



# education

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Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**SENIOR CERTIFICATE EXAMINATION - 2006**

**BIOLOGY P1**

**HIGHER GRADE**

**FEBRUARY/MARCH 2006**

**306-1/1 E**

**Marks: 200**

**2 Hours**

BIOLOGY HG: Paper 1

**This question paper consists of 17 pages.**



306 1 1E

HG

**X05**



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**INSTRUCTIONS AND INFORMATION TO CANDIDATES**

Read the following carefully before answering the questions:

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answer to each question at the top of a new page.
4. Number the answers exactly as the questions are numbered.
5. Write neatly and legibly.
6. If answers are not presented according to the instructions of each question candidates will lose marks.
7. All drawings should be done in pencil and labelled in ink.
8. Only draw diagrams or flow charts when requested to do so.
9. The diagrams in the question paper may not necessarily be drawn to scale.
10. The use of graph paper is NOT permitted.
11. Non-programmable calculators, protractors and compasses may be used.

**SECTION A****QUESTION 1**

1.1 Various possible answers are provided for each question. Indicate the correct answer by writing only the **letter** of your choice next to the relevant question number.

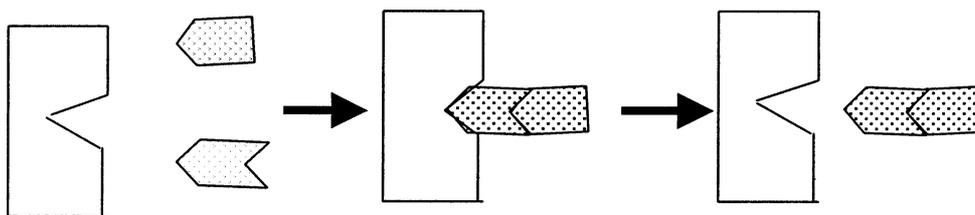
1.1.1 A high carbohydrate diet lacking in proteins is characteristic of the nutritional disorder called ...

- A bulimia.
- B kwashiorkor.
- C marasmus.
- D anorexia nervosa.

1.1.2 In both aerobic and anaerobic respiration ...

- A carbon dioxide and water are released.
- B carbon dioxide is used.
- C energy is released from food.
- D water and glucose are used.

**Questions 1.1.3 and 1.1.4 refer to the accompanying diagrams**



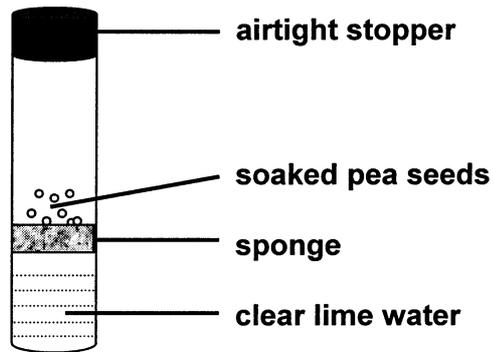
1.1.3 What process is illustrated by the sequence of diagrams?

- A Anabolism
- B Catabolism
- C Absorption
- D Hydrolysis

1.1.4 Which property of enzymes is illustrated by the sequence of the diagrams? Enzymes ...

- A speed up a reaction.
- B lower the activation energy.
- C are proteins.
- D are specific in their function.

- 1.1.5 The apparatus illustrated below is used to show that carbon dioxide is given off during respiration.



A suitable control for this investigation would be to ...

- A leave out the stopper.  
 B use boiled pea seeds.  
 C use bean seeds instead of pea seeds.  
 D use boiled pea seeds which have been sterilised.
- 1.1.6 Which of the following, if present in the correct proportions, will contribute to a balanced diet?
- A Mineral salts, vitamins, carbohydrates, no fats, proteins, water and fibre  
 B Mineral salts, vitamins, glucose, fats, water and fibre  
 C Vitamins, carbohydrates, fats, proteins, water and fibre  
 D Mineral salts, vitamins, carbohydrates, fats, proteins, water and fibre
- 1.1.7 Carbohydrates and lipids differ from each other because ...
- A the ratio of hydrogen to oxygen is greater than 2:1 in lipids.  
 B the ratio of hydrogen to oxygen is less than 2:1 in lipids.  
 C lipids are more soluble in water.  
 D lipids are insoluble in alcohol.

(7 x 2) (14)

- 1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the relevant question number.
- 1.2.1 Wavelike motion of the wall of the alimentary canal caused by the alternate contraction and relaxation of muscles
- 1.2.2 The substance upon which an enzyme works resulting in the formation of an end product
- 1.2.3 An organic acid that accumulates in muscle fibres when the supply of oxygen is insufficient
- 1.2.4 The occupation and defence of a specific area against intruders in order to be able to utilise its resources
- 1.2.5 The macro-nutrient needed for the synthesis of chlorophyll in plants and bone tissue in the human body
- 1.2.6 The phase in photosynthesis during which carbon dioxide is used
- 1.2.7 A disease which can develop from a deficiency of vitamin B<sub>1</sub>
- 1.2.8 The non-protein components attached to the protein part of an enzyme which act as enzyme activators (8)
- 1.3 State whether each of the statements in COLUMN I, applies to **A only**, **B only**, **both A and B** or **none** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the relevant question number.

