



# education

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Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**SENIOR CERTIFICATE EXAMINATION - 2007**

**BIOLOGY P1**

**HIGHER GRADE**

**FEBRUARY/MARCH 2007**

**306-1/1**

BIOLOGY HG: Paper 1

**MARKS: 200**



**306 1 1E**

**HG**

**TIME: 2 HOURS**

This question paper consists of 20 pages.

**X05**



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Please turn over



**INSTRUCTIONS AND INFORMATION**

Read the following instructions 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 for 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.

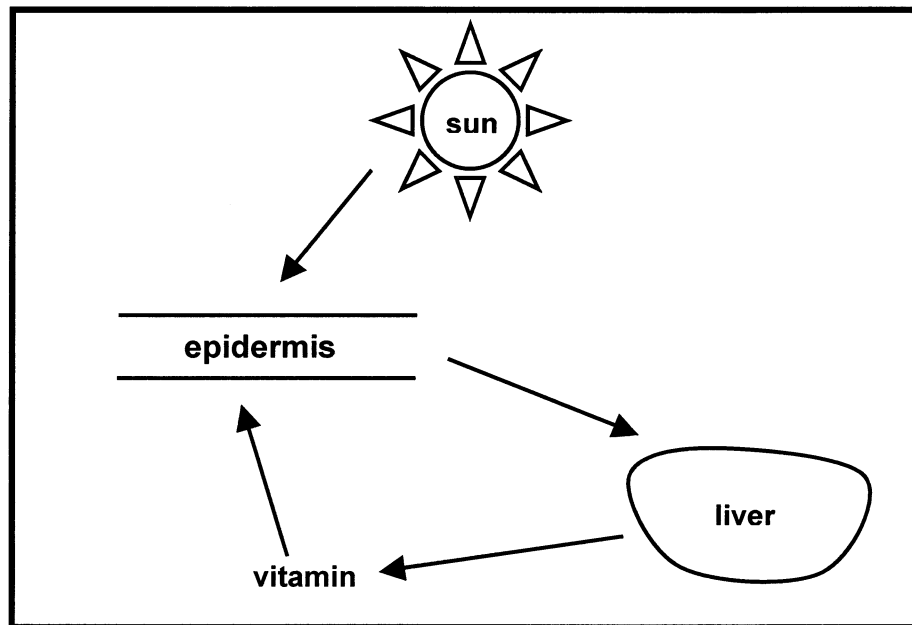
**SECTION A****QUESTION 1**

1.1 Various possible options are provided as answers for the following questions. Select the correct answer and write only the letter (A – D) next to the question number (1.1.1 – 1.1.7), for example 1.1.8 D.

1.1.1 Which of the following is a density-dependent factor?

- A Competition
- B Fire
- C Drought
- D Temperature

QUESTIONS 1.1.2 and 1.1.3 are based on the accompanying diagram of the synthesis of a vitamin in the human body. Study the diagrams and answer the questions that follow:

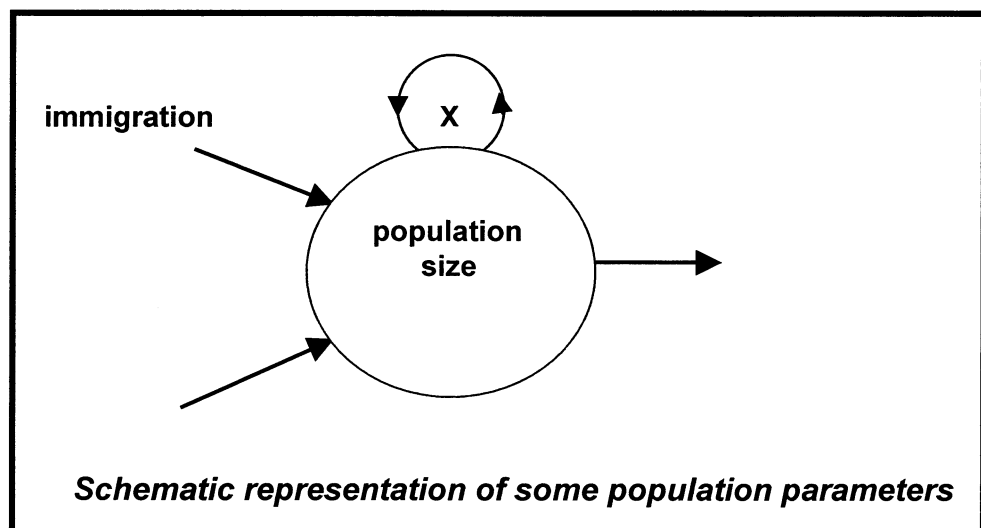


1.1.2 What vitamin is being synthesised?

- A Vitamin A
- B Vitamin B
- C Vitamin D
- D Vitamin E

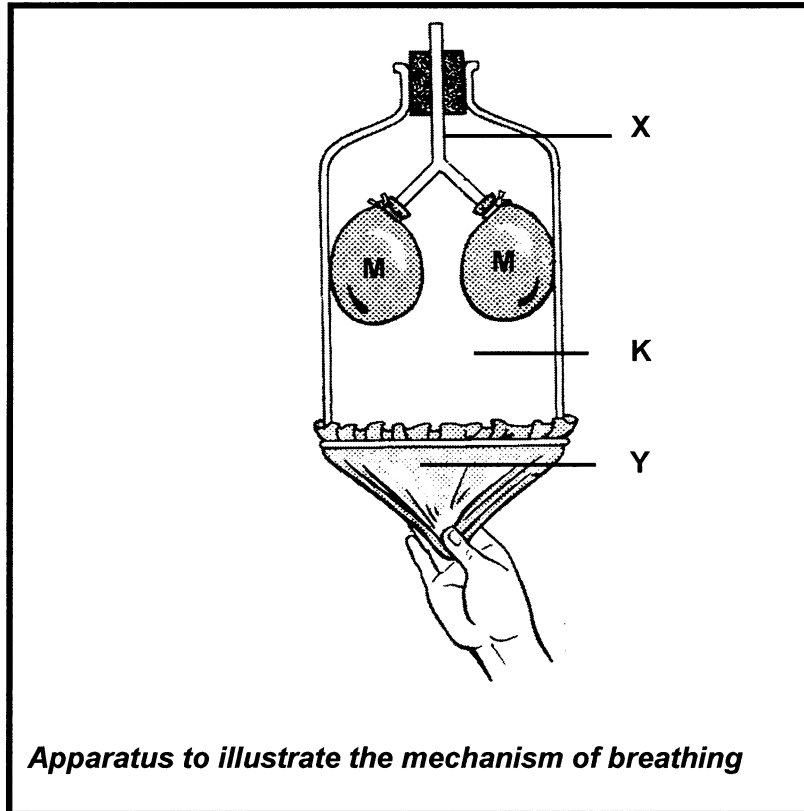
- 1.1.3 If a growing child does not have sufficient amounts of this vitamin, he/she will suffer from ...
- A anaemia.
  - B rickets.
  - C scurvy.
  - D beri-beri.
- 1.1.4 Which of the following elements will prevent the yellowing of leaves in plants?
- (i) Nitrogen
  - (ii) Phosphorus
  - (iii) Sodium
  - (iv) Magnesium
- A (i) and (ii)
  - B (ii) and (iii)
  - C (iii) and (iv)
  - D (i) and (iv)

QUESTION 1.1.5 is based on the accompanying schematic representation of some population parameters. Study the diagram and answer the question that follows:



- 1.1.5 Which parameter does the letter X on the diagram represent?
- A Natality
  - B Migration
  - C Mortality
  - D Emigration

QUESTIONS 1.1.6 and 1.1.7 refer to the diagram that represents the apparatus used to demonstrate the mechanism of breathing in the human body. Study the diagram and answer the questions that follow:



- 1.1.6 The structure marked X, represents the ...
- A bronchiole.
  - B trachea.
  - C oesophagus.
  - D bronchus.
- 1.1.7 The balloons, M, will blow up when structure Y is pulled downwards. This is a result of a/an ...
- A increase in pressure in K and a decrease in the volume of M.
  - B increase in pressure on M and a decrease in the volume of K.
  - C increase in volume of K and a decrease in the pressure on M.
  - D decrease in pressure on M and a decrease in the volume of K.

(7 x 2)

(14)



1.2 Give the correct biological term for each of the following descriptions. Write only the term next to the question number (1.2.1 – 1.2.6).

- 1.2.1 The leaf-like structure covering the opening of the trachea
- 1.2.2 A cell organelle concerned with the production of ATP
- 1.2.3 The phase in the logistic growth form where the population is beginning to adapt to the new environment
- 1.2.4 The splitting of a complex molecule by the addition of water
- 1.2.5 The measurement scale which indicates acidity and/or alkalinity of a solution
- 1.2.6 The sum of the factors inhibiting population growth as a result of current conditions in a habitat

(6)

1.3 Indicate 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 question number (1.3.1 – 1.3.7).

	COLUMN I	COLUMN II
1.3.1	A chemical used to determine the presence of fats	A Ether B Iodine solution
1.3.2	A micronutrient involved in the regulation of the metabolic rate in humans	A Phosphorus B Sulphur
1.3.3	A chemical process involving the oxidation of fuel molecules to release energy	A Metabolism B Cellular respiration
1.3.4	Final hydrogen acceptor during oxidative phosphorylation	A Water B Oxygen
1.3.5	Ways in which energy may be lost or used by an animal	A Production B Faeces
1.3.6	External physical factors, for example drought, which play an important role in population fluctuations	A Density-independent factors B Density-dependent factors
1.3.7	Lined with ciliated epithelium	A Nasal cavity B Trachea

(7 x 2) (14)

1.4 Study the following passage and answer the questions that follow:

### **EAT SMART**

*The daily kilojoules requirement for weight maintenance for a 56 kg moderately active adult is about 8 500 kJ.*

*For health, fat intake should be kept at 30% of the total kilojoules intake, which is a maximum of 67 g fat per day for a 56 kg moderately active adult. Saturated fat intake should be kept as low as possible: it should not exceed one third of the total daily fat intake.*

*Cholesterol is an independent risk factor for heart disease. It is recommended that for good health, dietary cholesterol intake should be less than 300 mg per day, and less than 200 mg for those with heart disease.*

