



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATION - 2005

BIOLOGY P1

HIGHER GRADE

OCTOBER/NOVEMBER 2005

MARKS: 200

2 HOURS

This question paper consists of 20 pages



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 What is the main function of the large intestine in the human body?

- A Digestion of cellulose
- B Absorption of water
- C Storage of nutrients
- D Absorption of digested food

1.1.2 Arrange the following digestive juices in the order of their pH values from smallest to largest.

- (i) bile
- (ii) gastric juice
- (iii) saliva

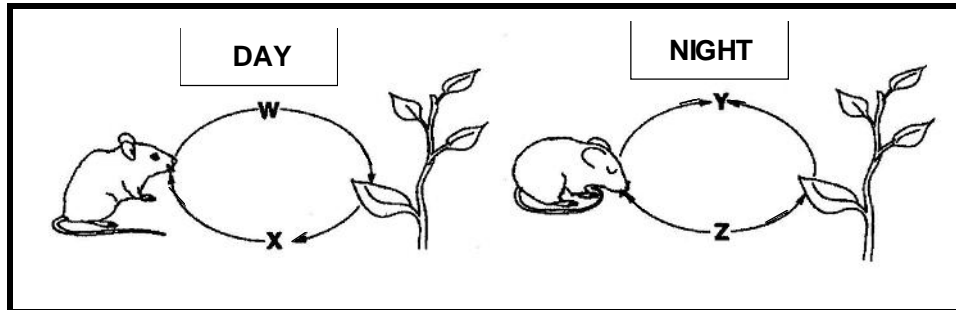
- A (i), (ii), (iii)
- B (ii), (iii), (i)
- C (ii), (i), (iii)
- D (iii), (ii), (i)

1.1.3 Which of the following shows the correct path of air movement during exhalation?

- A Alveoli → bronchioli → trachea → bronchus
- B Alveoli → bronchioli → bronchus → trachea
- C Bronchus → bronchioli → trachea → alveoli
- D Trachea → bronchioli → bronchus → alveoli

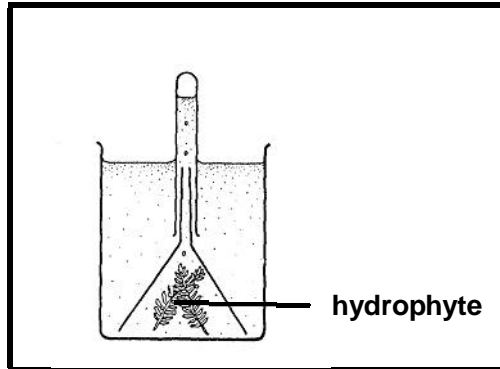


- 1.1.4 The diagram below shows the movement of two gases during the day and during the night.



Which letters represent carbon dioxide?

- A W and Y
 B W and Z
 C X and Y
 D X and Z
- 1.1.5 In the experiment below, sodium bicarbonate is added to the water in the beaker.



Which one of the following is the reason for adding sodium bicarbonate to the water?

- A It helps to maintain a constant pH level
 B It absorbs all carbon dioxide
 C It produces a large amount of oxygen for photosynthesis
 D It provides carbon dioxide necessary for photosynthesis



- 1.1.6 Which of the following will cause a decrease in the size of a population?
- (i) emigration
 - (ii) immigration
 - (iii) natality
 - (iv) predation
- A (i) and (iii)
B (ii) and (iv)
C (i) and (iv)
D (iii) and (iv)
- 1.1.7 Secondary production is the term that is used to describe the ...
- A total amount of air that penetrates the atmosphere.
B energy that is lost when radiant energy is converted into chemical potential energy.
C rate at which autotrophs in food chains store energy in tissues.
D rate at which consumers in food chains accumulate biomass or energy. (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 The blood vessel that transports nutrient-rich blood from the small intestine to the liver
- 1.2.2 A condition in children whose diet lacks protein but has sufficient energy
- 1.2.3 The substance that traps radiant energy for photosynthesis
- 1.2.4 The form in which glucose is stored in the liver
- 1.2.5 A common term for limiting factors that prevent a population from increasing
- 1.2.6 A behavioural mechanism whereby organisms occupy and defend a particular area and its essential resources **(6)**



