



TEST CODE 002374

MAY/JUNE 2001

FORM TP 21190

~~CARIBBEAN EXAMINATIONS COUNCIL~~

ADVANCED PROFICIENCY EXAMINATION

BIOLOGY

Unit 2 – Paper 01

$1\frac{1}{2}$ hours

In addition to the $1\frac{1}{2}$ hours, candidates are allowed a reading time of 15 minutes. Candidates may write in their answer booklets during this 15-minute period.

READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. Candidates must attempt ALL questions in this paper.
2. Answers are to be written in the spaces provided in this answer booklet.
3. EACH question is worth 10 marks.

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002374/CAPE/2001

1. (h) Figure 1 is a flow-chart made from an electron micrograph of a portion of a mitochondrial section.

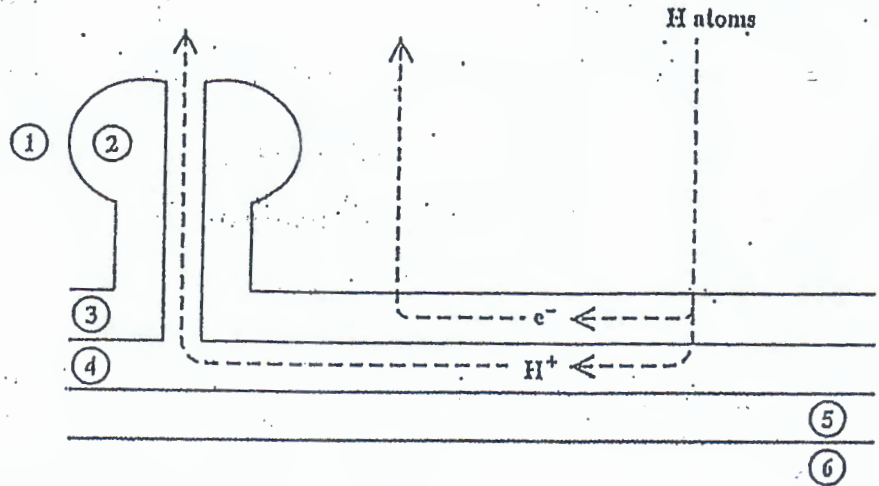


Figure 1

- (i) Identify the parts 1 – 6

1 _____	4 _____
2 _____	5 _____
3 _____	6 _____

[3 marks]

- (ii) If the structure labelled 5 is 7 nm wide in the actual mitochondrion what is the magnification of the drawing?

[1 mark]

- (b) The fermentation of a dilute solution of glucose by yeast extract is affected by the addition of other substances, as shown in Figure 2 and Table 1 on page 3.

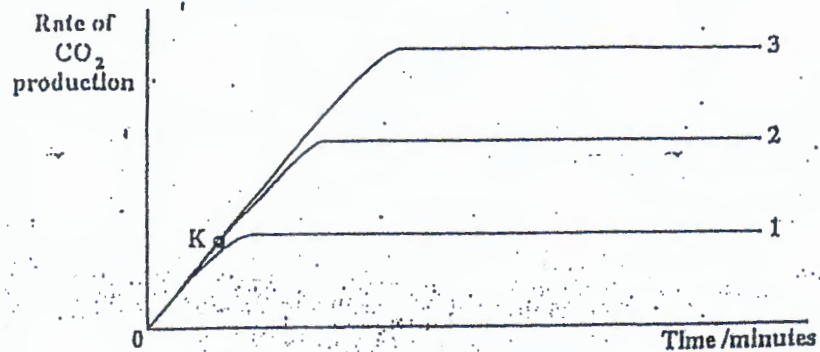


Figure 2

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Table 1
SUBSTANCES ADDED TO THE YEAST EXTRACT

Graph no.	1	2	3
Glucose solution	✓	✓	✓
Inorganic phosphate at K		✓	✓
Enzyme which converts inorganic phosphate to organic phosphate at K			✓

Explain what EACH of the following shows:

(i) Graph 1

[2 marks]

