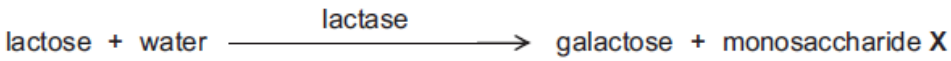
1)

The equation shows the breakdown of lactose by the enzyme lactase.



(a) (i) Name the type of reaction catalysed by the enzyme lactase.

.....

(1 mark)

(a) (ii) Name monosaccharide **X**.

.....

(1 mark)

(b) (i) Describe how you would use a biochemical test to show that a reducing sugar is present.

.....

(2 marks)

(b) (ii) Lactose, galactose and monosaccharide **X** are all reducing sugars. After the lactose has been broken down there is a higher concentration of reducing sugar. Explain why.

.....

(1 mark)

(c) A high concentration of galactose slows down the breakdown of lactose by lactase. Use your knowledge of competitive inhibition to suggest why.

.....

(2 marks)

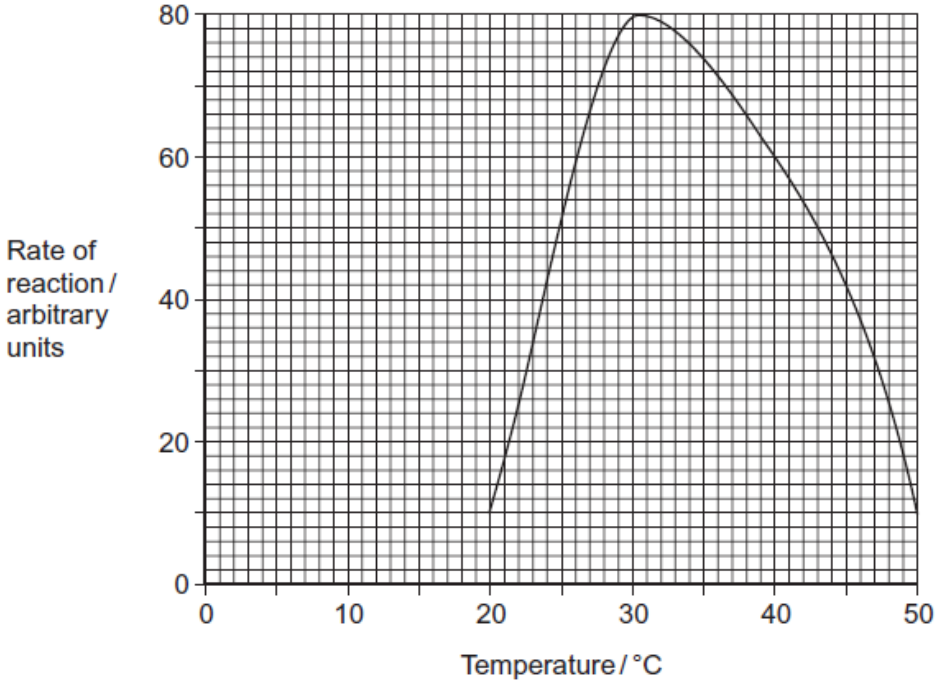
(d) People who are lactose intolerant are **not** able to produce the enzyme lactase. Explain why these people get diarrhoea when they drink milk containing lactose.

.....

(2 marks)

2)

A protease is an enzyme that digests protein. The graph shows how the activity of a protease varies with temperature.



(a) (i) Describe what the graph shows about the effect of temperature on the rate of reaction.

(1 mark)

.....

(a) (ii) Explain the shape of the curve between 30 °C and 50 °C.

