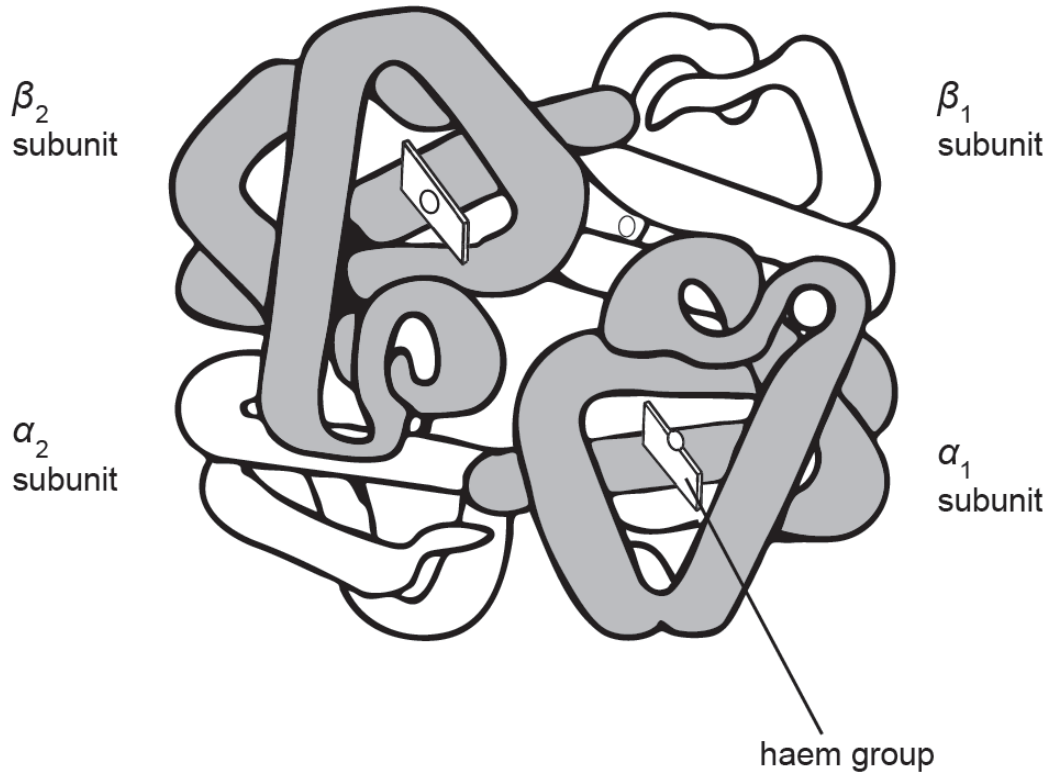
(ii) Suggest a problem that could arise in using this test if very low concentrations of the polymer are present in the solution. [1]

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(Total 8 Marks)

10. The diagram below shows a molecule of haemoglobin



(a) State the inorganic ion present in the haem group. [1]

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(b) Using the diagram above, explain why this molecule is regarded as having a quaternary structure. [2]

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(c) Describe the biochemical test that could be performed to test for a protein. [2]

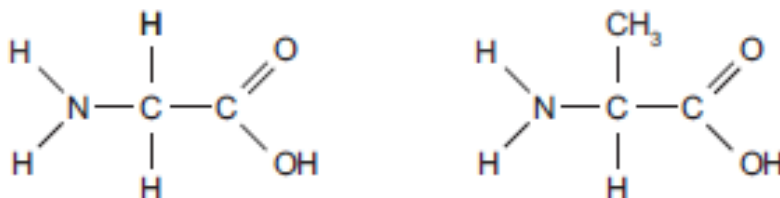
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11. 4. β -Bungarotoxin is a neurotoxin found in the venom of Krait snakes. The neurotoxin is a protein that causes muscle paralysis and eventual death.

The diagram below shows the structure of two amino acids found within the protein.

- (a) (i) Complete the diagram, to show the products formed when these amino acid molecules are joined by a condensation reaction. [2]

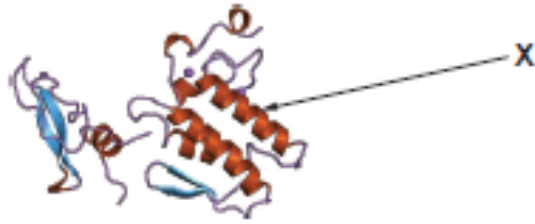


- (ii) State the bond formed.

