Q1.(a) Describe how you would test a piece of food for the presence of lipid.

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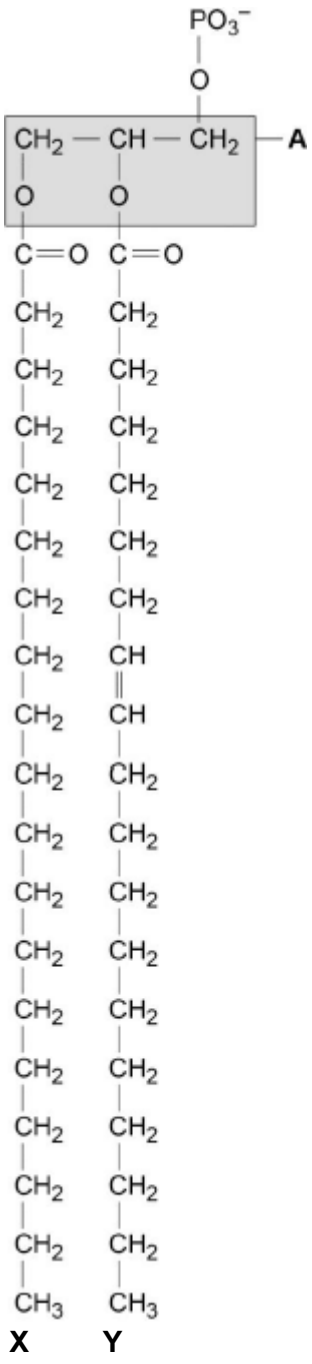
(2)

The figure below shows a phospholipid.



(b) The part of the phospholipid labelled **A** is formed from a particular molecule. Name this molecule.

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(1)

(c) Name the type of bond between **A** and fatty acid **X**.

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(1)

(d) Which of the fatty acids, **X** or **Y**, in the figure above is unsaturated? Explain your answer.

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(1)

Scientists investigated the percentages of different types of lipid in plasma membranes from different types of cell. The table shows some of their results.

Type of lipid	**Percentage of lipid in plasma membrane by mass**		
	Cell lining ileum of mammal	**Red blood cell of mammal**	**The bacterium *Escherichia coli***
Cholesterol	17	23	0
Glycolipid	7	3	0
Phospholipid	54	60	70
Others	22	14	30

(e) The scientists expressed their results as **Percentage of lipid in plasma membrane by mass**. Explain how they would find these values.

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(2)

Cholesterol increases the stability of plasma membranes. Cholesterol does this by making membranes less flexible.

(f) Suggest **one** advantage of the different percentage of cholesterol in red blood cells compared with cells lining the ileum.

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(1)

(g) *E. coli* has no cholesterol in its cell-surface membrane. Despite this, the cell maintains a constant shape. Explain why.

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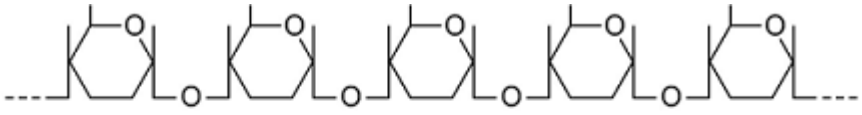
(2)
(Total 10 marks)

Q2. Starch and cellulose are two important plant polysaccharides.

The following diagram shows part of a starch molecule and part of a cellulose molecule.

Starch



Cellulose

(a) Explain the difference in the structure of the starch molecule and the cellulose molecule shown in the diagram above.

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(2)

(b) Starch molecules and cellulose molecules have different functions in plant cells. Each molecule is adapted for its function.

Explain **one** way in which starch molecules are adapted for their function in plant cells.

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(2)

(c) Explain how cellulose molecules are adapted for their function in plant cells.

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(Extra space) .....

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(3)
(Total 7 marks)

Q3.(a) Messenger RNA (mRNA) is used during translation to form polypeptides. Describe how mRNA is produced in the nucleus of a cell.

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(6)

(b) Describe the structure of proteins.

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(5)

(c) Describe how proteins are digested in the human gut.

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(4)
(Total 15 marks)

Q4.A student investigated the effect of chewing on the digestion of starch in cooked wheat.

He devised a laboratory model of starch digestion in the human gut. This is the method he used.

1. Volunteers chewed cooked wheat for a set time. The wheat had been cooked in boiling water.
2. This chewed wheat was mixed with water, hydrochloric acid and a protein-digesting enzyme and left at 37 °C for 30 minutes.
3. A buffer was then added to bring the pH to 6.0 and pancreatic amylase was added. This mixture was then left at 37 °C for 120 minutes.
4. Samples of the mixture were removed at 0, 10, 20, 40, 60 and 120 minutes, and the concentration of reducing sugar in each sample was measured.
5. Control experiments were carried out using cooked wheat that had been chopped up in a blender, not chewed.