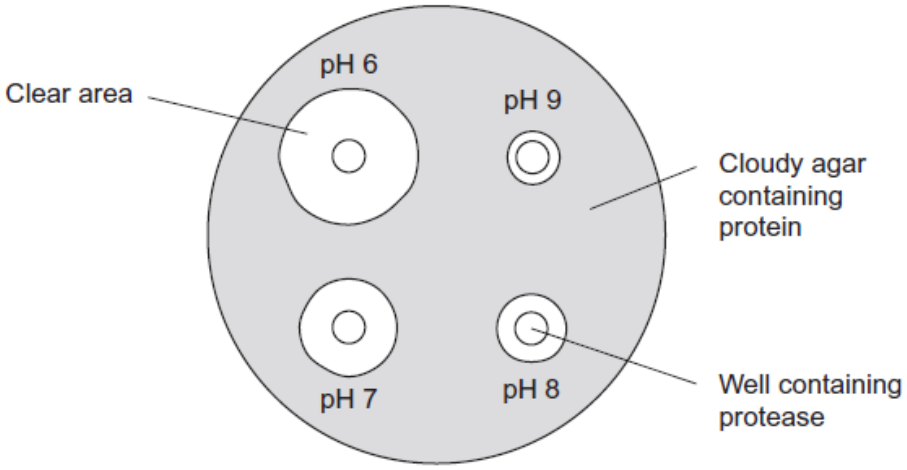
.....

(3 marks)

(b) Students investigated the effect of pH on the activity of the protease.

- The students used agar plates containing protein. The protein made the agar cloudy.
- They made four wells of equal size in the agar of each plate.
- They added a drop of protease solution to each of the wells. The protease solution in each well was at a different pH.
- The students incubated the agar plates for 4 hours at a constant temperature.

The diagram shows the agar plates after they were incubated and the pH of the protease solution in each well.



(b) (i) How should the students make sure that the pH of the protease solution did **not** change?

(b) (ii) Use the graph to suggest a suitable temperature for incubating the agar plates. Explain your answer.

.....

(1 mark)

(b) (iii) Use the diagram to describe the effect of pH on the activity of this protease.

.....

(1 mark)

3)

(a) Give **two** ways in which active transport is different from facilitated diffusion.

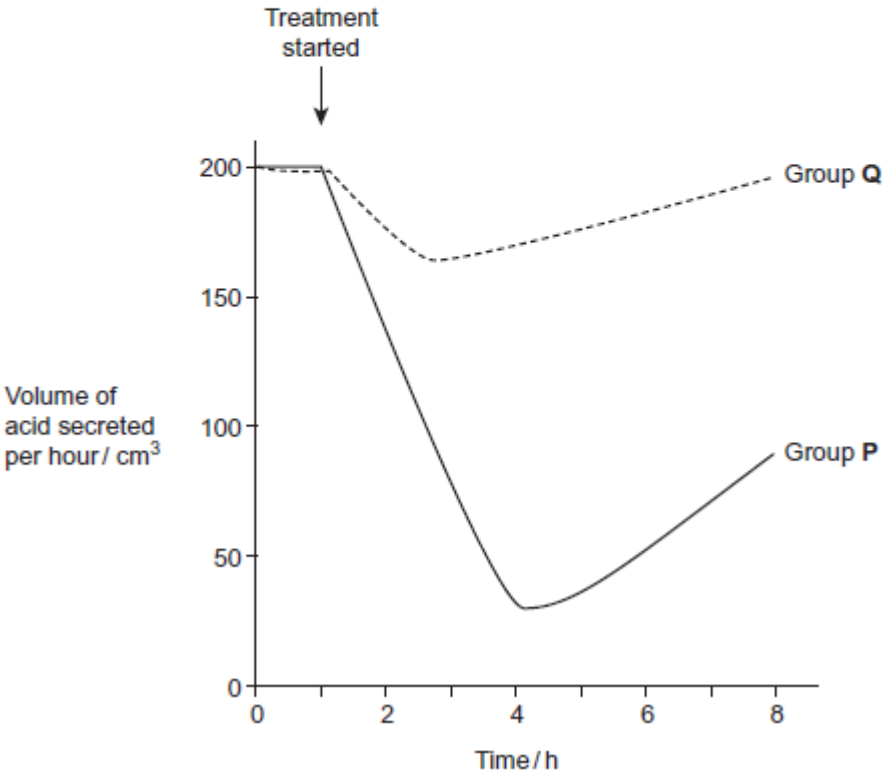
.....