[1]

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- (b) The diagram below shows the structure of the β -bungarotoxin. The protein is composed of two polypeptide chains.



- (i) State the highest level of protein structure exhibited by the β -bungarotoxin. [1]

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- (ii) Name the structure labelled X and state how this structure is maintained. [2]

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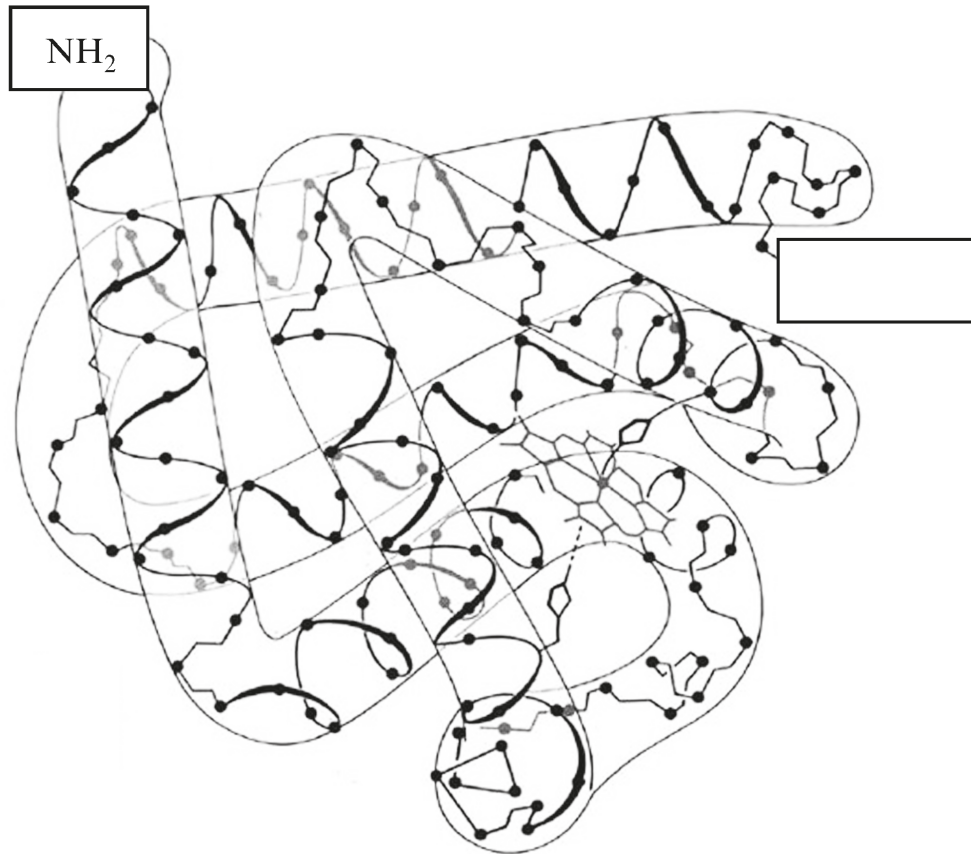
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12. Red blood cells are involved with the transport of oxygen around the body. Red blood cells lack internal organelles and their cytoplasm contains haemoglobin. Haemoglobin is a protein that consists of four polypeptide chains linked together.

(a) State the level of protein structure shown by haemoglobin. [1]

.....

(b) The diagram below shows one of the polypeptide chains from haemoglobin.



(i) On the diagram above, use an arrow to **clearly label** an alpha –helix. [1]

(ii) Complete the diagram above by writing in the empty box, the molecular group that would be present at the end of the polypeptide chain. [1]

(iii) Name **two** types of bonds that would be present to maintain the 3D shape of this polypeptide chain. [1]

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- (c) The plasma membrane contains proteins and phospholipids. Describe **two** ways in which the structure of phospholipids differ from triglycerides. [2]