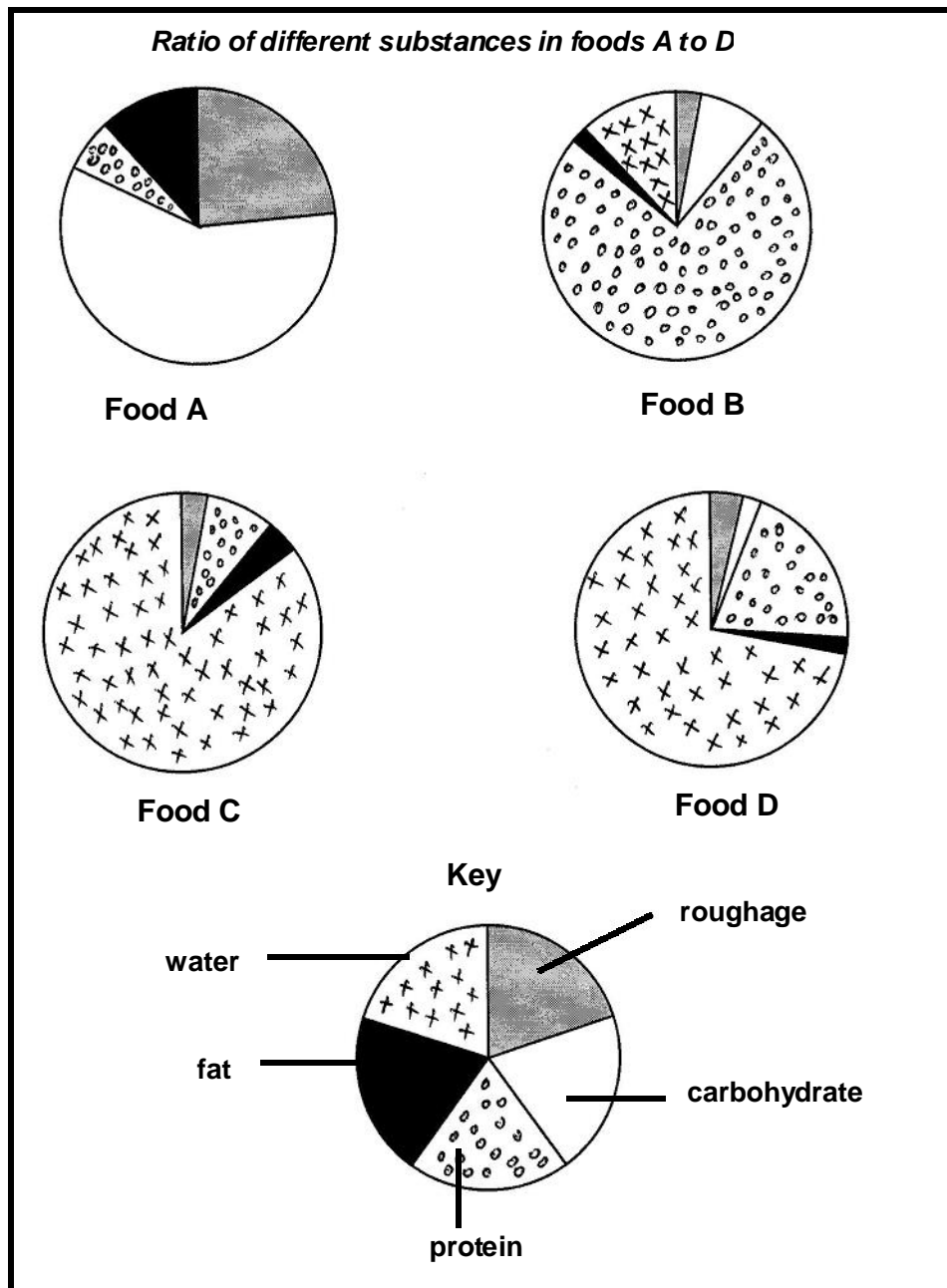
- 1.3 State whether each of the statements in COLUMN I, applies to **A only**, **B only**, **both A and B** or **none** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the relevant question number.

	COLUMN I	COLUMN II
1.3.1	Process by which fats are broken down into fat droplets by bile	A Emulsification B Hydrolysis
1.3.2	Carbohydrates formed by photosynthesis	A Amino acids B Glycerol
1.3.3	Lined with ciliated epithelium	A Nasal cavity B Trachea
1.3.4	The primary source of energy in an ecosystem	A Sun B Green plants
1.3.5	The one-way permanent movement of individuals out of a habitat	A Migration B Immigration

(5 x 2)

(10)

1.4 Study the pie charts below and answer the questions that follow.



- 1.4.1 Which food is best suited to prevent constipation? Give a reason for the answer. (3)
- 1.4.2 Name the main component of food C. (1)
- 1.4.3 List THREE functions of the component mentioned in QUESTION 1.4.2, with respect to nutrition. (3)