(2 marks)

Scientists investigated the effect of a drug called a proton pump inhibitor.
The drug is given as a tablet to people who produce too much acid in their stomach.
It binds to a carrier protein in the surface membrane of cells lining the stomach.
This carrier protein usually moves hydrogen ions into the stomach by active transport.

The scientists used two groups of people in their investigation. All the people produced too much acid in their stomach. People in group **P** were given the drug. Group **Q** was the control group.

The graph shows the results.



(b) (i) The scientists used a control group in this trial. Explain why.

.....

(1 mark)

(b) (ii) Suggest how the control group would have been treated.

.....

(2 marks)

(c) Describe the effect of taking the drug on acid secretion.

.....

(1 mark)

4)

Read the following passage.

Chlamydia is a bacterium. Scientists have shown that infection with chlamydia can cause heart disease in humans. Infection with the bacterium can stimulate the formation of atheroma. This can lead to a heart attack.

Other scientists have been working with mice. These scientists have suggested that chlamydia may cause heart disease in a different way. They have found a protein on the surface of chlamydia cells which is similar to a protein in the heart muscle of mice. After an infection with chlamydia, cells of the immune system of the mice may attack their heart muscle cells and cause heart disease.

Use the information in the passage and your own knowledge to answer the following questions.

(a) Explain how atheroma can lead to a heart attack (line 3).

.....

(3 marks)

(b) (i) Using information from the passage, explain what is meant by an antigen.

.....

(2 marks)

(b) (ii) After an infection with chlamydia, cells of the immune system of the mice may attack the heart muscle cells (lines 7-8). Explain why.

.....

(2 marks)

(c) Some scientists have suggested that people should be vaccinated to prevent infection by chlamydia. Evaluate this suggestion.

.....

(3 marks)

5)

Different cells in the body have different functions.

(a) Some white blood cells are phagocytic. Describe how these phagocytic white blood cells destroy bacteria.

.....

(4 marks)

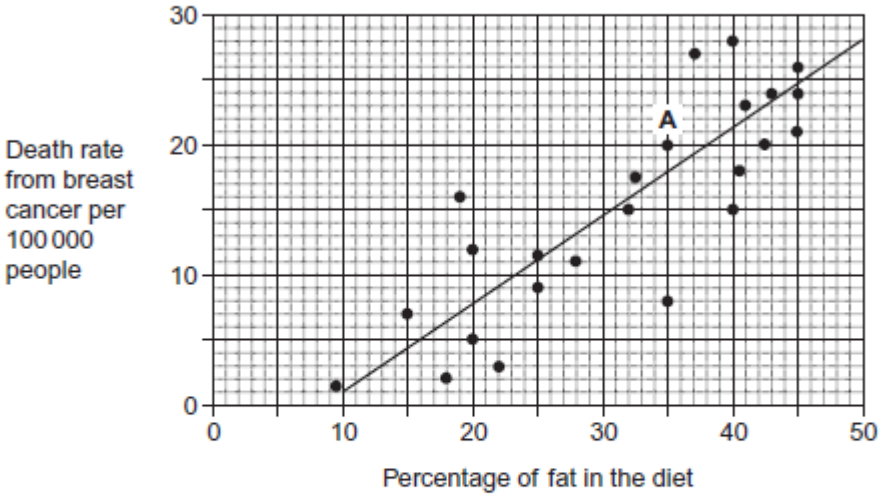
(b) The epithelial cells that line the small intestine are adapted for the absorption of glucose. Explain how.

.....

(6 marks)

6)

Scientists investigated the relationship between the percentage of fat in the diet and the death rate from breast cancer in 24 different countries. They plotted the data from each country on the graph below.



(a) Describe the information given by point **A** on the graph.

.....

(1 mark)

(b) Describe how the scientists calculated the death rate from breast cancer for each country.

.....

(1 mark)

(c) Some people have used the graph to conclude that a high percentage of fat in the diet causes breast cancer. Evaluate this conclusion.

