

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Education
Advanced



CYD-BWYLLGOR ADDYSG CYMRU
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314/01

BIOLOGY

MODULE BI4

A.M. TUESDAY, 20 June 2006

(1 hour 40 minutes)

For Examiner's Use Only

Total Marks	
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INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

1. (a) For each of the four diseases in the table use ticks to indicate a correct statement for the type of organism that causes the disease and the way in which it is transmitted from one individual to another. (Each column should contain at least one tick but no more than two ticks). [4]

	<i>Salmonellosis</i>	<i>Cholera</i>	<i>Influenza</i>	<i>Malaria</i>
Bacterium				
Virus				
Protoctist				
Waterborne				
Vector				
Droplet infection				

- (b) Which of the following biological terms is used to describe **each** of the following statements?

Endemic, epidemic, vector, carrier, vaccine,
antigen, antibody, antibiotic, toxin.

- (i) A significant increase in the usual number of cases of a disease often associated with a rapid spread. [1]

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- (ii) A chemical produced by a microorganism which causes damage to the host. [1]

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- (iii) An individual infected by a disease causing organism, showing no symptoms, but can pass the disease on to another individual. [1]

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- (iv) A disease which is present at low levels in a population for long periods of time. [1]

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(Total 8 marks)

2. Monoclonal antibodies are used in pregnancy testing kits.

(a) Briefly outline how monoclonal antibodies are produced.

[4]

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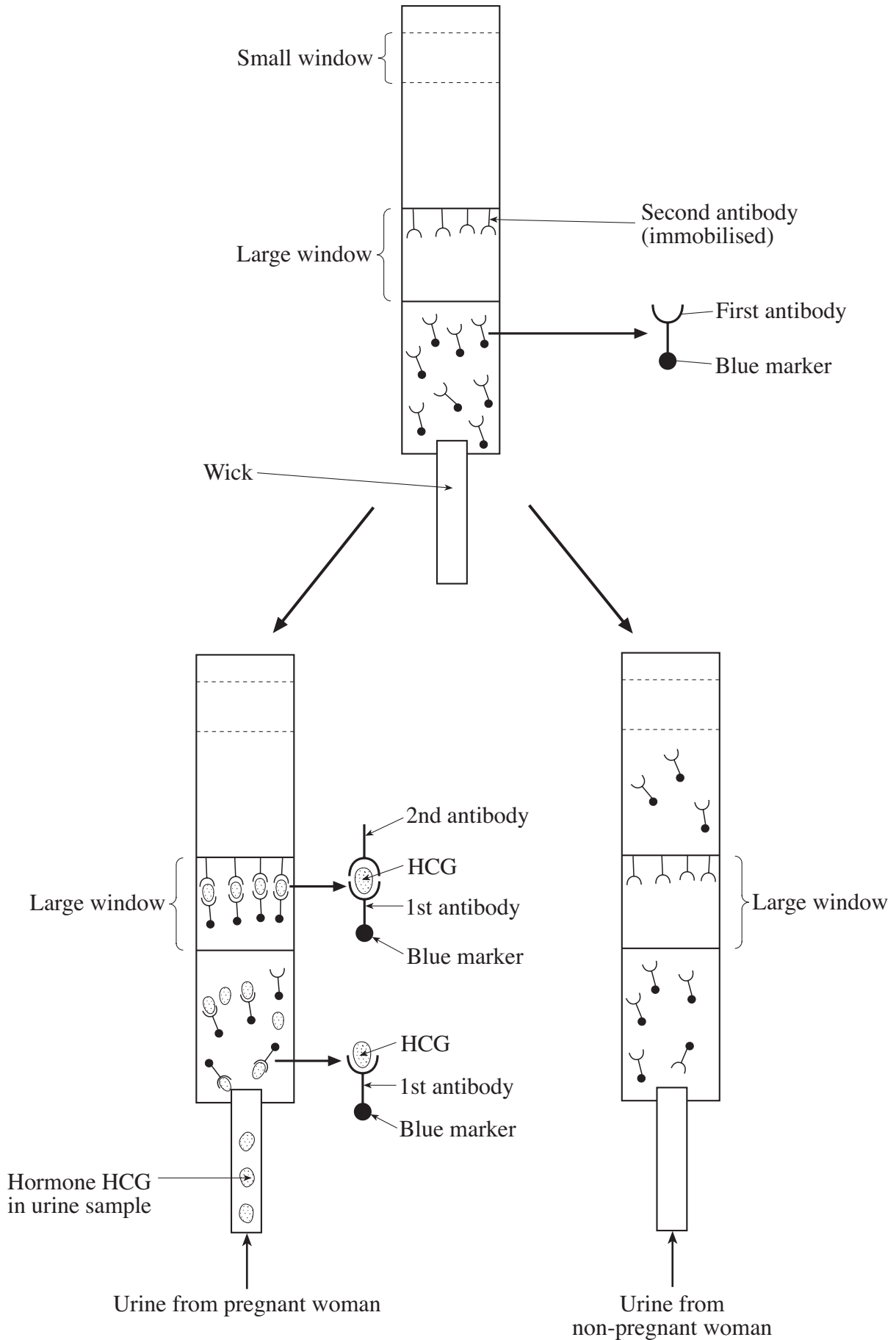
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(b) The diagram below represents a section through a tester used to detect pregnancy in humans.