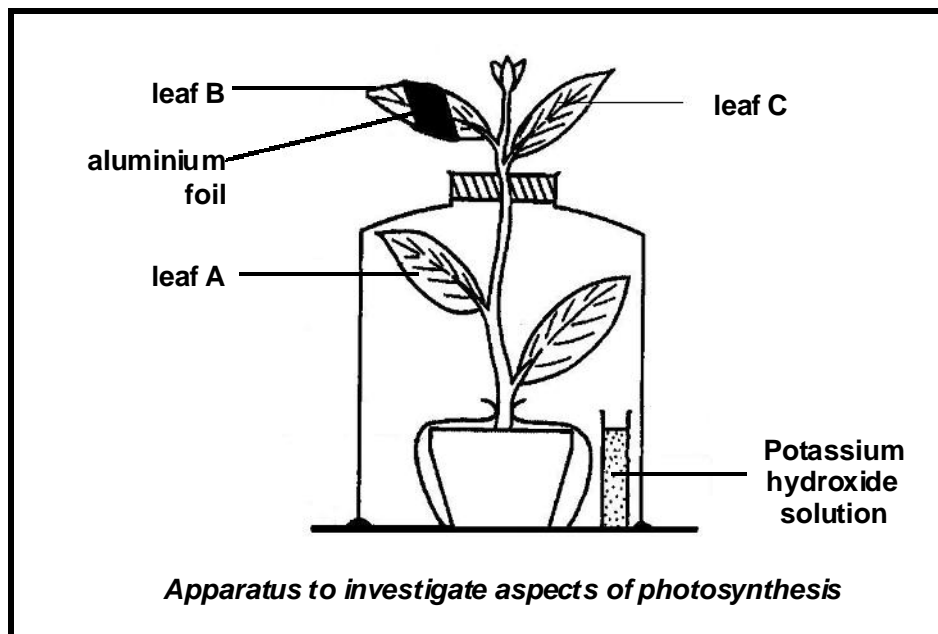


- 1.4.4 Which food will be most suitable for somebody who lives in a very cold place such as the Antarctic? Provide an explanation for the answer.

(3)
(10)

- 1.5 The following diagram illustrates some investigations carried out on photosynthesis. The plant was kept in the dark for 48 hours before being placed in sunlight.

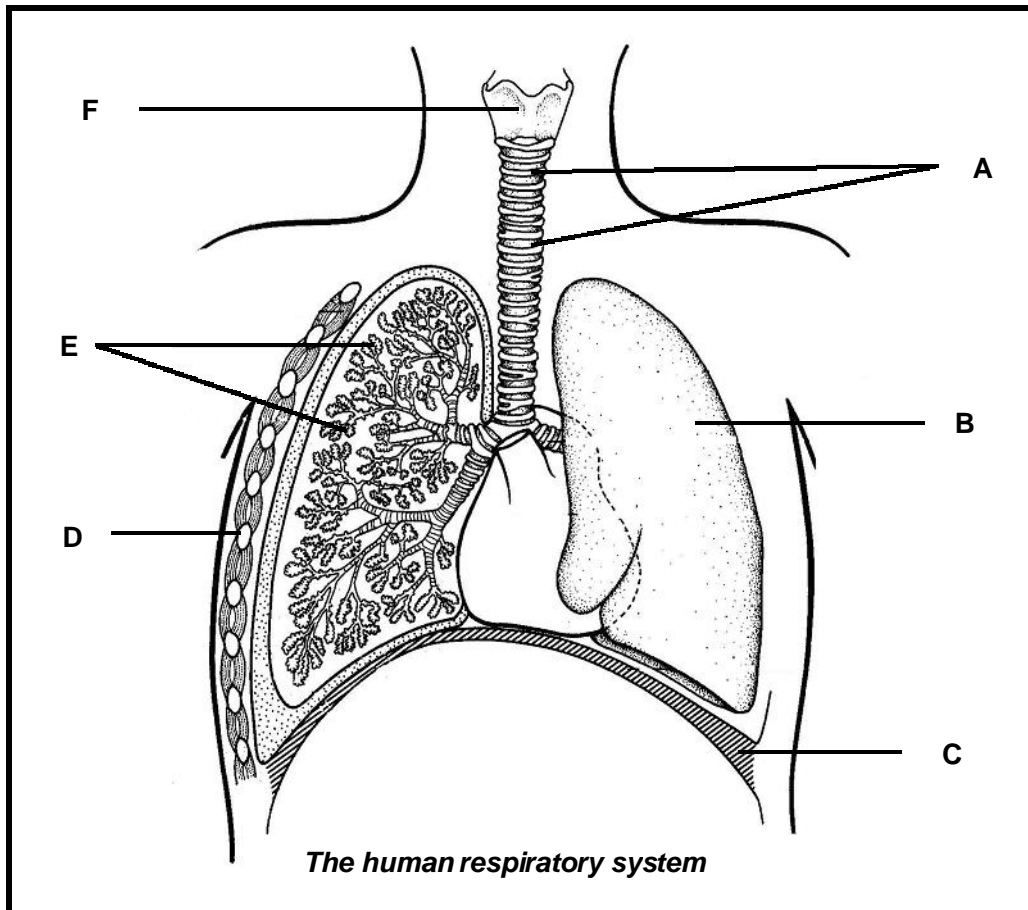
Study the diagram and then answer the questions that follow.



- 1.5.1 What is the aim of the investigation on:
- (i) Leaf A? (1)
- (ii) Leaf B? (1)
- 1.5.2 Why was the plant kept in the dark for 48 hours before being placed in sunlight? (1)
- 1.5.3 Starch tests were carried out on the three leaves. Name the chemical reagent that was used to test for the presence of starch. (1)
- 1.5.4 Tabulate the results of the tests on leaf A, leaf B and leaf C. (4)
- 1.5.5 Give a reason for the result of the starch test on leaf A. (2)
- (10)



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



- 1.6.1 Name the parts labelled C and F. (2)
- 1.6.2 Give the **letter** of the parts that are responsible for the following:
- (i) Protecting the lungs (1)
 - (ii) Increasing the surface area for gaseous exchange (1)
 - (iii) Preventing the trachea from collapsing (1)
- 1.6.3 List THREE requirements for an efficient gaseous exchange surface. (3)
- 1.6.4 Explain ONE way in which the nose is better suited for breathing than the mouth. (2)