	COLUMN I	COLUMN II
1.3.1	Has a high concentration of carbon dioxide	A Pulmonary artery B Pulmonary vein
1.3.2	Important for the transport of oxygen	A Calcium B Haemoglobin
1.3.3	Converts soluble caseinogen into insoluble casein	A Rennin B Pepsin
1.3.4	Serves as a final hydrogen acceptor during cellular respiration	A Carbon dioxide B Oxygen
1.3.5	Absorbed in the large intestine	A Water B Mineral salts
1.3.6	Takes place in the cytoplasm	A Glycolysis B Oxidative phosphorylation
1.3.7	Assists in the clotting of blood	A Vitamin K B Nitrogen

(7 x 2) (14)

1.4 Substance 'X' known to contain carbon, hydrogen and oxygen only was crushed with a pestle and mortar and mixed with water. Tests were performed on this substance and the following results were obtained:

- A A test with Iodine solution yielded a negative result.
- B A Millon's reagent or biuret test also gave a negative result.
- C A test with ether/alcohol gave a positive result.
- D A test with Fehling's A and B or Benedict's solution yielded a negative result.

1.4.1 Indicate what was tested for in ...

- (i) A.
- (ii) B.
- (iii) C.
- (iv) D. (4)

1.4.2 Briefly explain why test B was unnecessary in this experiment. (2)

1.4.3 State what a positive result would have been for test ...

- (i) A. (1)
- (ii) B. (1)
- (iii) D. (1)

1.4.4 Name an enzyme that would react with X if it contained the substance tested for in C. (1)  
**(10)**

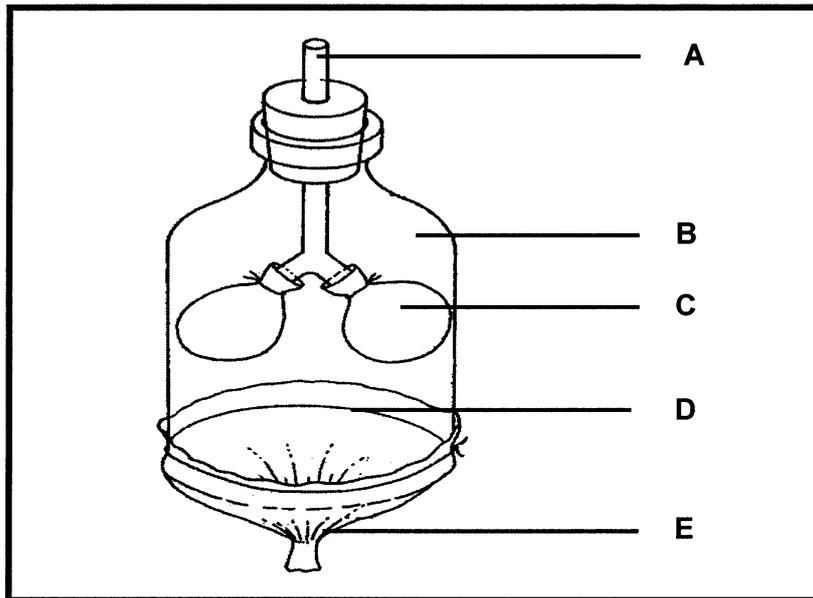
1.5 The following are examples of some kinds of food.

<i>Carrots</i>	<i>Table salt</i>	<i>Seafood</i>	<i>Wholewheat bread</i>
<i>Oranges</i>	<i>Potatoes</i>	<i>Egg-yolk</i>	

**Select from the list**

- 1.5.1 ONE foodstuff which is rich in vitamin A (1)
  - 1.5.2 TWO foodstuffs which can prevent goitre (2)
  - 1.5.3 ONE foodstuff which can prevent scurvy (1)
  - 1.5.4 ONE foodstuff which is rich in vitamin B<sub>1</sub> (1)
  - 1.5.5 ONE foodstuff which is rich in vitamin D (1)
- (6)**

1.6 Study the diagram below and answer the questions that follow.



1.6.1 What is the aim of this demonstration? (1)

1.6.2 Which structure in the gaseous exchange system of humans is represented by each of the following?

(i) A (1)

(ii) B (1)

(iii) C (1)

1.6.3 What would happen to the following if the part labelled E is moved to position D?

(i) Balloons (1)

(ii) Volume of air in the bell jar (1)

1.6.4 Explain ONE reason why this apparatus is considered as a poor representation of the breathing system of humans. (2)