(i) Identify **one** antigen which is shown in the diagram. [1]

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(ii) When a sample of urine from a pregnant woman is tested a blue band appears in the large window. State why this blue band develops in this window. [2]

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(iii) Give **one other** use of monoclonal antibodies. [1]

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(Total 8 marks)

3. (a) What is meant by the term *Law of limiting factors*?

[2]

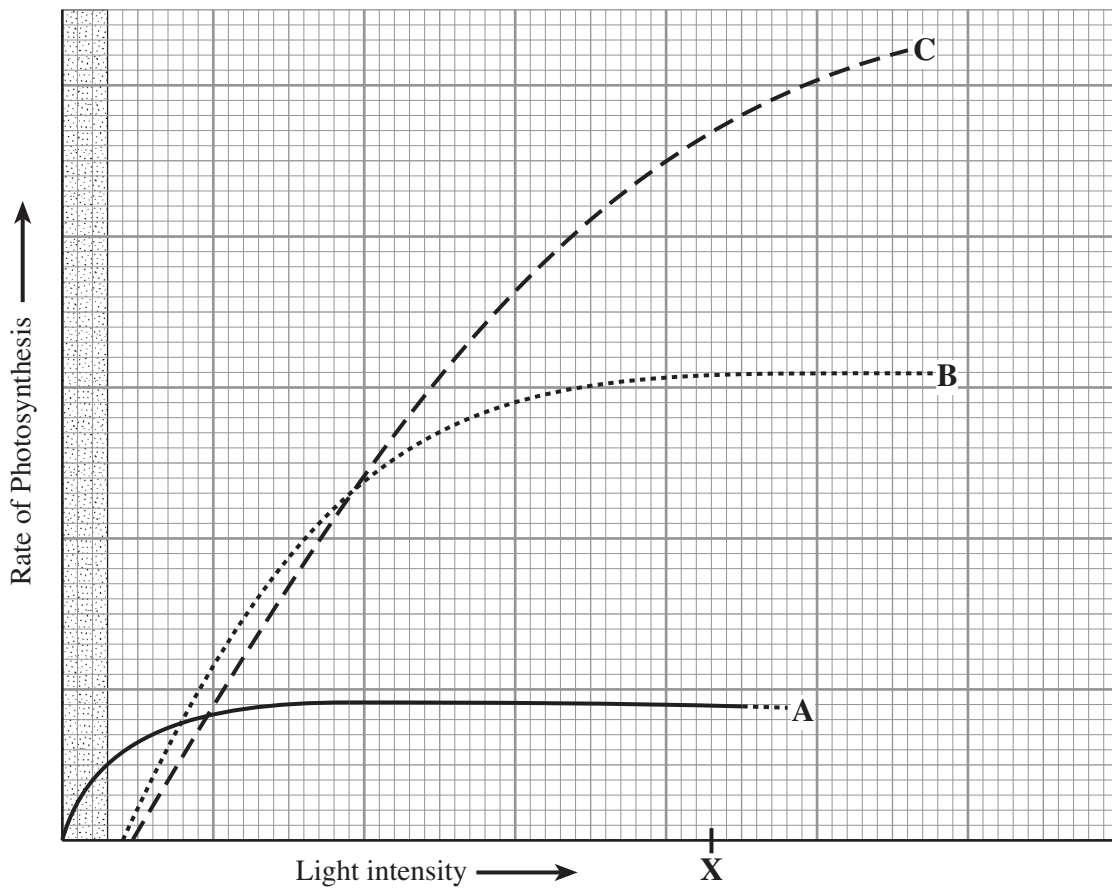
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(b) The graph below shows the effect of different light intensities on the rate of photosynthesis in three species of plants.