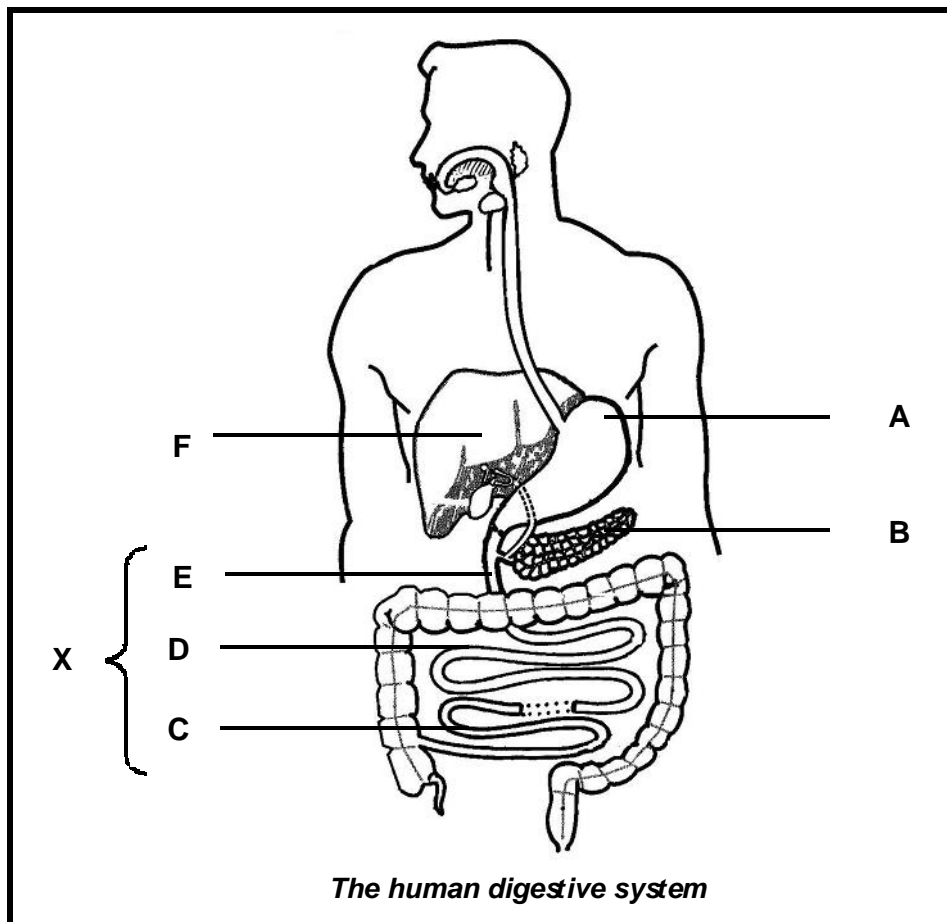
(10)

TOTAL QUESTION 1: 60
TOTAL SECTION A: [60]