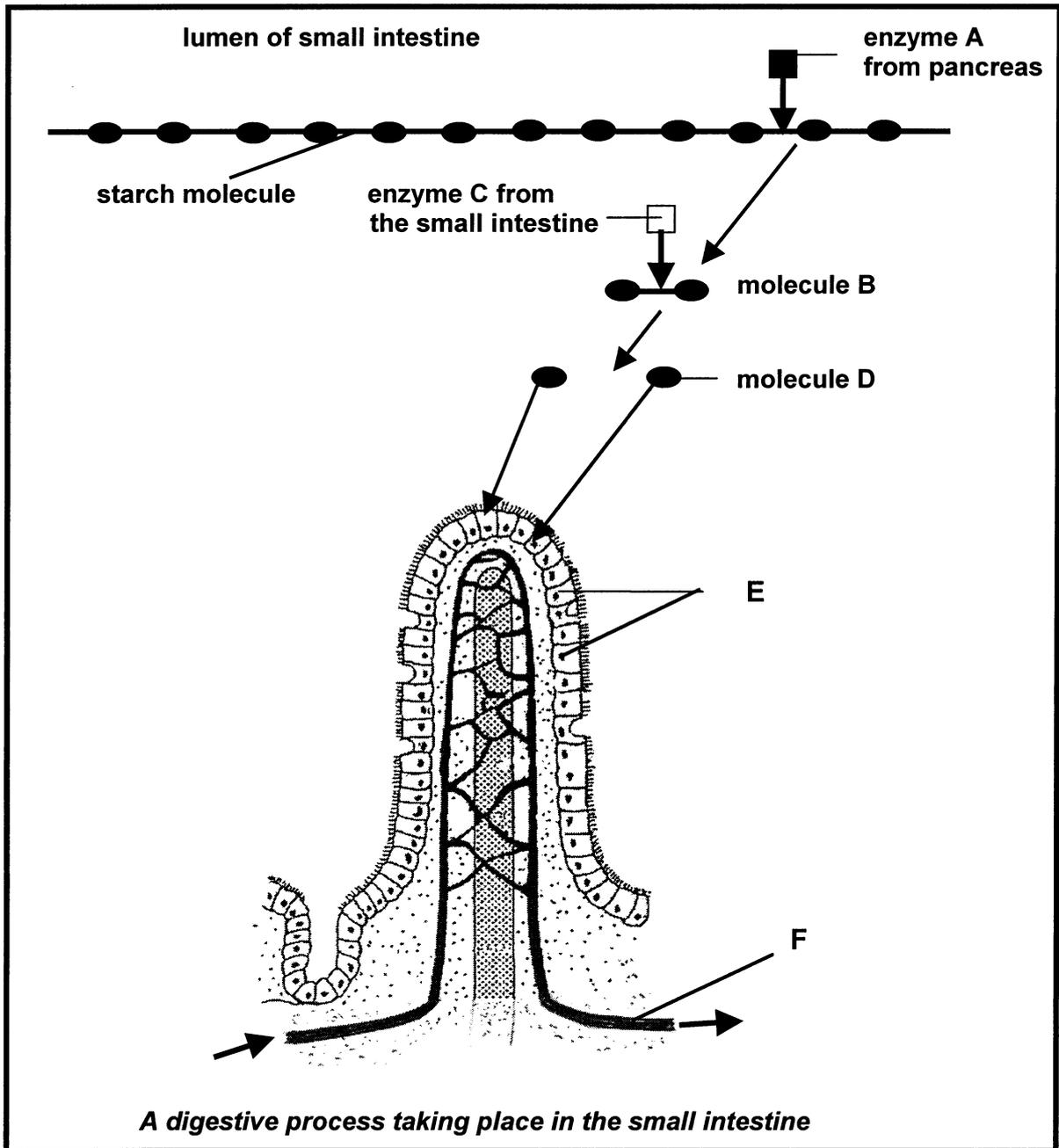
(8)

**TOTAL QUESTION 1: 60**  
**TOTAL SECTION A: 60**

**SECTION B**

**QUESTION 2**

2.1 Study the diagram below which represents the digestive process in a part of the small intestine. Answer the questions based on it.