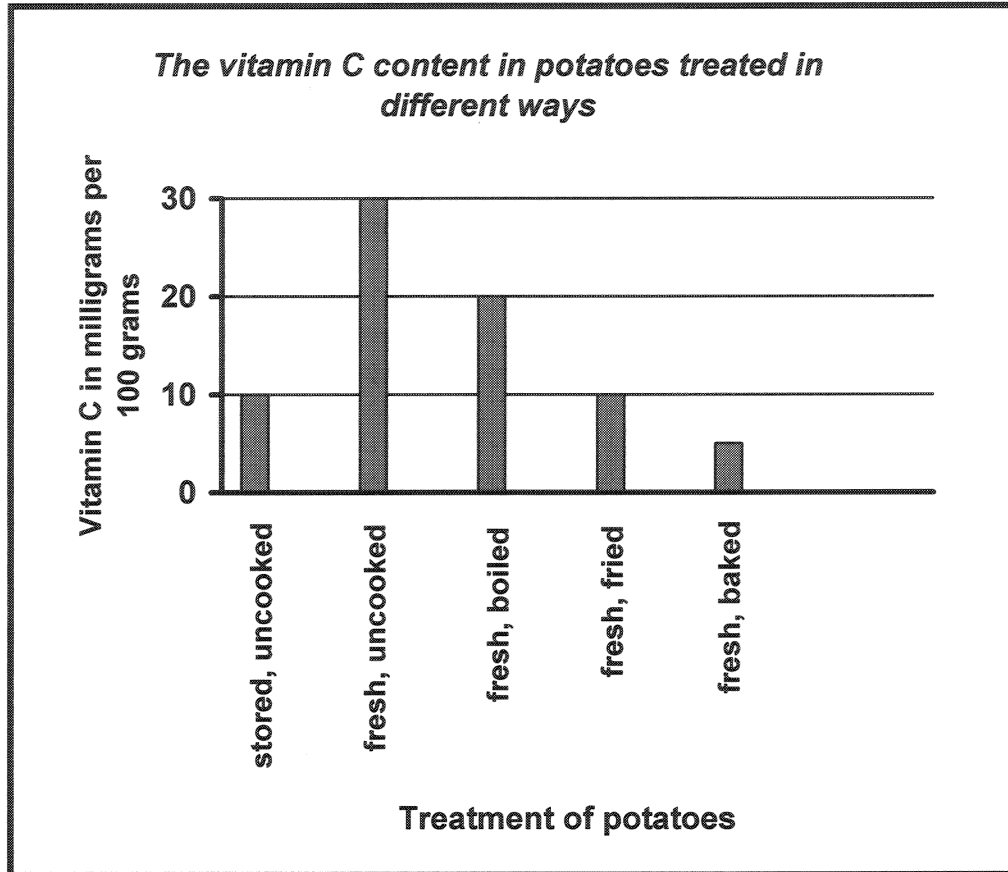
*High sodium intake is a major risk factor for hypertension (high blood pressure). The estimated safe adequate daily intake for sodium is approximately 1 100 to 3 300 mg per day.*

*Adapted from: **Health in the fast lane**, Ashleigh Caradas (Longevity Dec 2005)*

- 1.4.1 What do kilojoules refer to in the passage? (1)
- 1.4.2 Name TWO substances from the passage which, when taken in large amounts, increase the risk of getting heart disease. (2)
- 1.4.3 Calculate the following:
- (a) The maximum amount of saturated fat that a 56 kg, moderately active adult should consume per day. Show ALL the calculations. (3)
- (b) The approximate number of kilojoules that 67 g of fat contains. Show ALL the calculations. (3)
- (9)

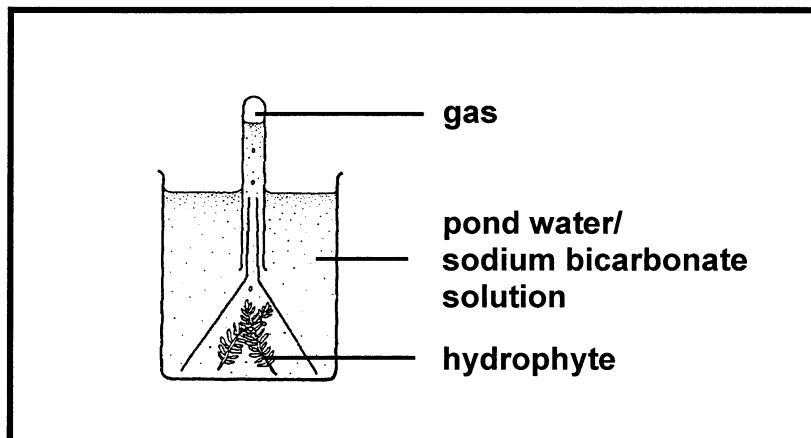


- 1.5 Potatoes are treated differently and after that, the vitamin C content is measured. The ways in which the potatoes were treated and the results are shown in the graph below. Study the graph and answer the questions that follow:



- 1.5.1 How much vitamin C is contained in 100 grams of fresh, baked potatoes? (2)
- 1.5.2 What general conclusions can be made from the information on the graph about loss of vitamin C? (2)
- 1.5.3 Suggest how vitamin C could have been lost in the fresh, boiled potatoes. (1)
- 1.5.4 According to the information on the graph, which method of cooking potatoes conserves the most vitamin C? (1)
- 1.5.5 State TWO functions of vitamin C in the body. (2)
- (8)**

- 1.6 Study the diagram that illustrates bubbles of gas being released during an investigation and answer the questions that follow:

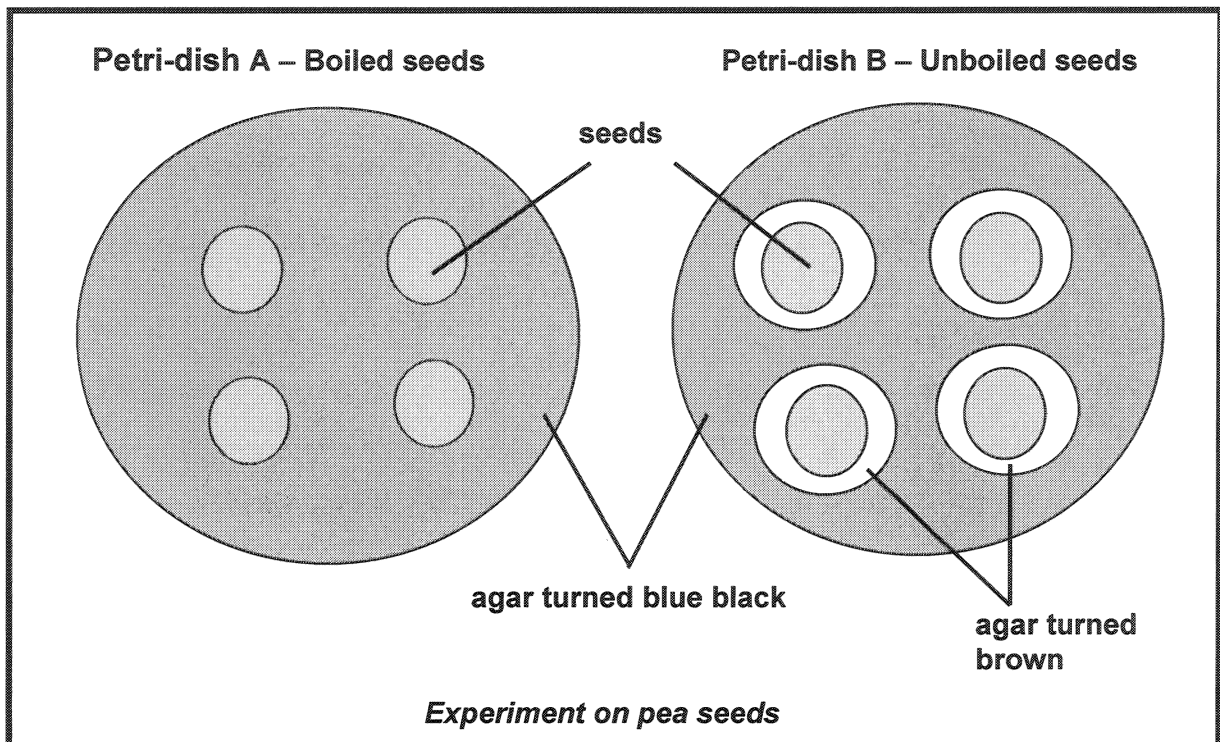


- 1.6.1 Which process is being investigated in this experiment? (1)
- 1.6.2 Name the gas that accumulates in the test tube. (1)
- 1.6.3 Describe how you would test for the gas referred in QUESTION 1.6.2. (3)
- 1.6.4 Why should pond water or sodium bicarbonate be added to the water/solution used in the investigation? (2)
- 1.6.5 How would you set up a control for this experiment? (2)

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

**SECTION B****QUESTION 2**

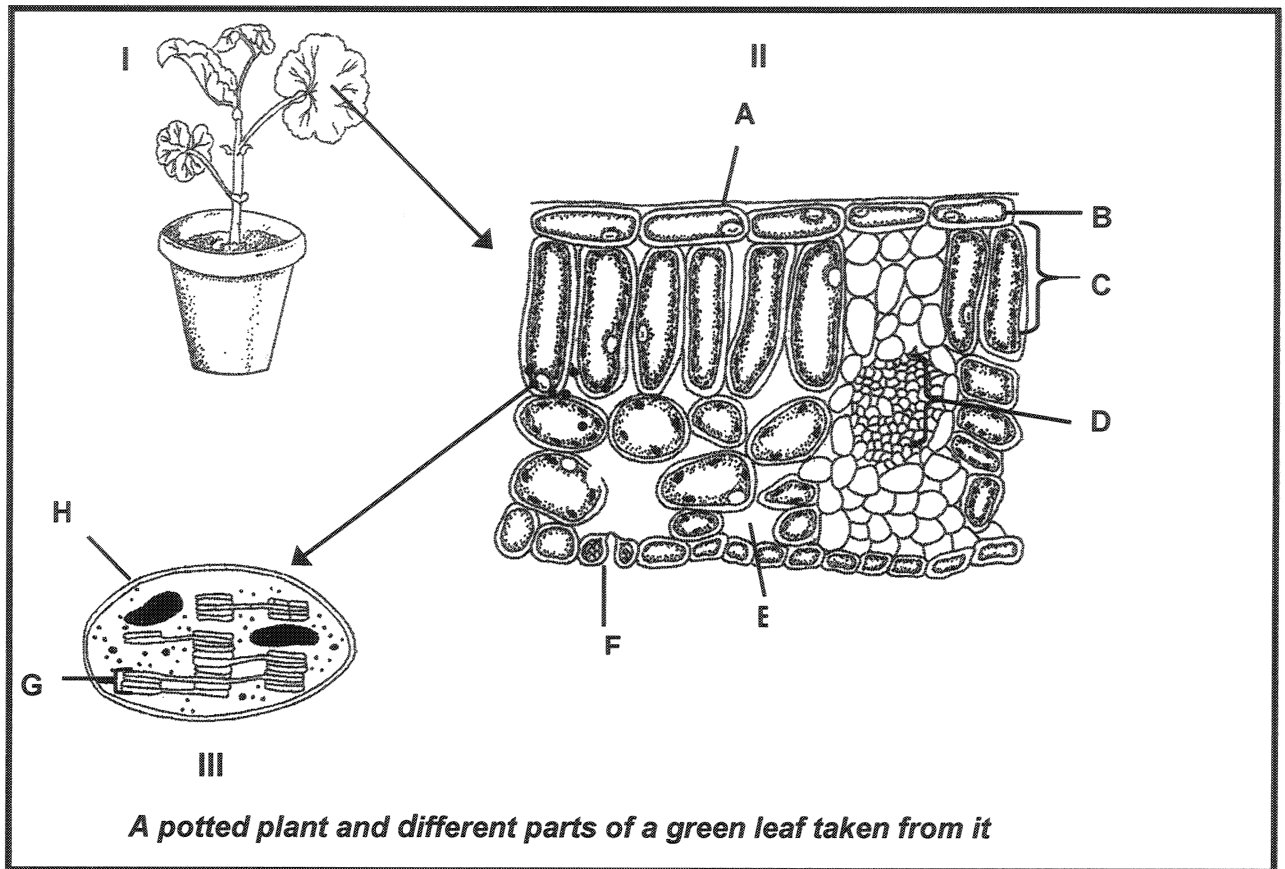
- 2.1 A learner conducted an experiment using pea seeds to investigate enzyme actions. The learner soaked 8 dry pea seeds in water for 24 hours. Thereafter, four of the seeds were boiled for 3 minutes and allowed to cool down. Equal quantities of agar jelly containing starch were poured into two petri-dishes marked A and B respectively. Four boiled seeds were placed in petri-dish A and four unboiled seeds in petri-dish B. After three days all the peas were removed and the petri-dishes filled with iodine solution. The results obtained are shown in the diagrams below:



- 2.1.1 What is the aim of the experiment? (2)
- 2.1.2 Why did a large area of agar turn blue black? (2)
- 2.1.3 Explain why the area around the unboiled seeds turned brown. (2)
- 2.1.4 Which organic product might be found in the brown area? (1)
- 2.1.5 Name the enzyme that might be present in peas that could be responsible for the reaction mentioned in QUESTION 2.1.3. (1)
- 2.1.6 Explain why it was necessary to soak the peas at the start of the experiment. (3)
- 2.1.7 Explain TWO characteristics of enzymes that are illustrated in this experiment. (4)

**(15)**

2.2 Study the diagrams and answer the questions that follow:



2.2.1 Identify the following parts:

- (a) C (1)  
(b) D (1)

2.2.2 Which gas would MAINLY move:

- (a) OUT through F during the day? (1)  
(b) OUT through F at night? (1)

2.2.3 List ONE function, related to photosynthesis, of:

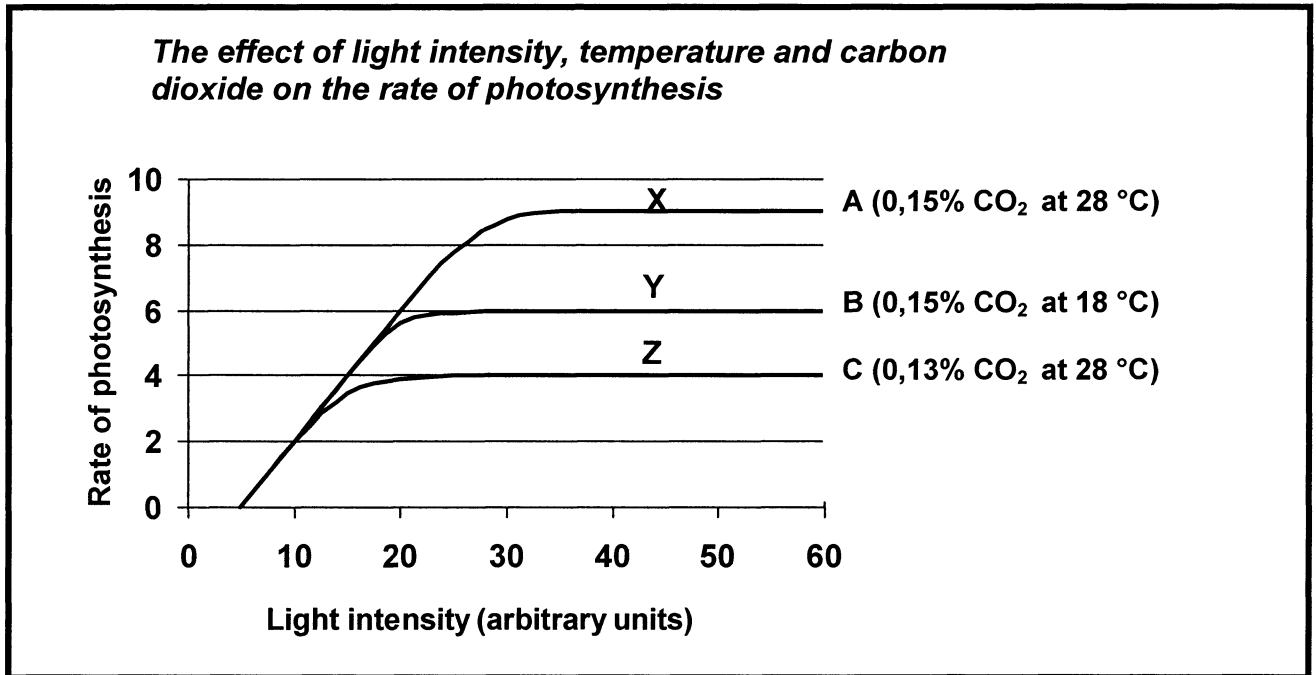
- (a) B (1)  
(b) E (1)

2.2.4 Name the phase of photosynthesis that takes place in G. (1)

2.2.5 Explain TWO ways to show how organelle shown as III on the diagram, is suited to its function. (4)  
(11)

2.3 The following graph shows the results of an experiment to determine the effect of different light intensities, temperatures and carbon dioxide concentrations on the rate of photosynthesis in a plant.

Study the graph and then answer the questions that follow:



2.3.1 Explain the effect of different light intensities on the rate of photosynthesis as seen on the graph above. (3)

2.3.2 Explain the difference in the rate of photosynthesis between the following:

(a) X and Y (3)

(b) X and Z (3)