SECTION B**QUESTION 2**

2.1 Study the diagram below and then answer the questions that follow.

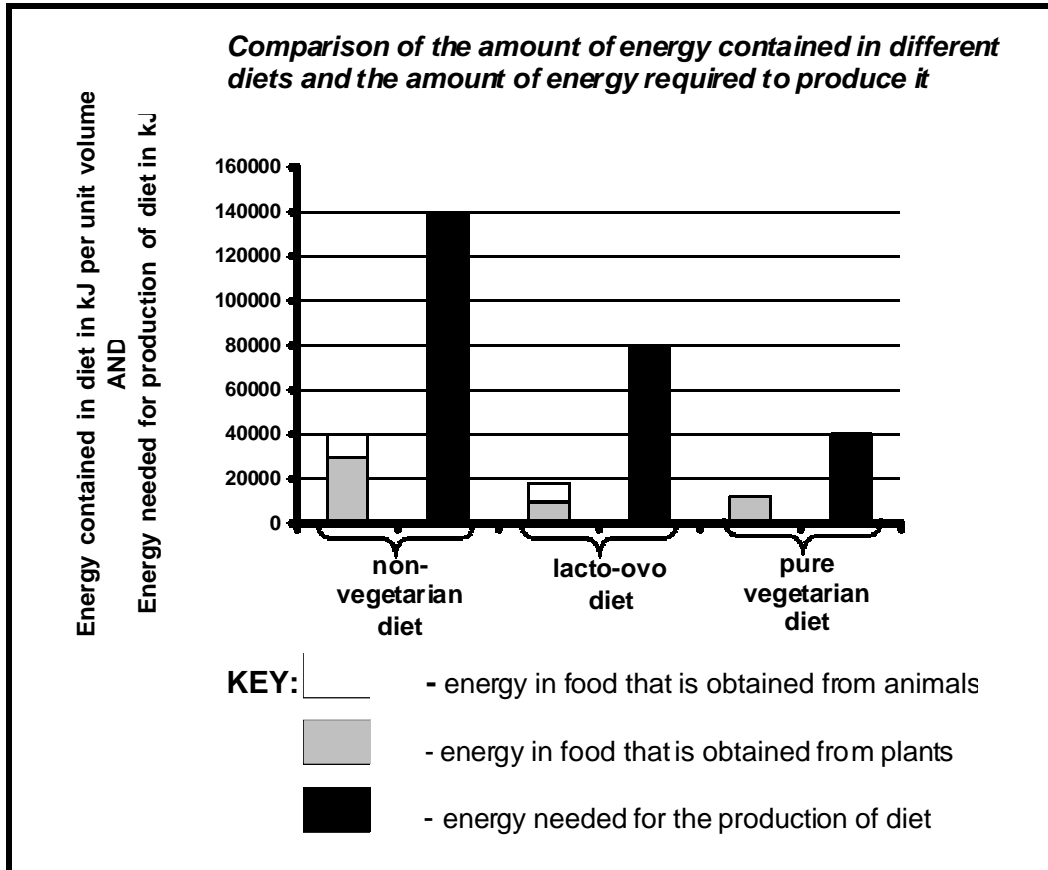


- 2.1.1 Identify parts B and F. (2)
- 2.1.2 Name ONE major food type that is digested in organ A. (1)
- 2.1.3 Pepsin is an enzyme that is secreted in an inactive form in organ A. Explain why it is necessary for this enzyme to be secreted in an inactive form. (2)
- 2.1.4 Hydrochloric acid (HCl) provides the appropriate pH for pepsin to function optimally. List TWO other functions of HCl. (2)
- 2.1.5 List THREE features of part X which increase its surface area. (3)
- 2.1.6 State TWO advantages of part X having an increased surface area. (2)



- 2.1.7 The partly digested food that enters part D from organ A is acidic. The enzymes in part D function in an alkaline medium. Name TWO substances, which help to create an alkaline medium here. (2)
- 2.1.8 What is meant by active absorption? (2)
- 2.1.9 Explain why it is important that active absorption is employed in the small intestine for the products of carbohydrate and protein digestion. (4)
- 2.2 In general, people's eating patterns can be divided into three basic kinds of diet based on the type of protein eaten. (20)
- (a) **Non-vegetarian diet** : where people eat / drink all types of food
- (b) **Lacto-ovo diet** : where people do not eat meat but do eat / drink eggs, milk, and milk products
- (c) **Pure vegetarian diet** : where people do not eat/ drink any animal-based food

The bar graphs below show the amount of energy contained in each of these three types of diets per unit volume as well as the amount of energy needed to produce each type of diet.



- 2.2.1 Which of the above three diets requires the greatest volume of food to be eaten? Give a reason for the answer. (3)
- 2.2.2 Suggest a reason why this diet named in QUESTION 2.2.1 might cause problems for very young children. (2)
- 2.2.3 What is the main source of proteins for pure vegetarians? (1)
- 2.2.4 Calculate the food energy intake that is provided by animals in the non-vegetarian diet, as a percentage. (3)
- 2.2.5 State a generalization that can be made with respect to the amount of energy needed for the production of food and the type of diet. (4)
- 2.2.6 State ONE function of:
- (i) Vitamin A (1)
- (ii) Vitamin D (1)
- (15)**

TOTAL QUESTION 2: 35

QUESTION 3

- 3.1 Most breakfast cereal packages contain a small label with nutritional information per 100 g. An example of this is shown in the table below.

Component	Quantity
Energy	1 045,0 kJ
Protein	3,1 g
Carbohydrate	40,1 g
Fat	2,2 g
Fibre	25,6 g
Iron	9,0 mg
Vitamin B complex	18,3 g
Vitamin D	2,8 ug

- 3.1.1 Give TWO reasons why this breakfast is a good choice for people wanting to lose weight. (2)
- 3.1.2 All the items listed in the table account for about 98 g of the 100 g sample. Name ONE other important item of the diet that is likely to form most of the remaining 2 g. (1)



- 3.1.3 List TWO functions of each of the following in humans:
- (i) Proteins (2)
 - (ii) Carbohydrates (2)
- 3.1.4 Iron is an essential nutrient in any diet for the formation of red blood corpuscles.
- (i) Which substance in a red blood corpuscle contains iron? (1)
 - (ii) Name ONE disorder that is due to the lack of iron in a person's diet. (1)
- 3.2 Several sets of test tubes, A to F, each containing 10 ml starch solution, 5 ml saliva and 5 ml of iodine solution were prepared for an investigation. The tubes were placed in water baths at different temperatures. The time taken for the starch solution to take up the colour of the iodine solution in each set of test tubes was recorded.

The results are indicated in the table below.