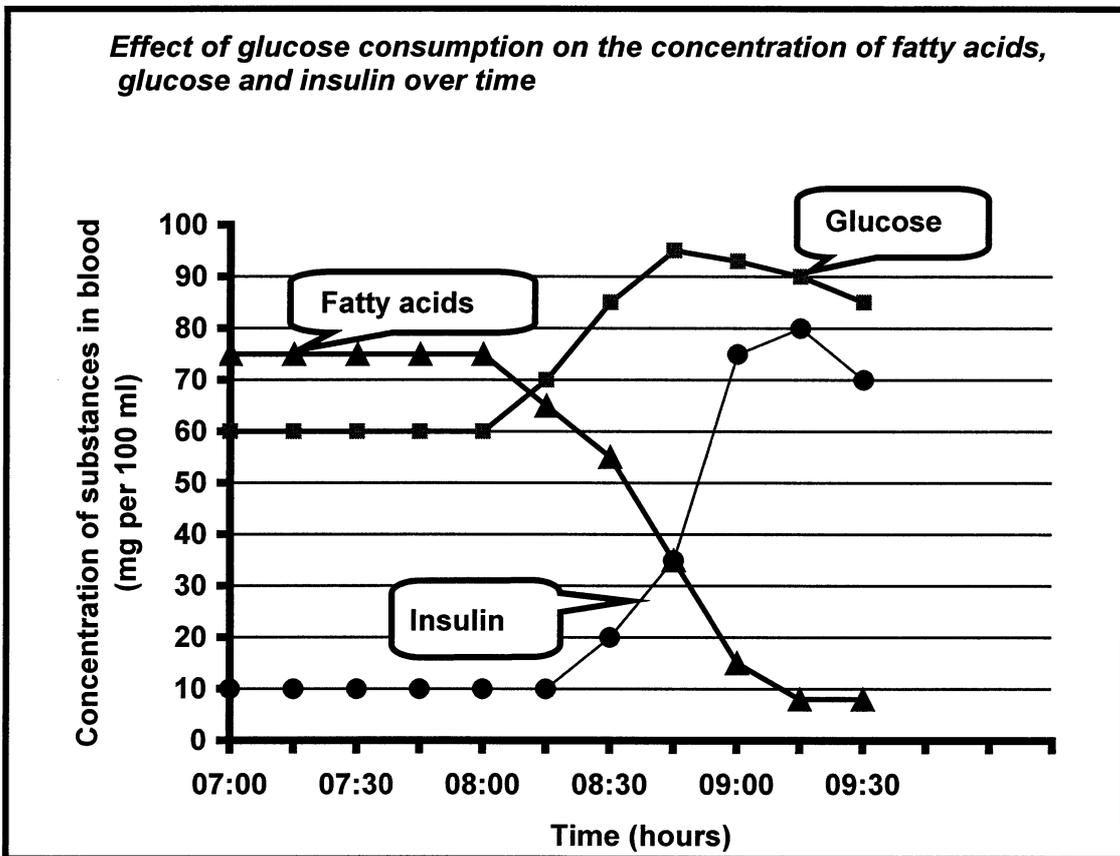
*A digestive process taking place in the small intestine*

2.1.1 Identify ...

- (i) enzymes A and C. (2)
- (ii) molecules B and D. (2)
- (iii) parts labelled E and F. (2)

- 2.1.2 Which molecule is also needed for the digestive process to take place? (1)
  - 2.1.3 Describe how molecule D will pass into cells E. (3)
  - 2.1.4 Explain how an optimum pH level is maintained which is needed for enzymes A and C to function effectively. (4)
  - 2.1.5 Name the vessel that will transport D to the liver after it has been absorbed into F. Describe its final fate in the cells also. (4)
  - 2.1.6 List THREE adaptations of the small intestine for digestion and absorption. (3)
- (21)**

2.2 The effect of eating 50 g of glucose on the concentrations of fatty acids, glucose and insulin was measured for a healthy person. The results are indicated in the graph below.



Use the results to answer the following questions.

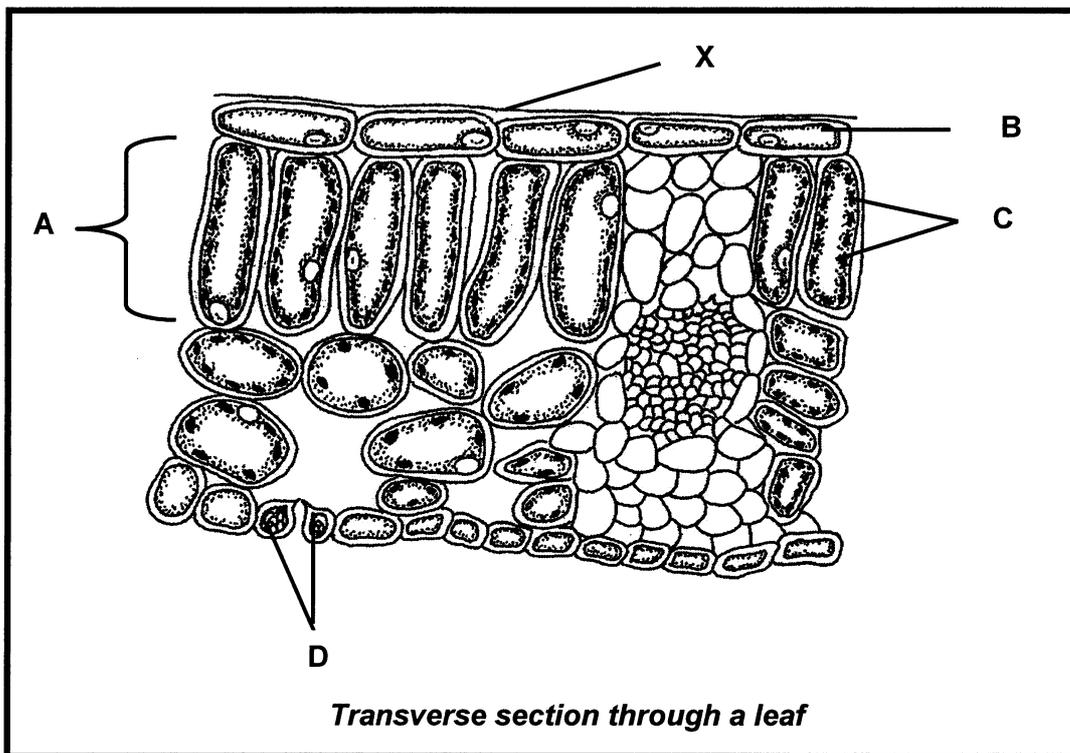
- 2.2.1 During which period of time was the person's blood glucose level constant? (2)
- 2.2.2 At what time were the concentrations of insulin and fatty acids equal? (2)