(a) What reducing sugar, or sugars, would you expect to be produced during chewing? Give a reason for your answer.

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(2)

(b) In this model of digestion in the human gut, what other enzyme is required for the complete digestion of starch?

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(1)

(c) What was the purpose of step 2, in which samples were mixed with water, hydrochloric acid and pepsin?

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(1)

(d) In the control experiments, cooked wheat was chopped up to copy the effect of chewing.

Suggest a more appropriate control experiment. Explain your suggestion.

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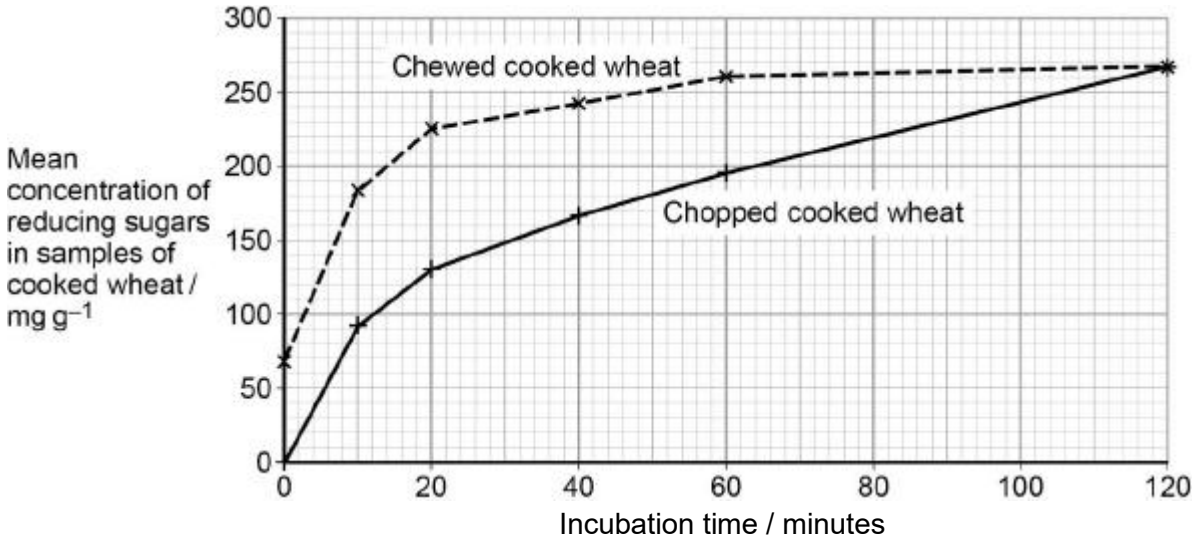
(2)

(e) The figure below shows the student's results.



Explain what these results suggest about the effect of chewing on the digestion of starch in wheat.

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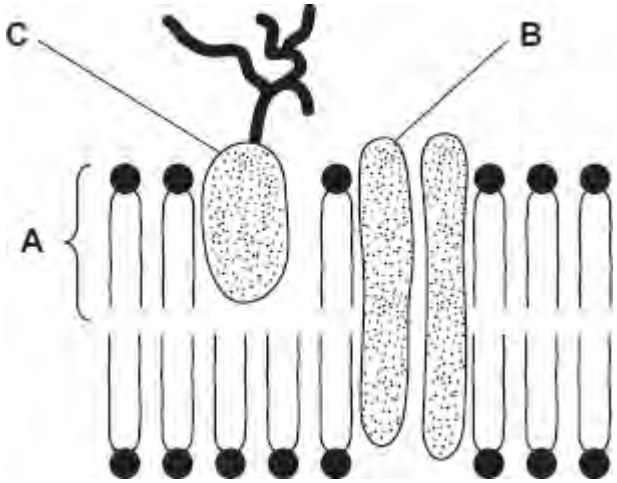
(3)
(Total 9 marks)

Q5. The diagram shows the structure of the cell-surface membrane of a cell.



(a) Name **A** and **B.**

A.....

B.....

(2)

(b) (i) **C** is a protein with a carbohydrate attached to it. This carbohydrate is formed by joining monosaccharides together. Name the type of reaction that joins monosaccharides together.

Name the type of reaction that joins monosaccharides together.

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(1)

(ii) Some cells lining the bronchi of the lungs secrete large amounts of mucus. Mucus contains protein.

Name **one** organelle that you would expect to find in large numbers in a mucus-secreting cell and describe its role in the production of mucus.

Organelle.....

Description of role.....

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(2)
(Total 5 marks)