	Sets of test tubes					
	A	B	C	D	E	F
Temperature of water bath (°C)	10	20	30	40	50	60
Average time taken for starch solution to take up the colour of the iodine solution (minutes)	20	10	5	3	8	X

- 3.2.1 Suggest an aim for this investigation. (2)
- 3.2.2 Name the enzyme that is responsible for the results in test tubes A to E. (1)
- 3.2.3 At which temperature is the enzyme named in QUESTION 3.2.2 at its optimum level of activity? (2)
- 3.2.4 Provide an explanation for the 'X' in the result for the test tubes in set F. (2)
- 3.2.5 When the contents of the test tubes of set F were cooled down, it was found that this made no difference to the results. Give an explanation for this observation. (2)
- 3.2.6 Describe ONE precaution that needed to be taken to ensure that the results of this investigation are valid and reliable. (2)



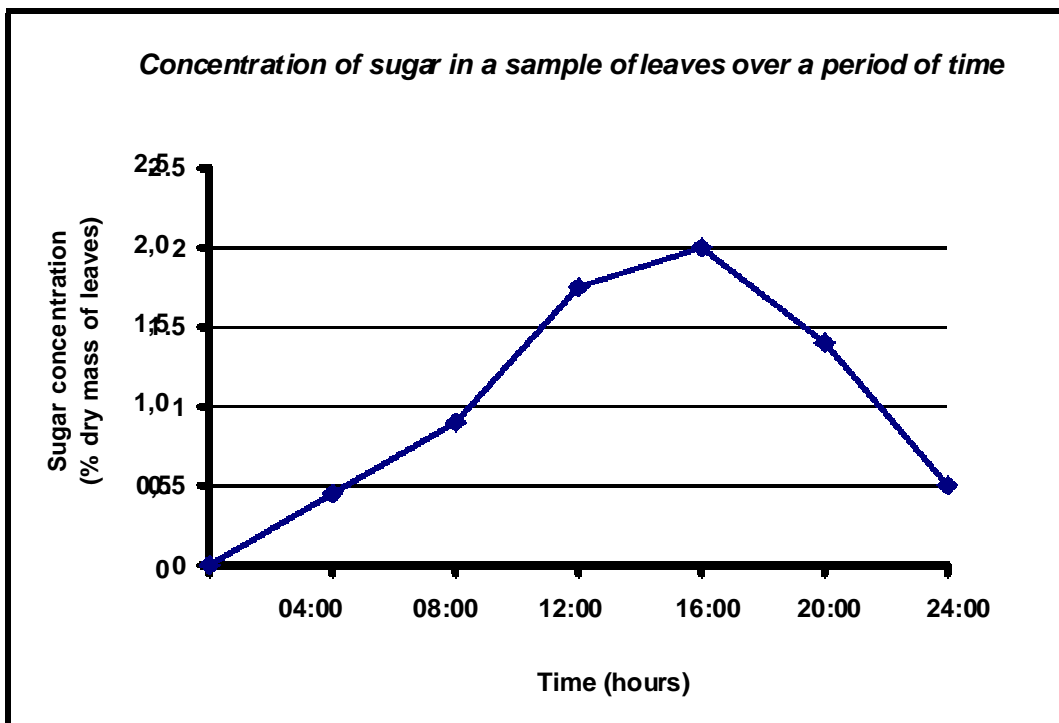
3.2.7 When a set of test tubes, previously kept at 0°C, was warmed to 25°C the starch solution took up the colour of the iodine solution in 8 minutes.

Use the results of this investigation to explain why food kept in a refrigerator (at about 2°C) does not last as long as food heated to a very high temperature, sealed in a container and then refrigerated at about 2°C.

(4)
(15)

3.3 A learner measured the amount of sugar in a sample of leaves taken from a maize field. These measurements were taken every four hours for a whole day. The sugar concentration was expressed as a percentage of the dry mass of the leaves.

The results are illustrated in the graph below.



3.3.1 What is the concentration of sugar in the leaves at 18:00? (2)

3.3.2 Give an explanation for the changes in the sugar concentration over the 24 hour period. (3)

3.3.3 Draw and label a diagram of an organelle in the leaves of plants where the production of this sugar takes place. (6)
(11)

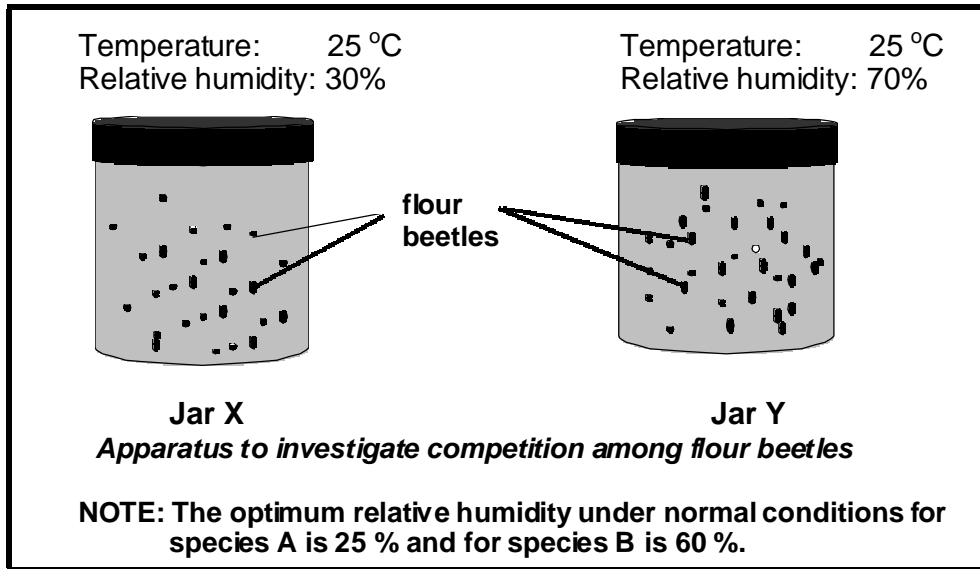
TOTAL QUESTION 3: 35



QUESTION 4

4.1 An experiment was carried out with two different species (A and B) of flour-beetles.

Two jars were each filled with 500 g of flour. 25 males and 25 females of species A and 25 males and 25 females of species B were placed in each jar.