- 2.2.3 Glucose was given to a person at 08:00. What effect did this have on each of the following during the next 15 minutes?
- (i) The glucose concentration in the blood (1)
  - (ii) The insulin concentration in the blood (1)
- 2.2.4 Explain why there is a difference in time between the two effects mentioned in QUESTION 2.2.3 (i) and (ii). (2)
- 2.2.5 Give a reason why the fatty acids concentration began to decrease from just after 08:00. (2)
- 2.2.6 Use the data above to briefly describe the role of insulin in glucose metabolism. (4)
- (14)**

**TOTAL QUESTION 2 : 35**

**QUESTION 3**

3.1 The diagram below illustrates the internal structure of a leaf.



- 3.1.1 Provide labels for A and C. (2)
- 3.1.2 Explain
- (i) ONE way in which part X is structurally adapted for photosynthesis. (2)
  - (ii) TWO ways in which tissue A is structurally adapted for photosynthesis. (4)

3.1.3 Tabulate TWO structural differences between cells B and D. (5)  
(13)

3.2 The following procedure was used in an investigation on photosynthesis:

- \* A cork borer was used to punch out discs of equal area from a leaf
- \* Batches of five leaf discs were then transferred to fresh sodium bicarbonate solution of the same concentration in test tubes
- \* These test tubes were then placed in different light intensities.

Observations and results:

All the leaf discs rose to the surface. The time taken for each disc to rise to the surface was noted and the net rate of photosynthesis was calculated.

Light Intensity (lux)	Net Rate of Photosynthesis (arbitrary units)
400	16
1 200	28
2 000	71
2 800	221
3 600	218

3.2.1 State ONE important precaution that must be taken when selecting areas of leaf for taking the discs. (2)

3.2.2 Suggest an aim for this investigation. (2)

3.2.3 Explain why the leaf discs rose to the surface of the test tubes. (2)

3.2.4 Give a reason for the use of sodium bicarbonate solution instead of water. (2)

3.2.5 Explain why batches of five leaf discs were used and not just one. (2)

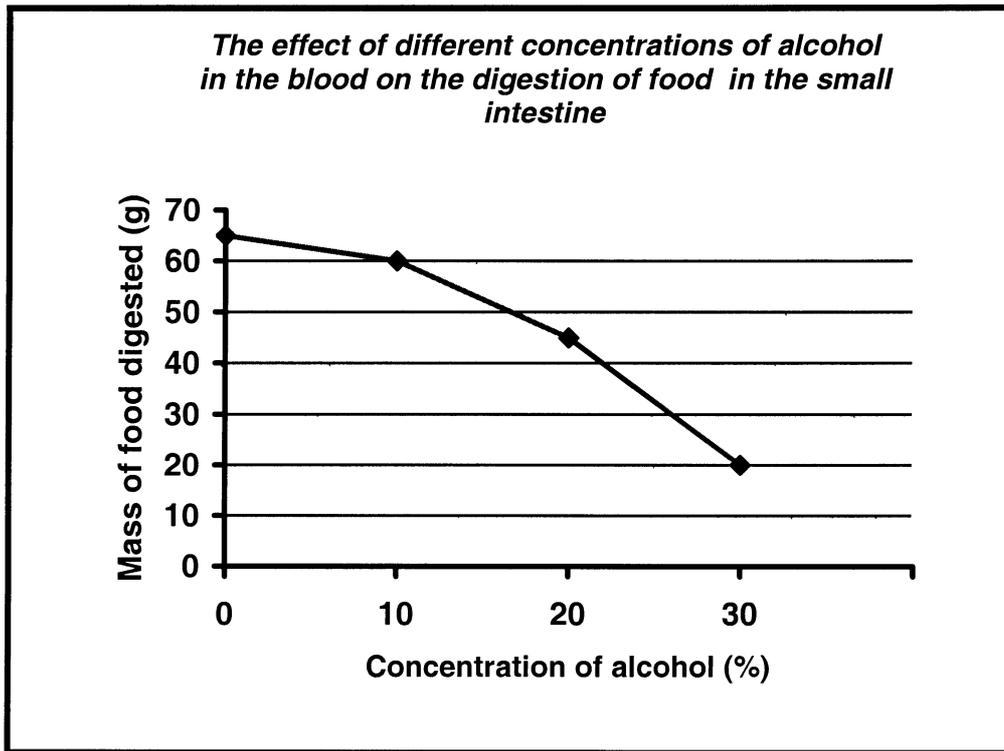
3.2.6 Use the data in the table and account (explain with reasons) for the changes in the net photosynthetic rate between:

(i) 400 and 1 200 lux (2)

(ii) 2 800 and 3 600 lux (2)

(14)

- 3.3 The figure below shows the effect of alcohol on the activity of an enzyme which is responsible for digesting food in the small intestine of humans.

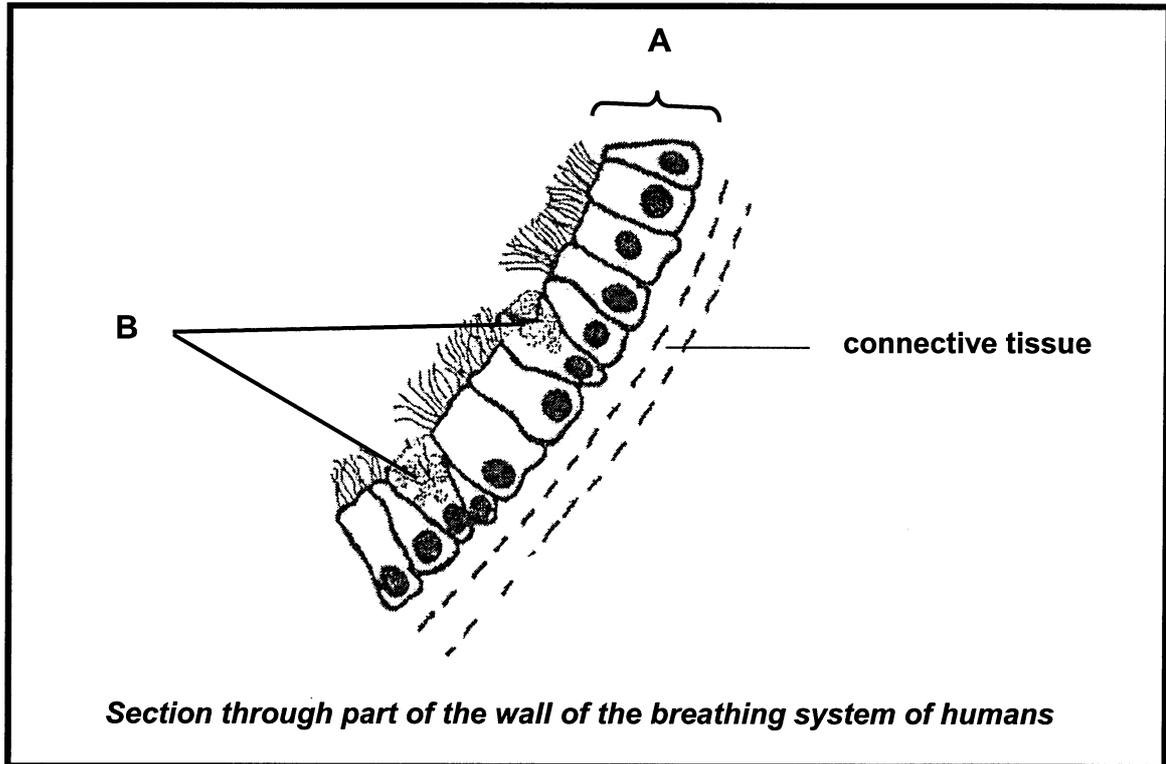


- 3.3.1 Explain the information shown by the graph. (3)
- 3.3.2 From the graph determine the concentration at which alcohol has the greatest negative effect on digestion of food. (2)
- 3.3.3 Calculate the percentage decrease in enzyme activity that occurred between 10% and 20%. Show all your workings. (3)
- (8)**