(ii) Graph 2

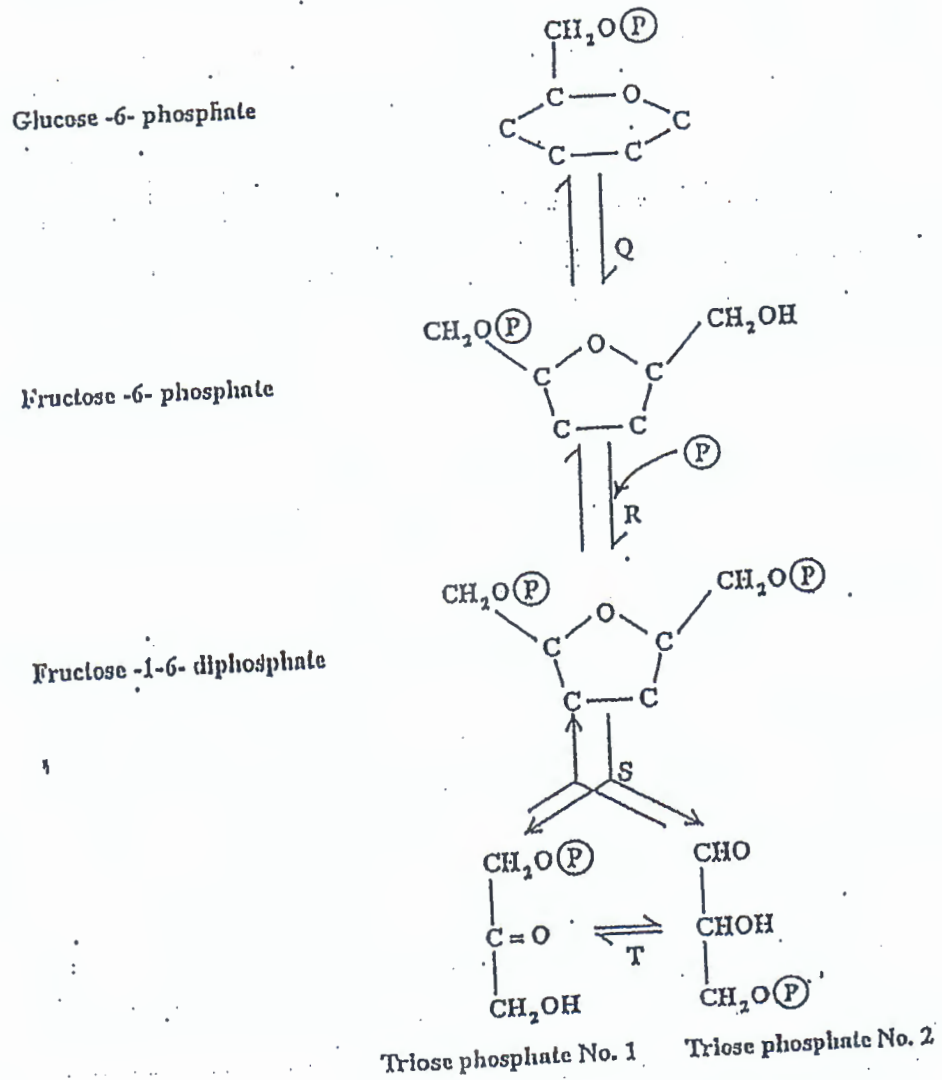
[2 marks]

(iii) Graph 3

[2 marks]

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2. The preliminary stages of glycolysis include the following steps:



Note (P) = phosphate

Figure 3

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The preliminary stages of glycolysis include the following steps:
With reference to Figure 3:

(n) State the type (class) of enzyme found at

(i) Q and T _____

(ii) R _____

(iii) S. _____

[3 marks]

(b) What is the purpose of the reaction at

(i) Q?

[1 mark]

(ii) R?

[1 mark]

(iii) S?

[1 mark]

(c) Two triose phosphates are shown in Figure 3 on page 4. Which is an aldose and which is a ketose?

(i) Triose phosphate No. 1 _____

(ii) Triose phosphate No. 2 _____

[2 marks]

(d) During photosynthesis, only triose phosphate No. 2 is formed in large quantities. How can the pool of triosephosphate No. 2 be used to produce glucose - 6 - phosphate?

[2 marks]

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3.