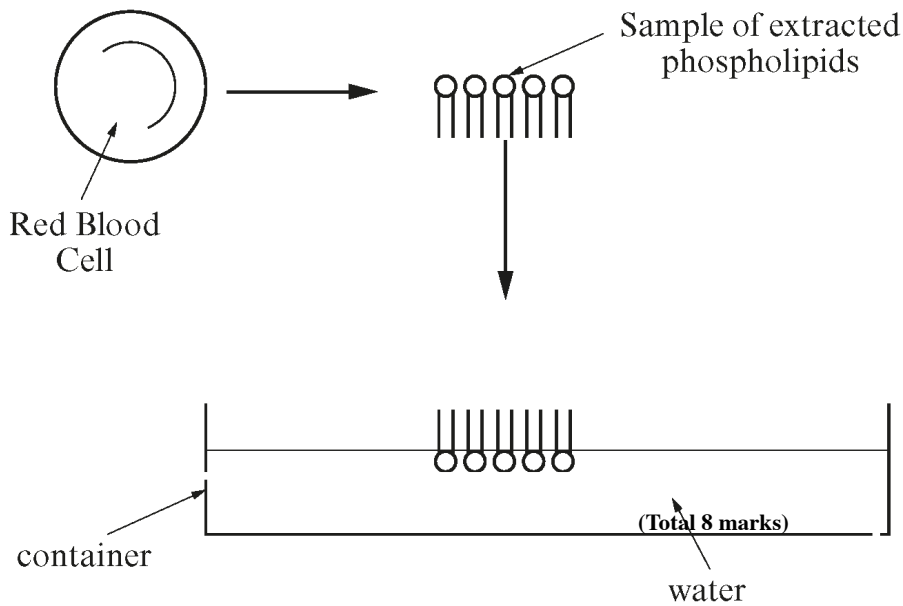
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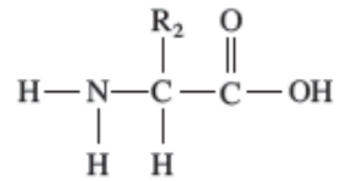
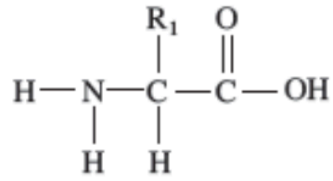
- (d) In 1925, two scientists, Gorter and Grendel investigated the arrangement of phospholipids in the plasma membrane. This involved the removal of the phospholipids from the surface membrane of all the red blood cells in 10cm³ of blood. The phospholipids were then placed on the surface of water and allowed to spread out to form a single layer, called a monofilm.



- (i) Explain fully the arrangement of the phospholipid molecules as shown in the container on the diagram above. [2]

(Total 8 marks)

13. The diagram below shows two molecules which are sub-units of proteins.



(a) (i) Complete the diagram above to show how a reaction takes place to join the two molecules.

[3]

(ii) Name the type of reaction involved.

[1]

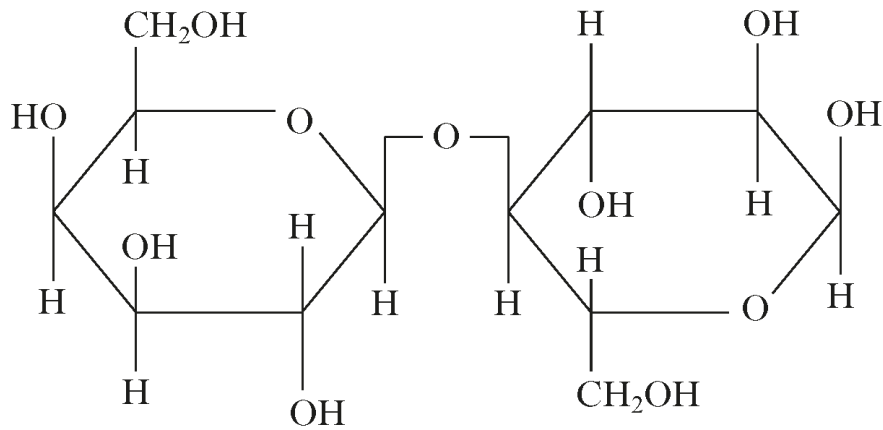
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(iii) Name the type of bond formed.

[1]

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14. Lactose is a disaccharide found in milk. The diagram below shows the structure of lactose.



- (a) Lactose can be broken down into its constituent monosaccharides.
- (i) Complete the diagram above to show how lactose is broken down. [2]
- (ii) State the type of reaction involved in the breakdown of lactose. [1]
-
- (iii) Name the bond that is broken during this reaction. [1]
-
- (iv) Name the molecules produced when lactose is broken down. [1]
-

(Total 5 marks)