Key

 Normal light intensity inside building

(i) Suggest **two** reasons why the rate of photosynthesis of plant **B** slows down after light intensity **X** is reached. [2]

1.

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2.

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(ii) Suggest which of these species of plant is adapted to living in high light intensities. [1]

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(iii) Using information from the graph, suggest why species **A** is likely to make the best indoor house plant. [1]

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(c) There is a certain light intensity at which the rate of photosynthesis just balances the rate of respiration (net carbon dioxide exchange is zero) and this is called the light compensation point.

(i) Explain why the rate of photosynthesis of a plant is not accurately given by the volume of carbon dioxide taken in. [1]

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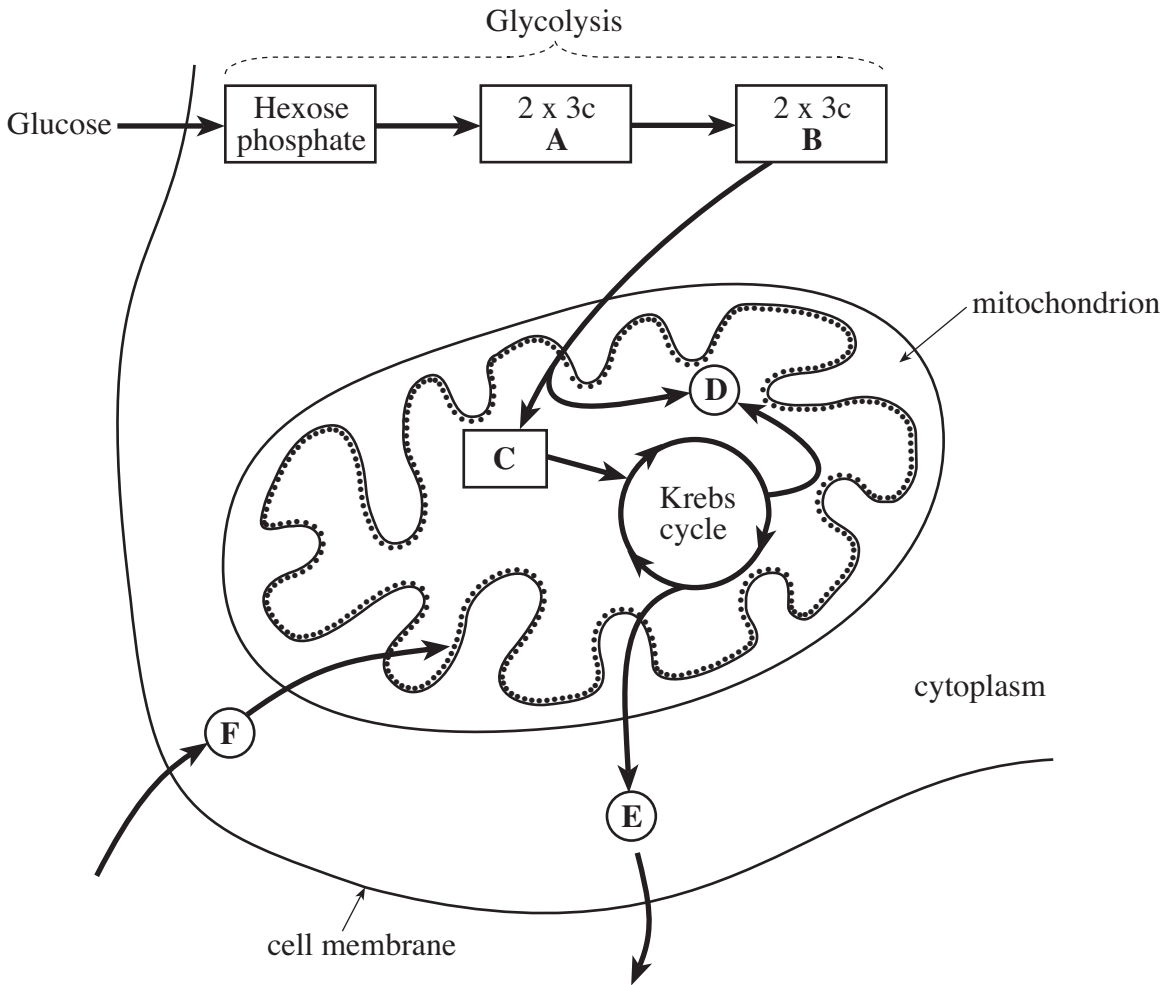
(ii) What do you predict would happen to the **dry mass** of a plant which is kept in a light intensity below the light compensation point? [1]

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(Total 8 marks)

4. (a) The diagram represents an overview of the main stages in the breakdown of a glucose molecule in an animal cell when oxygen is freely available.



- (i) Identify the molecules which are represented by boxes **A-F**. [6]