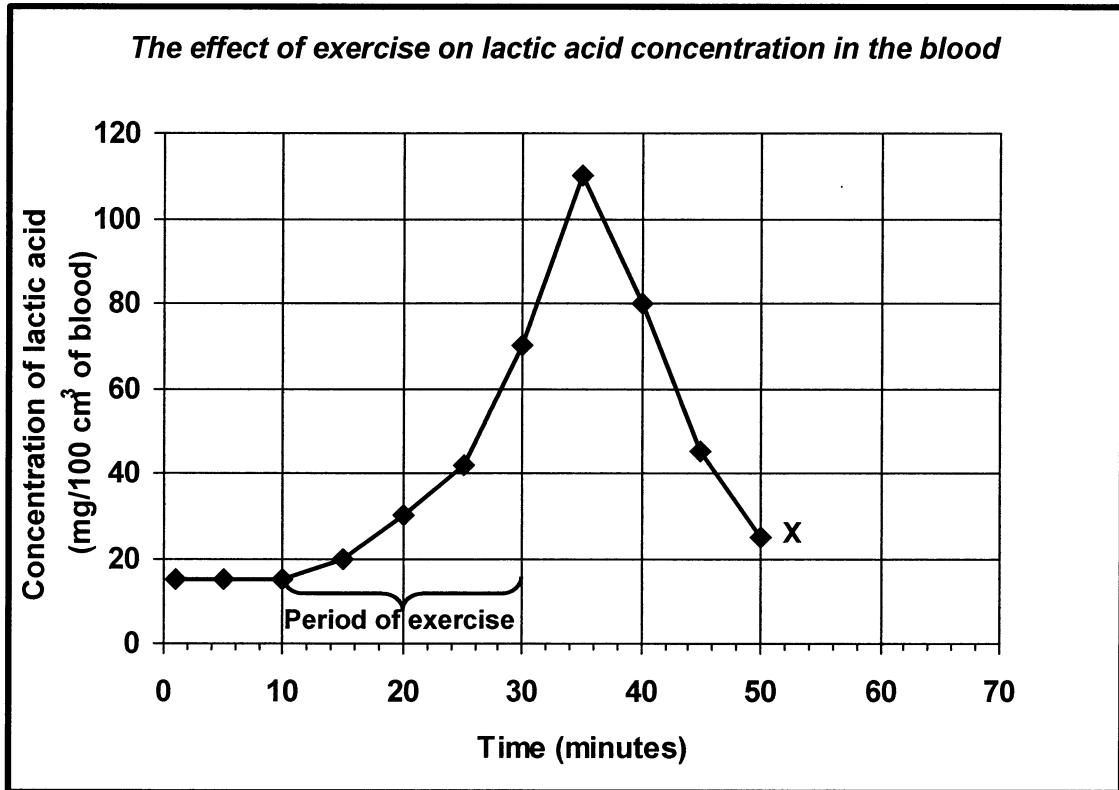
(9)

**TOTAL QUESTION 2: 35**



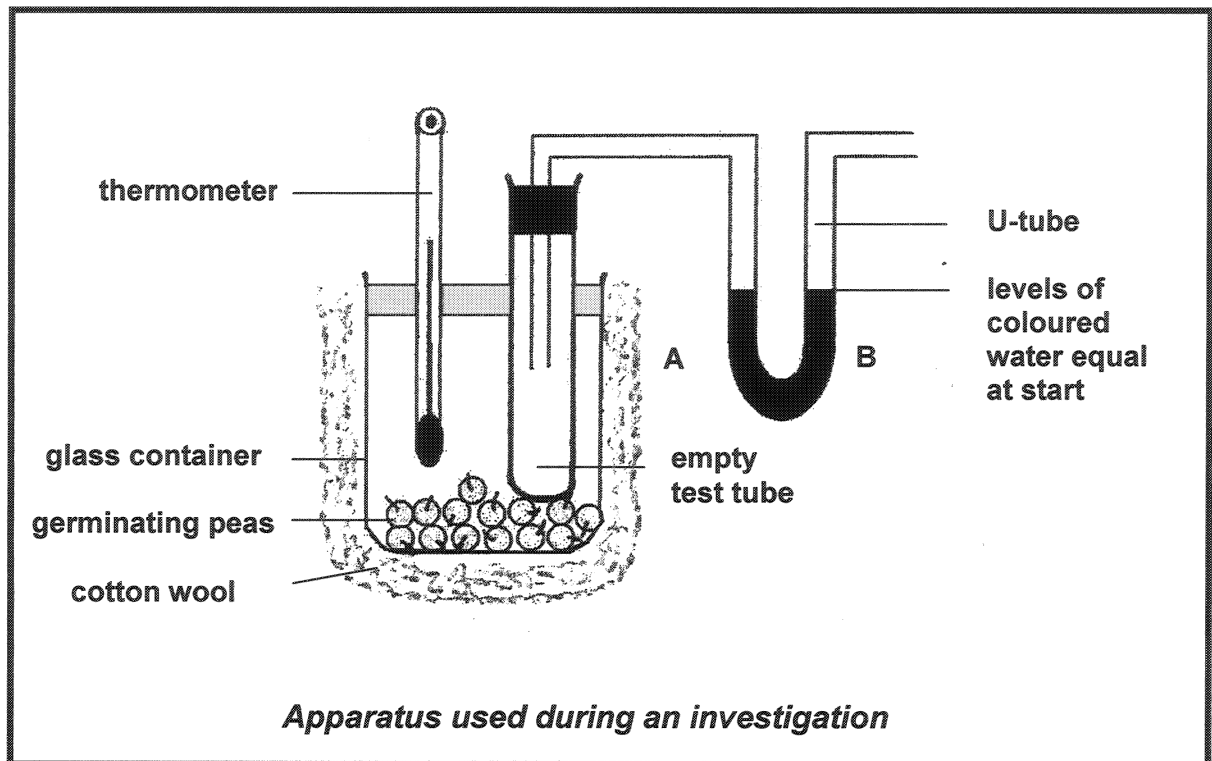
**QUESTION 3**

3.1 The following graph shows the effect of exercise by humans on the lactic acid concentration in the blood. Study the graph and answer the questions that follow:



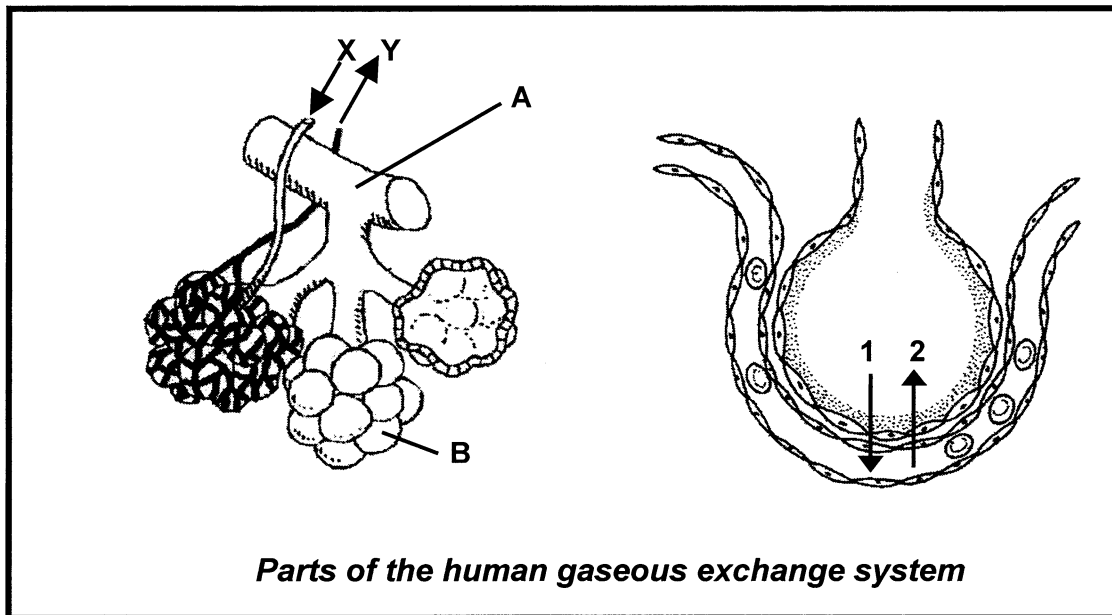
- 3.1.1 What was the concentration of lactic acid in the blood before exercise? (2)
- 3.1.2 How long did it take for the concentration of lactic acid to drop from the highest point to point X on the graph? (2)
- 3.1.3 If the rate of decline continued from X, predict the time at which the lactic acid level in the blood would have gone back to the initial level. (2)
- 3.1.4 Explain the continued rise in the concentration of lactic acid just after the exercise had stopped. (2)  
(8)

- 3.2 The diagram below shows an apparatus which was used during an investigation. Study the diagram and answer the questions that follow.



- 3.2.1 Suggest the following:
- An aim for this investigation (2)
  - The purpose of the coloured water (2)
- 3.2.2 On which side of the U-tube (A or B) will the coloured water move higher? (1)
- 3.2.3 Explain your answer to QUESTION 3.2.2. (2)
- 3.2.4 During this investigation, cotton wool was placed around the container.
- State the function of the cotton wool. (1)
  - Briefly explain what will happen to the levels of coloured water in the U-tube if the cotton wool had not been placed around the container. (2)
- (10)**

3.3 Study the diagrams and answer the questions that follow:



3.3.1 Identify:

- (a) Parts A and B (2)
- (b) The process represented by 1 and 2 (1)

3.3.2 With regard to carbon dioxide and oxygen concentrations, which one will be the highest at:

- (a) X? (1)
- (b) Y? (1)

3.3.3 List TWO features visible on the diagram which make the above structure an efficient respiratory surface. (2)

3.3.4 Describe how diffusion of carbon dioxide takes place at the tissue surface. (3)

(10)



- 3.4 Study the table below which refers to the effect of exercise on the composition of exhaled air and answer the questions that follow:

Gas	Proportion of gases in different air samples (%)		
	Inhaled air	Exhaled air	
		At rest	During exercise
Oxygen	21	17	12
Carbon dioxide	0,04	4	9
Nitrogen	78	78	78

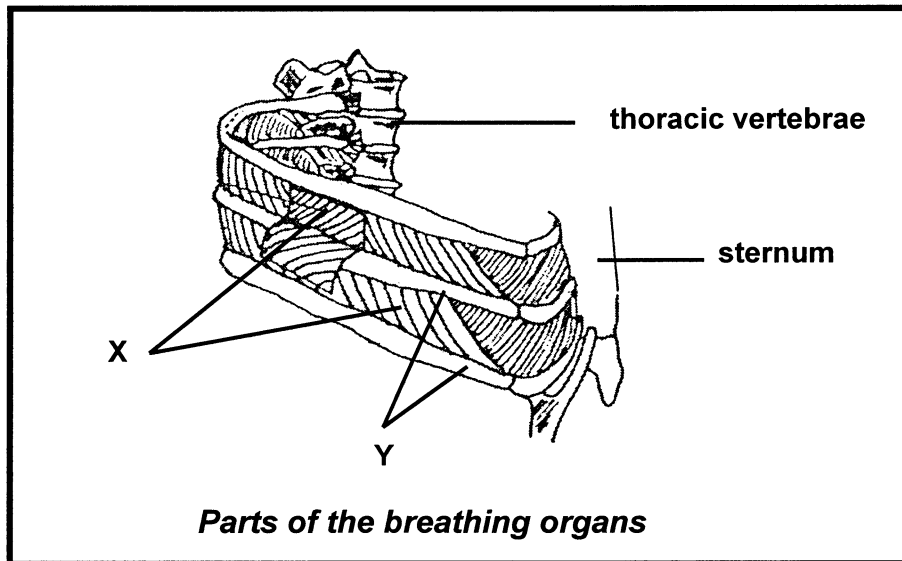
- 3.4.1 Explain why air exhaled during exercise contains more carbon dioxide than air exhaled at rest. (2)
- 3.4.2 Name ONE common gas, not shown in the table, which would most likely be more concentrated in exhaled air than in inhaled air. (1)
- 3.4.3 Calculate the increase in the percentage of oxygen absorbed by the lungs during exercise. (2)
- 3.4.4 Explain why there is no difference in the volume of nitrogen in inhaled air and exhaled air. (2)

(7)

**TOTAL QUESTION 3: 35**

**QUESTION 4**

4.1 Study the diagram below and answer the questions that follow:



- 4.1.1 Identify X and Y. (2)
- 4.1.2 Describe the role of X during inhalation/inspiration. (3)
- 4.1.3 Briefly explain how the rate of inhalation/inspiration is increased during exercise. (3)
- (8)**

4.2 A group of students studied a population of a species of arthropods over a period of 5 days. Their results are indicated in the table below.