.....

(3 marks)

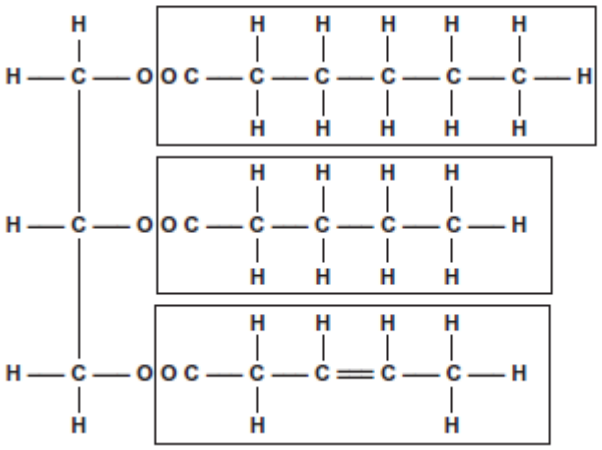
7)

(a) Some seeds contain lipids. Describe how you could use the emulsion test to show that a seed contains lipids.

.....

(3 marks)

(b) A triglyceride is one type of lipid. The diagram shows the structure of a triglyceride molecule.



Fatty acid **A**

Fatty acid **B**

Fatty acid **C**

(b) (i) A triglyceride molecule is formed by condensation. From how many molecules is this triglyceride formed?

(1 mark)

(b) (ii) The structure of a phospholipid molecule is different from that of a triglyceride. Describe how a phospholipid is different.

.....

(2 marks)

(b) (iii) Use the diagram to explain what is meant by an unsaturated fatty acid.

.....

(2 marks)

8)

(a) Scientists who investigate disease may look at risk factors. What is a risk factor?

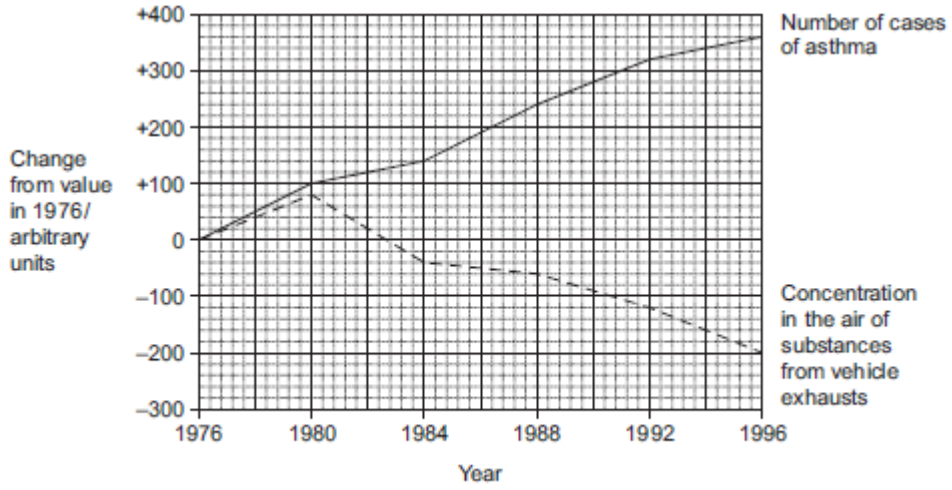
.....

(1 mark)

Scientists investigated the link between pollution from vehicle exhausts and the number of cases of asthma. Between 1976 and 1996, the scientists recorded changes in the following

- the concentration in the air of substances from vehicle exhausts
- the number of cases of asthma.

The graph shows their results



(b) Between which years on the graph was there

(b) (i) a positive correlation between the number of cases of asthma and the concentration in the air of substances from vehicle exhausts

.....

(1 mark)

(b) (ii) a negative correlation between the number of cases of asthma and the concentration in the air of substances from vehicle exhausts?

.....

(1 mark)

(c) The scientists concluded that substances in the air from vehicle exhausts did **not** cause the increase in asthma between 1976 and 1980. Explain why.