**TOTAL QUESTION 3: 35**

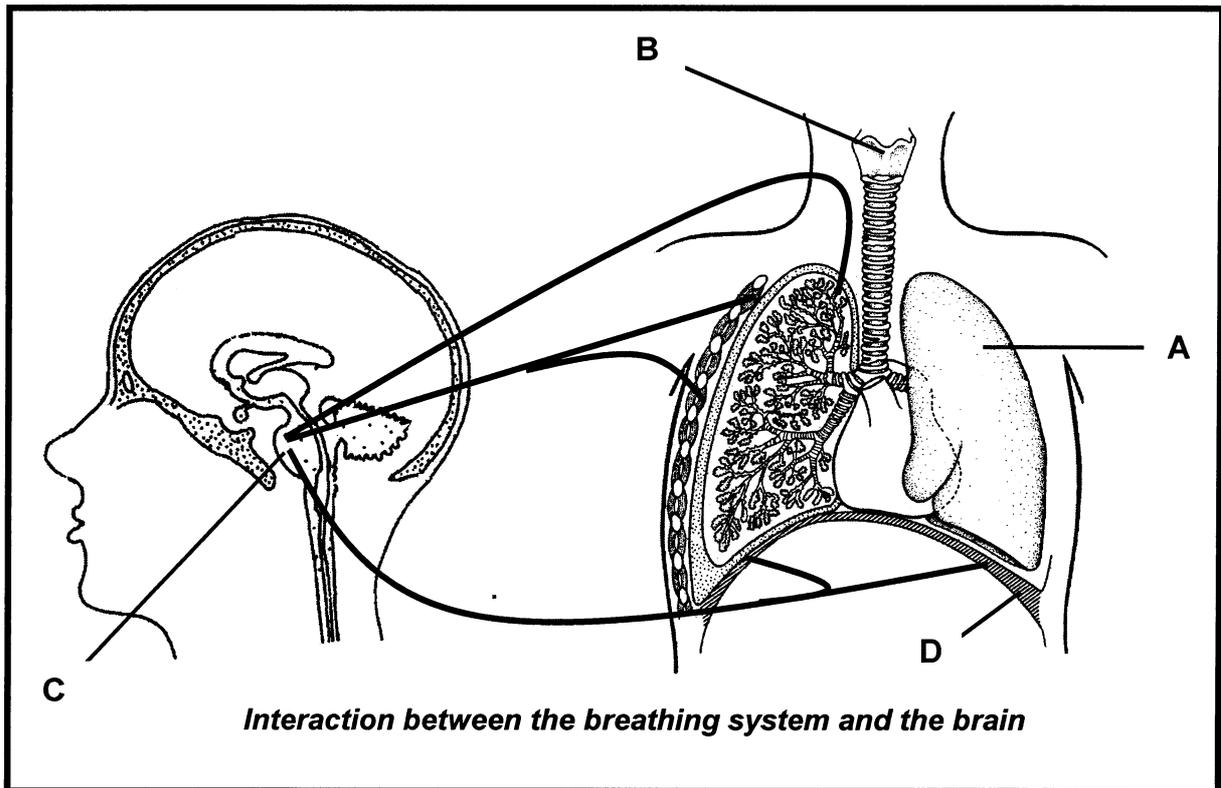
**QUESTION 4**

4.1 The following diagram shows part of the wall of the breathing system of a human. Answer the questions based on it.



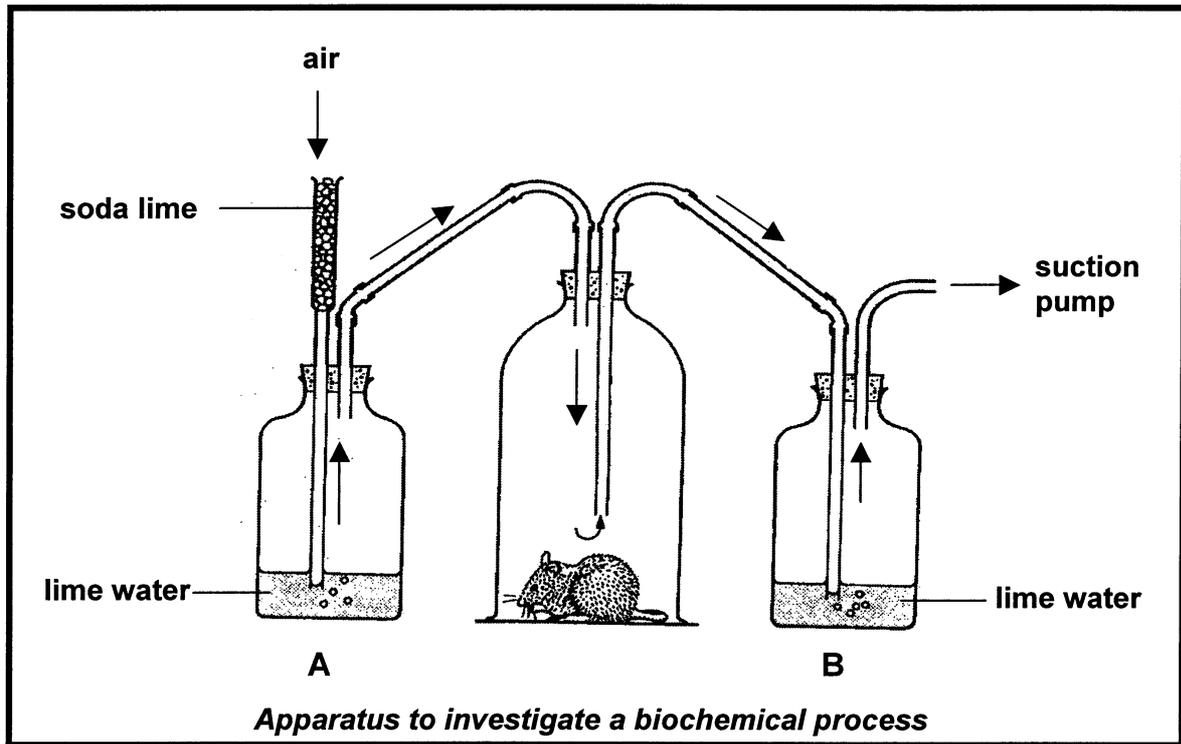
- 4.1.1 Provide labels for tissue A and cells B, respectively. (2)
  - 4.1.2 State TWO functions of tissue A. (2)
  - 4.1.3 Name TWO parts of the breathing system where the walls have the above tissue. (2)
  - 4.1.4 Name the structure in the wall (not shown on the diagram) that prevents the tube from collapsing and closing. (1)
- (7)**