Time (days)	Number of arthropods
1	20
2	100
3	400
4	800
5	100

- 4.2.1 Define the term *population*. (3)
- 4.2.2 Use the data from the table and plot a line graph to show how the number of arthropods varied during the 5 days. (11)
- 4.2.3 What type of population growth is represented by your graph up to day 4? (1)

- 4.2.4 What is the carrying capacity of this population? (2)
- 4.2.5 How many times did the population size double from day 2 to day 3? (1)
- 4.2.6 Give TWO possible reasons for the sudden decrease in the size of the population. (4)
- 4.2.7 Suggest a method the students could have used to measure the size of the population. (1)
- 4.3 Explain how territoriality regulates the population density of animals such as lions in their natural environment. (4)

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

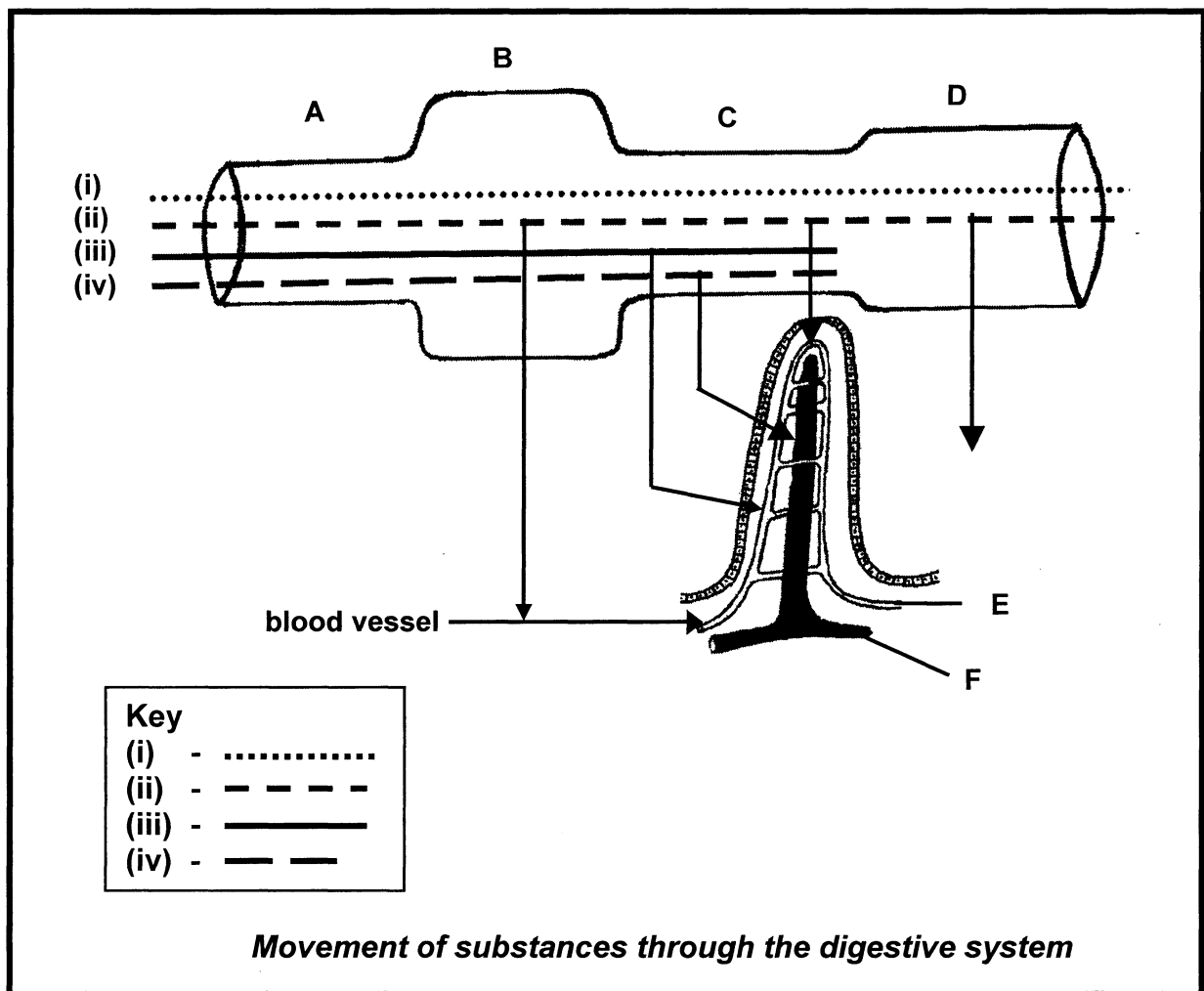
**SECTION C**

**QUESTION 5**

5.1 The following diagram represents the movement of substances through the human digestive system.

Letters A to D represent regions of the alimentary canal, E and F represent transport systems, while numbers (i) to (iv) represent substances eaten, of which some can be digested and others not. The arrows show absorption of substances.

Study the diagram and answer the questions that follow:



- 5.1.1 Identify the parts of the digestive system represented by A and D. (2)
- 5.1.2 Name TWO organs normally associated with part C. (2)
- 5.1.3 Which organic substance is represented by (i)? Explain your answer. (3)

- 5.1.4 State TWO ways in which the substance referred to in QUESTION 5.1.3 is important for nutrition. (2)
- 5.1.5 What inorganic substance could (ii) represent? Give a reason for your answer. (3)
- 5.1.6 Explain TWO ways in which the inorganic substance referred to in QUESTION 5.1.5 assists in the absorption of nutrients. (2)
- 5.1.7 What is the name of the main blood vessel that collects nutrients at E and transports these to the liver? (1)
- 5.1.8 Name TWO substances that (iii) could represent. (2)
- (17)**
- 5.2 Describe how fats are absorbed in the human body and then explain the fate/role of the absorbed nutrients.

**NOTE:**

No marks will be allocated for answers given in the form of diagrams and flow charts.

Factual Content: (15)

Synthesis: (3)

**(18)****TOTAL QUESTION 5: 35****TOTAL SECTION C: 35****GRAND TOTAL: 200**