The beetles were counted every week over a period of three months.

The results are shown in the table below.

Jars	Species A	Species B
X	Number of beetles increased	Number of beetles decreased until all died
Y	Number of beetles decreased until all died	Number of beetles increased

- 4.1.1 What type of competition occurs in the jars? Give a reason for your answer. (2)
- 4.1.2 Name the factor that has been investigated and also state whether this factor is density-dependent or density independent. (2)
- 4.1.3 Which species, A or B, is more tolerant to high humidity? (1)



- 4.1.4 Regardless of which species was successful in the jars, its numbers usually increased, then started levelling off and eventually it decreased.
- (i) What type of growth form is this? (1)
- (ii) State TWO reasons why the increase in numbers was initially slow. (2)
- (iii) Name this initial growth phase. (1)
- (iv) Why do the numbers level-off at a certain stage? (2)
- 4.1.5 What would you expect to happen to the populations if a third jar with the same quantity of flour and the same number of beetles was kept at 25°C and at 10% humidity? Give a reason for your answer. (4)

(15)

4.2 A group of students wanted to determine the population size of two species of butterflies. Their results are indicated in the table below.

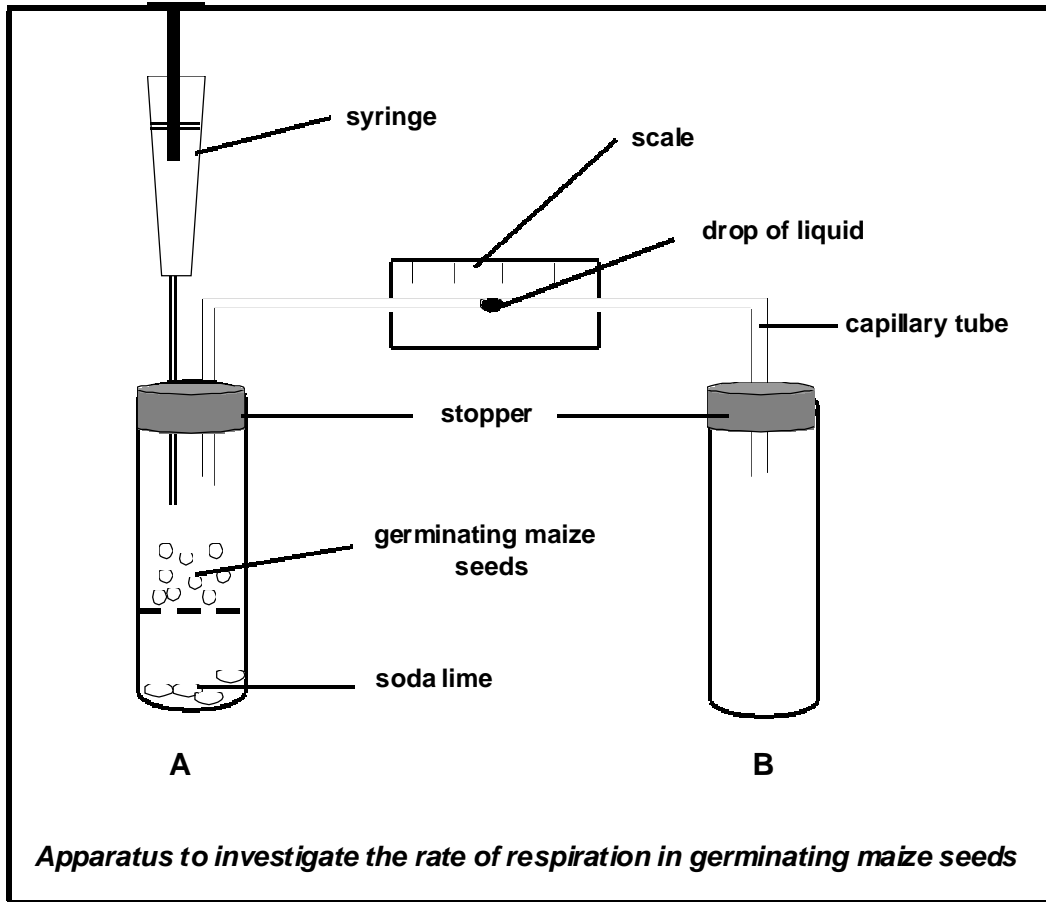
	October 2004	November 2004	
	Number marked and released in first sample	Number in recaptured / second sample	Number marked in recaptured / second sample
Species A	20	300	10
Species B	25	75	05

- 4.2.1 Define the term population. (3)
- 4.2.2 Estimate the number of butterflies of species A in the area by using the following formula:
- $$P = \frac{F \times S}{M}$$
- F = Number caught in the first sample
 S = Number caught in the second sample
 M = Number marked in the second sample
- Show all workings. (3)
- 4.2.3 Suggest TWO reasons why there were differences in the numbers between species A and species B in the recaptured / second sample? (4)

(10)



4.3 The diagram below represents a set of apparatus used in an experiment to determine the rate of respiration of germinating maize seeds. A similar apparatus was set up for the control but with dead seeds.