.....

(3 marks)

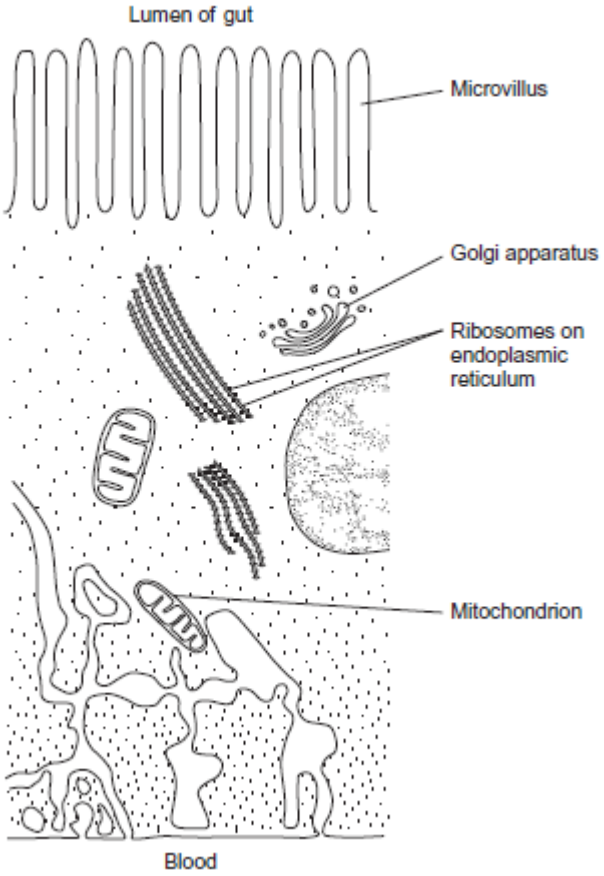
9)

(a) The table shows some features of cells. Complete the table by putting a tick in the box if the feature is present in the cell.

Feature	Cell		
	Cholera bacterium	Epithelial cell from intestine	Epithelial cell from alveolus of lung
Cell-surface membrane			
Flagellum			
Nucleus			

(3 marks)

(b) The diagram shows part of an epithelial cell from an insect's gut.



This cell is adapted for the three functions listed below. Use the diagram to explain how this cell is adapted for each of these functions.

Use a **different** feature in the diagram for each of your answers.

(b) (i) the active transport of substances from the cell into the blood

.....

(2 marks)

(b) (ii) the synthesis of enzymes

.....

(2 marks)

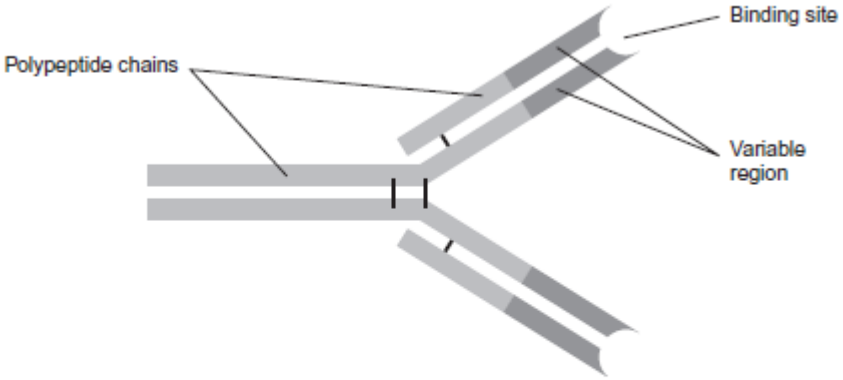
(b) (iii) rapid diffusion of substances from the lumen of the gut into the cytoplasm

.....

(1 mark)

10)

The diagram shows an antibody molecule.



(a) What is the evidence from the diagram that this antibody has a quaternary structure?

.....

(1 mark)

(b) Scientists use this antibody to detect an antigen on the bacterium that causes stomach ulcers. Explain why the antibody will only detect this antigen.

.....

(3 marks)