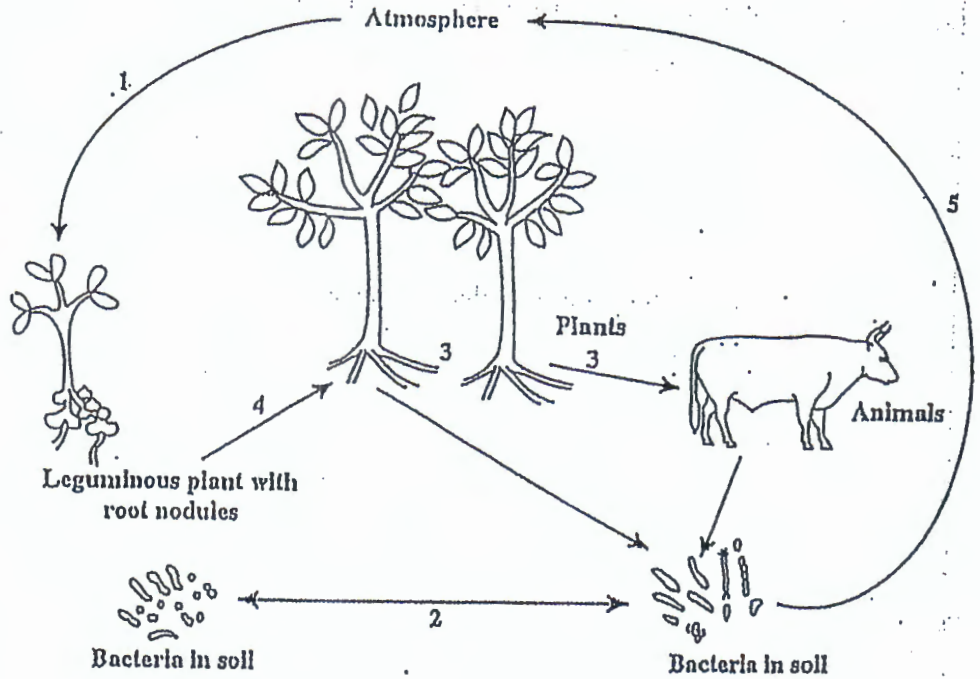


Figure 4

(a) Why is nitrogen essential for all living organisms?

[1 ma

(b) Name the FIVE steps in the nitrogen cycle in Figure 4 above.

1 _____

2 _____

3 _____

4 _____

5 _____

[2 ma

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- (c) In farming, fertilisers containing nitrate are applied to the soil to aid in plant growth. Describe the step of the nitrogen cycle that farmers are imitating.

[2 marks]

- (d) Distinguish between a food web and a food chain.

[2 marks]