A

B

C

D

E

F

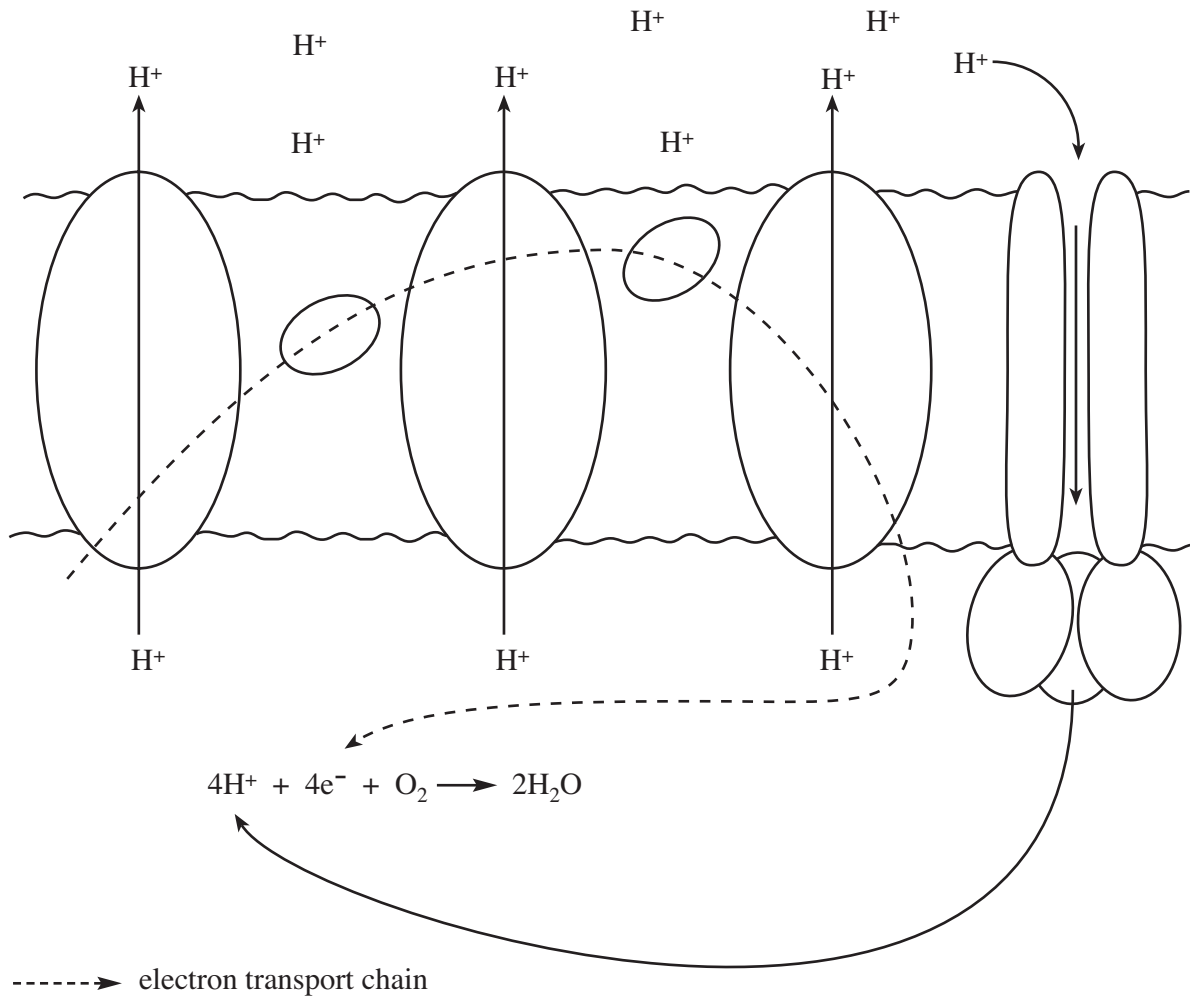
- (ii) Give a reason why ATP is used in the process of glycolysis. [1]

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(b) The diagram below represents the electron transport chain in an animal cell.



(i) State precisely where this process takes place in a cell. [1]

(ii) What is the origin of the electrons which are passed along the chain? [1]

- (iii) As electrons are transferred along the electron transport chain energy is made available for ATP production. Using the information in the diagram explain how this energy is used to produce ATP. [4]

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- (c) Dinitrophenol is a chemical which was used in the manufacture of explosives during the First World War but it poisoned some of the workers. If dinitrophenol is absorbed into the body it reduces the quantity of ATP produced by the electron transport chain. The electron transport chain continues but most of the energy released is in the form of heat. Explain why people suffering from dinitrophenol poisoning experience symptoms such as lack of energy and weight loss. [3]

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(Total 16 marks)

5. Bacteria can be cultured in the laboratory on agar plates.

(a) State **three** conditions which are necessary for growth of bacterial colonies on these plates. [3]

- 1.
- 2.
- 3.