4.2 The accompanying diagram shows some structures that co-ordinate the rate of breathing in humans. Study the diagram and answer the questions which follow.



- 4.2.1 Name structures A, B, C and D. (4)
  - 4.2.2 Name TWO factors acting on region C that can cause the breathing rate to increase. (2)
  - 4.2.3 Describe the homeostatic process that will occur to bring the breathing rate back to normal. (6)
- (12)**

4.3 Study the diagram below and then answer the questions which follow.



- 4.3.1 Suggest an aim for the above investigation. (2)
  - 4.3.2 State the function of the soda lime. (1)
  - 4.3.3 Explain the difference in the purposes of the lime water in flask A and in flask B. (2)
  - 4.3.4 State the expected results in the above investigation. (2)
  - 4.3.5 Explain TWO ways in which the above experimental design could be improved to achieve more valid and reliable results. (4)
  - 4.3.6 Name the organelle in which the Krebs cycle takes place. (1)
  - 4.3.7 Briefly describe the Krebs cycle. (4)
- (16)**

**TOTAL QUESTION 4: 35**  
**TOTAL SECTION B: 105**

**SECTION C****QUESTION 5**

- 5.1 Read the following passage on tsunamis carefully and then answer the questions that follow.

*'Tsunamis are huge waves that begin when the sea floor is violently shaken by an earthquake, a landslide or a volcanic eruption. According to a newspaper report, the death toll from the earthquake-generated tsunami in Asia on 26 December 2004 is estimated at 275 950. This is the second highest earthquake death toll recorded in history. The deadliest earthquake on record occurred on 23 January 1556 in China when an earthquake of a magnitude of 8,0 killed an estimated 830 000 people. The earthquake that hit Asia had a magnitude of 9,0 on the Richter scale.'*

*(Note: The magnitude/strength of an earthquake is measured on a Richter's scale.)*

Study the table below which shows information on some of the earthquake-generated tsunamis which occurred between 1918 and 2003.

<b>Earthquake-generated tsunamis</b>			
<b>Year</b>	<b>Country</b>	<b>Magnitude on the Richter's scale</b>	<b>Number of deaths</b>
1918	Philippines	8,3	102
1925	Philippines	6,8	428
1950	India	8,7	574
1953	Turkey	7,5	1 070
1974	Pakistan	6,2	5 300
1976	Philippines	8,0	6 500
1985	Mexico	8,1	9 500
1995	Japan	6,8	5 502
2003	Algeria	6,9	2 266

- 5.1.1 Are tsunamis density-dependent or density-independent factors? Give a reason for your answer. (2)
- 5.1.2 How many people in total were killed in the Philippines by tsunamis from 1918 to 2003? (Show all workings.) (2)
- 5.1.3 Name TWO causes of tsunamis. (2)

- 5.1.4 Draw a bar graph to show the number of people killed by tsunamis between 1918 and 2003 in Turkey, Pakistan, Mexico, Japan and Algeria. (11)  
(17)

- 5.2 Discuss the role that carrying capacity, competition and predation play in regulating the size of a population.

Factual Content :15

Synthesis :03

(18)

**TOTAL QUESTION 5: 35**

**TOTAL SECTION C: 35**

**GRAND TOTAL: 200**