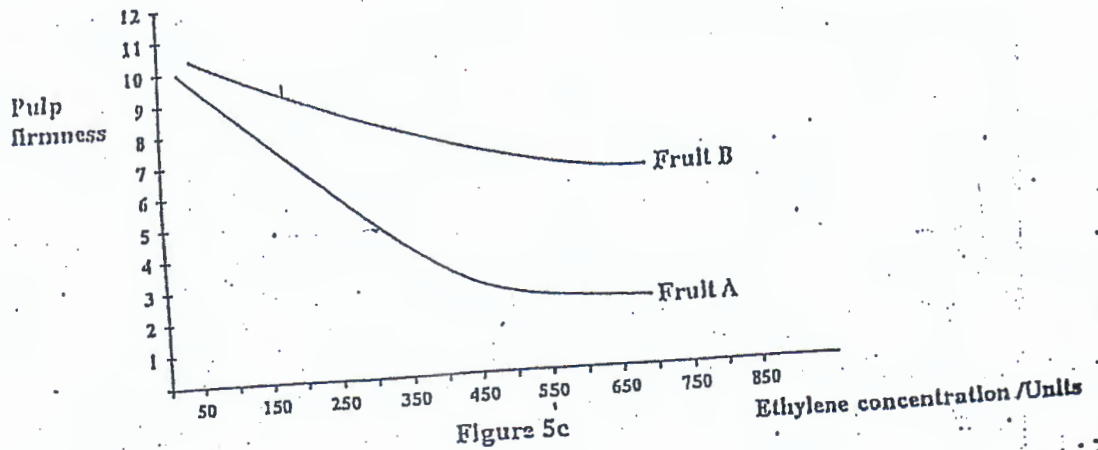
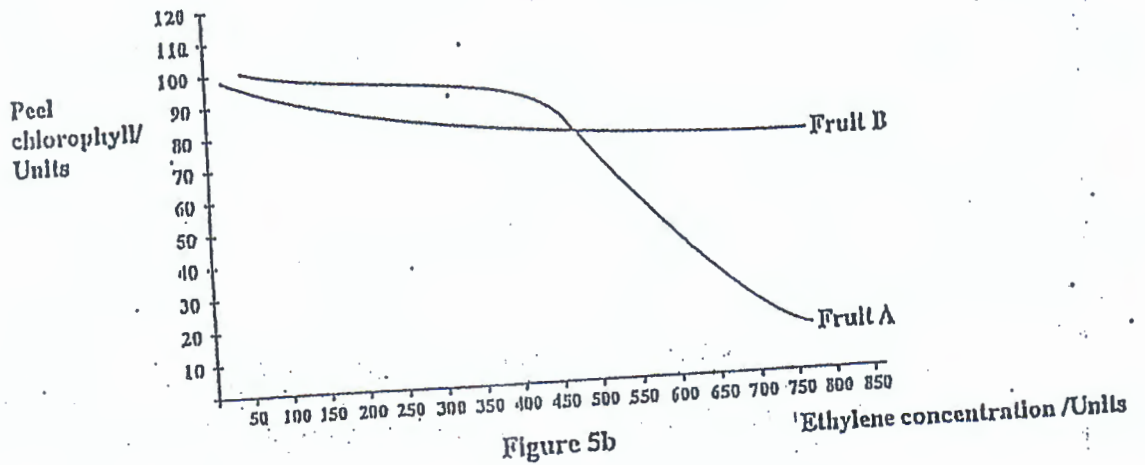
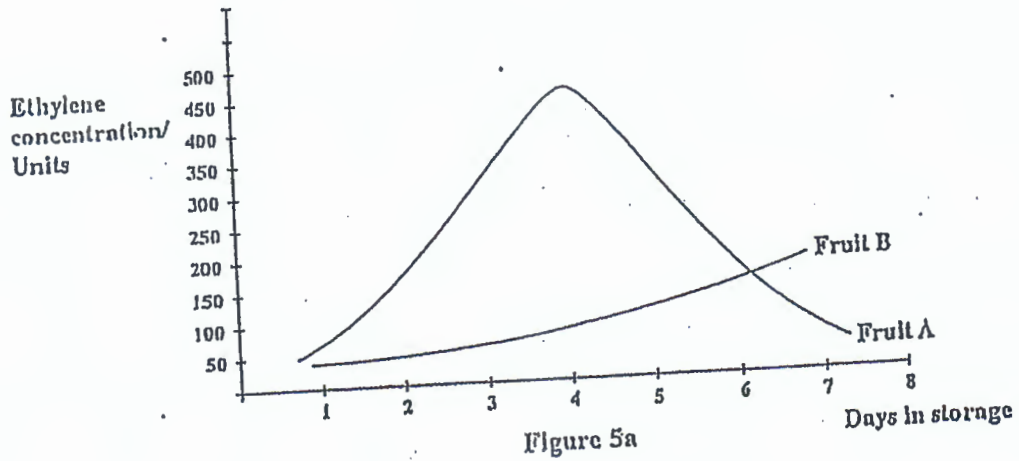
- (e) Suggest reasons why the number of links in a food chain is usually less than six.

[2 marks]

- (f) Decomposers are the last links in the food chain. They extract energy from the organic molecules in the carcasses and body wastes of other members of the food chain. Name the step of the nitrogen cycle that this represents.

[1 mark]

4. Immature fruit may be harvested and exposed to certain post-harvest conditions (e.g. temperature, gas content in the atmosphere). Initiation of ripening occurs when a threshold level of ethylene is reached in the fruit cells.



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(a) Briefly describe the chemical changes that occur during the ripening of bananas.

[3 marks]

(b) From Figure 5a; determine the amount of ethylene being produced by Fruit A and Fruit B after storage for 4 days.

[1 mark]

(c) State, giving a reason, which fruit is climacteric.