(b) Suggest how you could ensure that aseptic and sterile conditions are present during the preparation of agar plates and the transfer of the bacteria from the culture medium to the plates. [2]

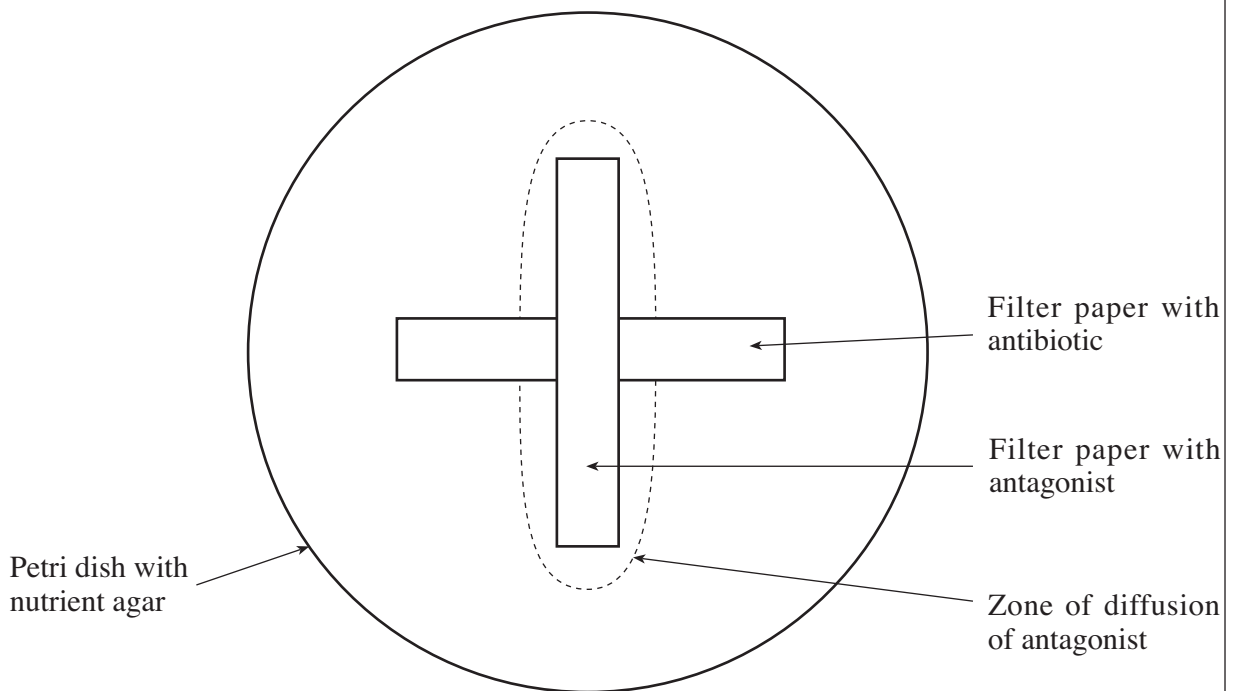
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(c) Some substances are known to interfere with the action of antibiotics and are called antagonist. Two strips of filter paper, one soaked with the antibiotic and the other soaked with a suspected antagonist, are placed so that they cross at right angles on a Petri dish. The Petri dish contains nutrient agar inoculated with a microorganism sensitive to the antibiotic. Draw and label on the diagram the pattern of bacterial growth you would expect to see after 48 hours incubation. [2]



(d) Antibiotics can be described as being bactericidal or bacteriostatic. State what is meant by **each** of these terms. [2]

Bactericidal

Bacteriostatic

(e) Certain bacteria are resistant to antibiotics.

(i) Suggest **two cellular** features which enable a bacterium to be resistant to antibiotics. [2]

1.

2.

(ii) Explain how mutation and natural selection are involved in the development of resistance by certain bacteria to antibiotics. [3]