The rate of respiration was determined by measuring the distance travelled by a drop of liquid in a capillary tube. Movement of the drop of liquid is caused by a decrease in pressure in the container.

The results are recorded in the table below.

Time in minutes	Distance travelled by the drop of liquid (mm)	
	Experiment	Control
10	5	1
20	10	2
30	15	2
40	18	2
50	20	2

4.3.1 State the function of the soda lime.

(1)



- 4.3.2 Provide an explanation for each of the following observations:
- (i) Movement of the drop of liquid in the control during the first 10 minutes of the investigation. (2)
 - (ii) The decrease in the distance travelled by the drop of liquid in the experiment after 30 minutes. (2)
- 4.3.3 The entire investigation was repeated using sesame seeds which have a higher fat content. The rate at which the drop of liquid moved was faster than when maize seeds were used. Suggest an explanation for this. (3)
- 4.3.4 Explain why the oxygen that is absorbed is necessary for the survival of the germinating seeds. (2)

(10)

TOTAL QUESTION 4: 35
TOTAL SECTION B: 105



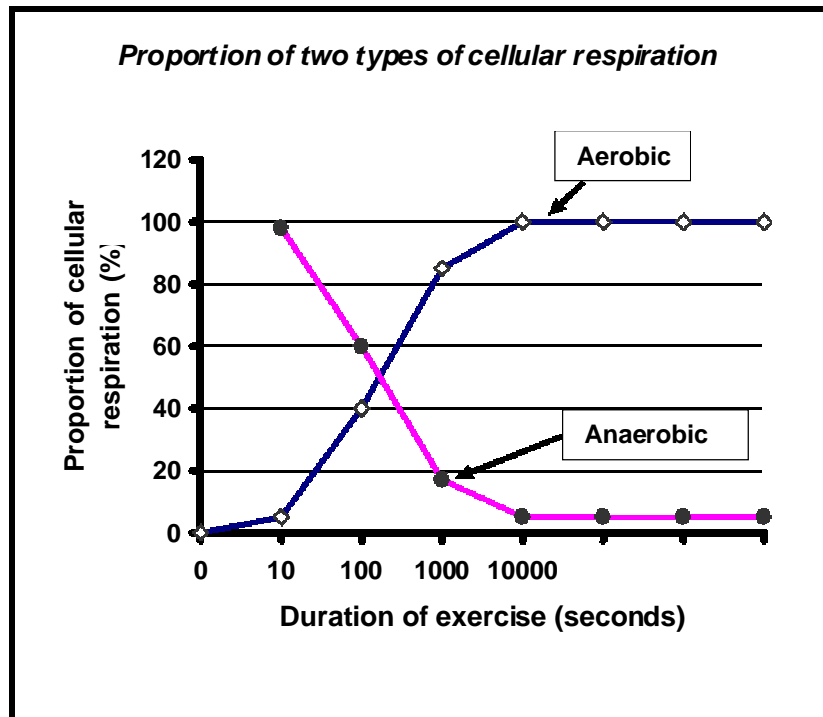
SECTION C

QUESTION 5

5.1 A schools sports coach drew a graph to show the proportion of two types of cellular respiration which were used to provide energy for athletes as they trained (exercised) for certain lengths of time.

The coach also tabulated a sample of school records set for different athletic events during the competition.

Study the graph and the table and then answer the questions that follow.



Athletic Event	Record
100 m	10 s
200 m	20 s
400 m	50 s
800 m	1 min 57 s
1500 m	4 min 25 s
3000 m	8 min 52 s

- 5.1.1 Which athletic event uses mostly anaerobic respiration? Give a reason for the answer. (3)
- 5.1.2 Which event uses more or less equal proportion of aerobic and anaerobic respiration? (2)
- 5.1.3 Name TWO end products of aerobic respiration. (2)



- 5.1.4 'Oxygen debt' can be defined as the extra oxygen that is needed to normalise the respiratory process after strenuous exercise. Which TWO athletic events in the table would give rise to a high oxygen debt? (2)
- 5.1.5 Describe the process of cellular respiration in the body cells when there is a lack of oxygen. (2)
- 5.1.6 State ONE conclusion from the graph about the relationship between the length of exercise and the type of cellular respiration. (2)
- 5.1.7 Which type of cellular respiration will be more useful for someone who wants to "burn" a lot of energy? Give a reason for your answer. (4)
- (17)**
- 5.2 The higher concentration of CO₂ created in the cells and tissue fluid as a result of more exercise, causes a drop in the blood pH so that it becomes slightly acidic. This situation is not favourable for the functioning of the organism as a whole.

Describe the mechanism by which the breathing system will bring about a homeostatic balance to correct this situation.

Factual Content: (15)
 Synthesis: (3)
(18)

TOTAL QUESTION 5: 35
TOTAL SECTION C: 35

GRAND TOTAL: 200

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