[1 mark]

(d) From Figure 5b, in which fruit would peel chlorophyll suggest ripeness of fruit? Give a reason for your answer.

[1 mark]

(e) From Figure 5c, compare the pulp firmness of Fruit A and B after 4 days in storage.

[2 marks]

(f) A ripe mango is stored with an unripe mango in a sealed plastic bag. Explain what would occur and why.

[2 marks]

5. The oxygen dissociation curve for human haemoglobin (H) at 37 °C is shown in Figure 6 below. Also shown is the graph line of percentage oxygen saturation of haemoglobin at a constant partial pressure of 6 kPa CO₂(C).

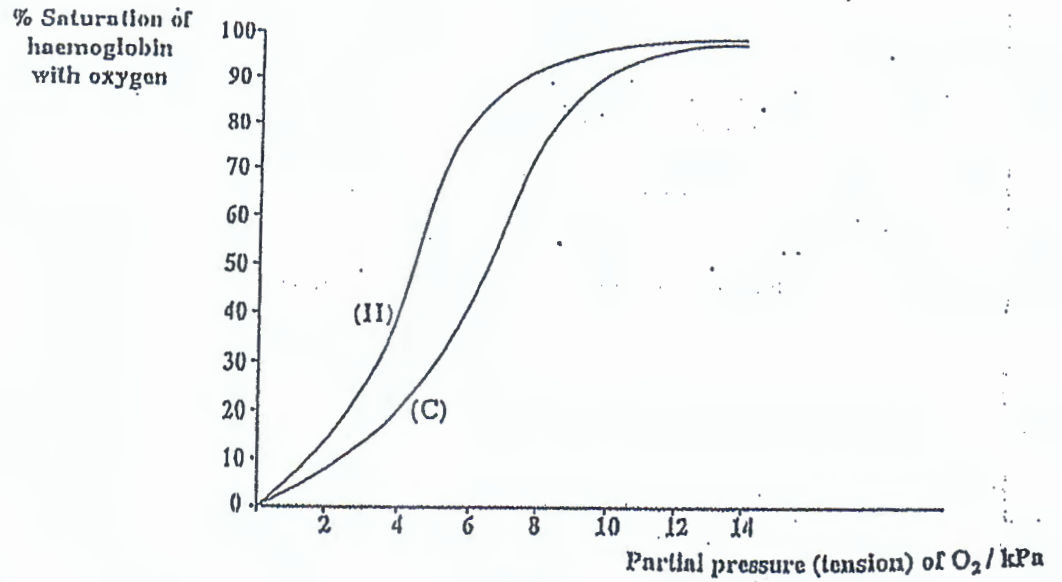


Figure 6

- (a) At what oxygen tension is haemoglobin 50% saturated

(i) under normal conditions?

(ii) at a partial pressure of 6 kPa CO₂?

[2 marks]

- (b) Use the figures from Figure 6 to clarify the effect of CO₂ on the oxygen dissociation curve at 4 kPa O₂.

[2 marks]

(c) State TWO ways in which increased exercise influences the % saturation of haemoglobin in the tissues.

[2 marks]

(d) With reference to the structure of the haemoglobin molecule, explain the reason for the S-shape of Graph H.

[2 marks]

(e) State TWO features of a red blood cell which make it an efficient oxygen carrier.

[2 marks]



6.

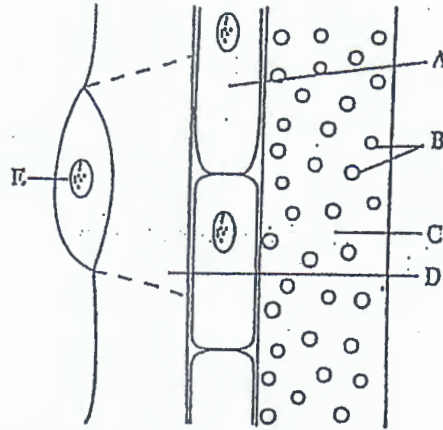


Figure 7

(a) From Figure 7 state the function of:

(i) A _____ [1 mark]

(ii) B _____ [1 mark]

(iii) E _____ [1 mark]

(b) From your knowledge of cell structure, underline the approximate diameters of Cell C and Cell D from the list below.