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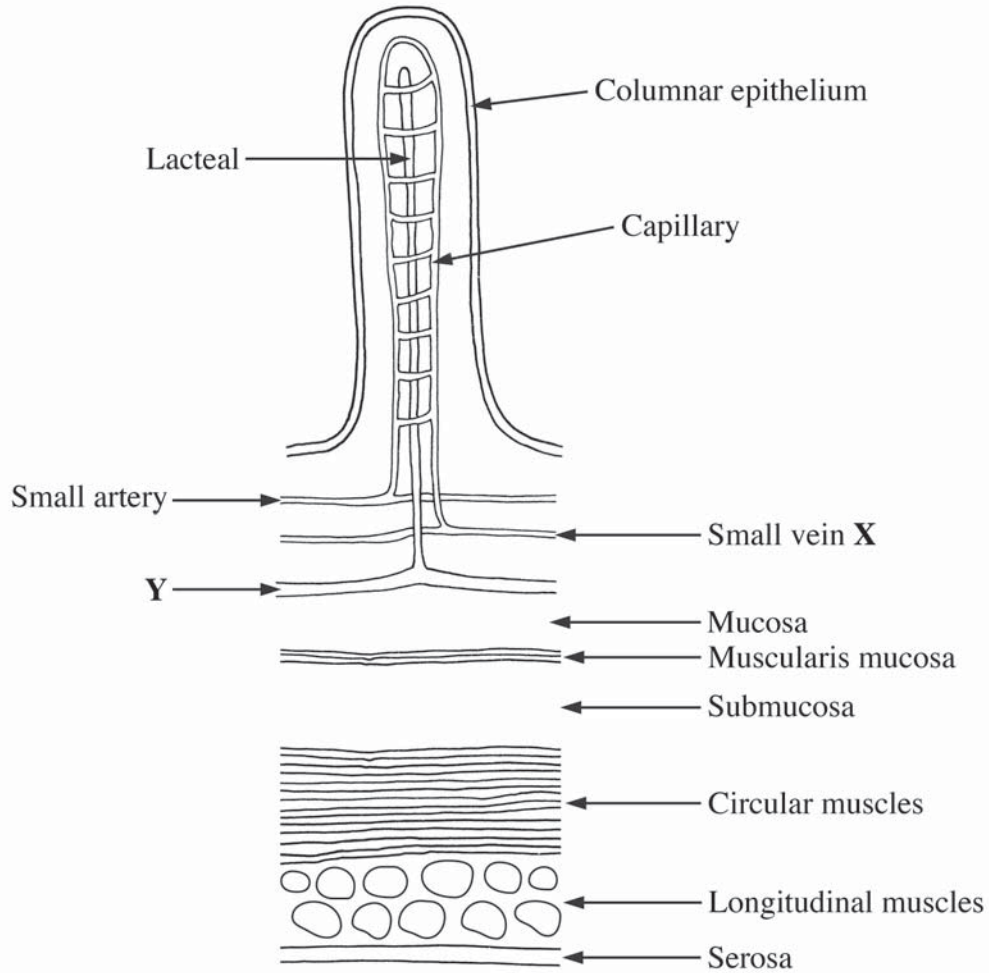
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(Total 14 marks)

6. The drawing represents a section of the wall of the small intestine.



(a) What is the role of the following structures in the function of the small intestine?

(i) Circular and longitudinal muscles. [1]

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(ii) Goblet cells. [1]

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(iii) Lacteals. [1]

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(b) (i) Which vessel does the blood in vein X enter? [1]

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(ii) What is the name of the fluid in structure Y? [1]

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(c) In the duodenum there are glands in the submucosa called Brunners glands. What do these glands secrete and what is the function of the secretion? [2]

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(d) Coeliac disease in humans is caused by chemicals in wheat, barley and rye leading to a loss of villus height and a breakdown of microvilli.

(i) Explain why people with coeliac disease sometimes suffer from deficiency diseases. [2]

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(ii) How do you account for the reduced efficiency of digestive enzymes such as those involved with the final breakdown of disaccharides and dipeptides in people with coeliac disease? [2]

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(Total 11 marks)

7. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, (a) (i) Describe how vaccination can result in actively acquired immunity in an individual. [6]

(ii) Describe the problems associated with using vaccination to control influenza in the UK population. [4]

Or (b) Describe **the light-independent** stage (Calvin cycle) of photosynthesis. Indicate the possible fate of the products of this process. [10]

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(Total 10 marks)

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