- C = 30 μm D = 15 μm
- C = 215 μm D = 430 μm
- C = 415 μm D = 830 μm
- C = 2 mm D = 1 mm

[1 mark]

GO ON TO THE NEXT PAGE

(c) State, with a reason, one structure present in Cell D which is absent in Cell C.

Structure

Reason

[2 marks]

(d) What is the major force causing fluid flow in

(i) Cell C?

[1 mark]

(ii) Cell D?

[1 mark]

(e) Figure 8 below shows the flow speed of the translocate by phloem under A, aerobic conditions and B, increasing anaerobic conditions, operative from *.

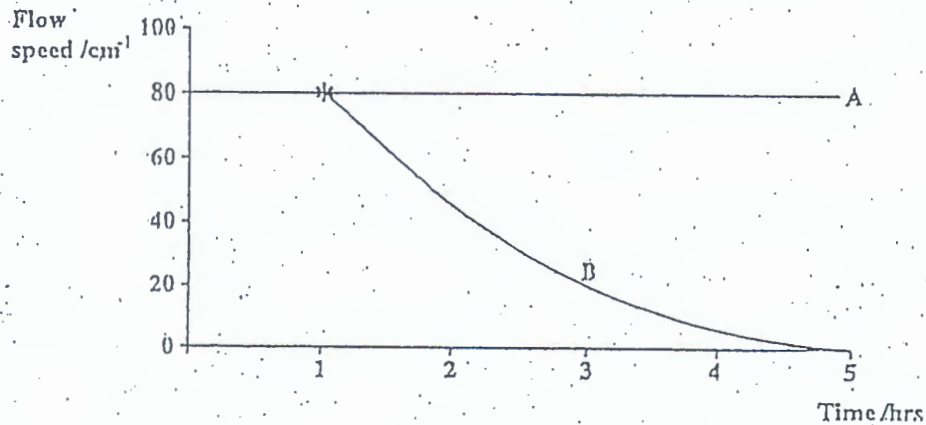


Figure 8

(i) What is the flow rate in aerobic conditions?

[1 mark]

(ii) Why does the flow rate decline in anaerobic conditions?

[1 mark]

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7. (a) Define the term 'psychological dependence'.

[2 marks]

(b) Define the term 'addiction'.

[2 marks]

(c) The average person has 5.6 litres of blood. A man and a woman go to a party and drink several alcoholic beverages in 1 hour. They each drink four alcoholic beverages of 150 ml each that contain 50% by volume of alcohol, and three alcoholic beverages of 126 ml each that contain 25% by volume of alcohol. What is the total alcohol content of their blood at the end of 1 hour?

[2 marks]

(d) As alcohol consumption increases there is an increase in the volume of alcohol in the blood. Explain why the same dosage of alcohol has different effects on men and women.

Men

Women

[4 marks]

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8. (a) State the meaning of the following terms:

(i) Genome

[1 mark]

(ii) Genomic library

[1 mark]

(iii) Recombinant DNA

[1 mark]

(iv) Vector molecule

[1 mark]

(v) Transformation

[1 mark]

(b) The restriction enzyme, HINDIII, cuts DNA at sequences of bases that are palindromic i.e. each strand of DNA has the same base sequence (AGCT), in opposite direction.

Indicate, using arrows, where HINDIII would cut the following sequence of DNA, and write alongside the diagram the number of bases each fragment of DNA would contain.



[5 marks]

9. (a) Define the term 'chronic disease'.

[1 mark]

(b) Give an example of a chronic disease due to severe underweight, and give TWO reasons why protein malnutrition is dangerous to health.

Example

Reason 1

Reason 2

[3 marks]

Table 2 below shows the trends in men's weight over a 15-year period.

Table 2

Condition	% of Sample, Males			
	1980	1985	1990	1995
Underweight	10	6	5	4
Normal	51	49	39	34
Overweight	33	38	43	46
Obese	6	7	13	16

(c) Use the figures in Table 2 to describe what has happened to the number of men with above-normal weight over the 15-year period.

[3 marks]

(d) Name TWO diseases caused by excess body fat, and for each disease; explain how fat influences progression of the disease.

[2 marks]

(e) State TWO other facts about the males that would be of help in analysing these data.

[1 mark]

END OF TEST