

Candidate Name	Centre Number	Candidate Number
		0



General Certificate of Secondary Education

239/02

**ADDITIONAL SCIENCE
HIGHER TIER (Grades D-A*)
BIOLOGY 2**

P.M. TUESDAY, 15 January 2008

(45 minutes)

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	9	
2.	6	
3.	10	
4.	3	
5.	10	
6.	9	
7.	3	
Total	50	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator.

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.

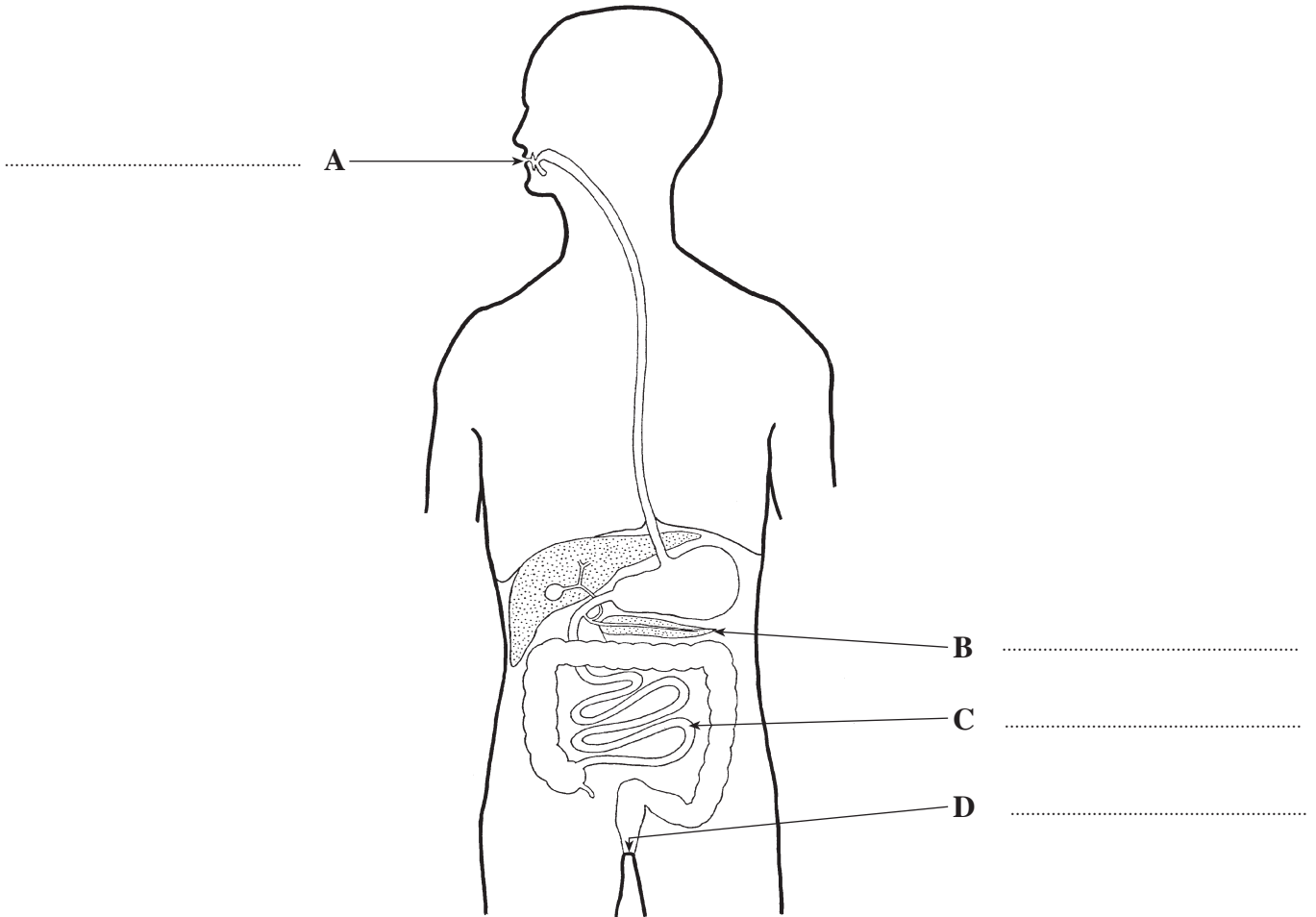
No certificate will be awarded to a candidate detected in any unfair practice during the examination.

BLANK PAGE

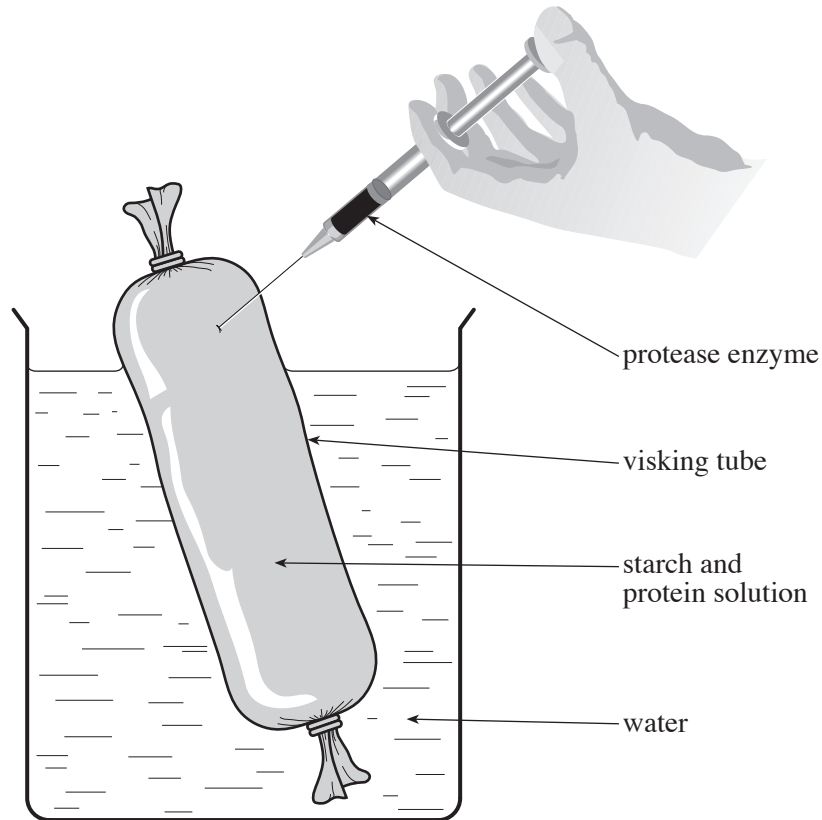
Answer all questions.

1. (a) The diagram below shows the digestive system.
Name the parts labelled **A-D**.

[4]



- (b) In the experiment below a length of visking tubing was used to act as a model gut. The visking tubing was filled with a starch and protein solution.



A sample of the water surrounding the visking tube was taken every 15 minutes and tested for starch, protein, amino acids and glucose. After 45 minutes a protease enzyme was added to the contents of the visking tube. The results are shown below.

<i>Time/minutes</i>	<i>starch</i>	<i>protein</i>	<i>amino acids</i>	<i>glucose</i>
0	-	-	-	-
15	-	-	-	-
30	-	-	-	-
45	-	-	-	-
60	-	-	+	-
75	-	-	+	-
90	-	-	+	-

Protease added →

Key: + = substance present
- = substance absent

- (i) After the protease enzyme was added, amino acids were present in the sampled water. Explain this result. [2]

.....

.....

.....

- (ii) Explain why protein is not found in the sampled water. [1]

.....

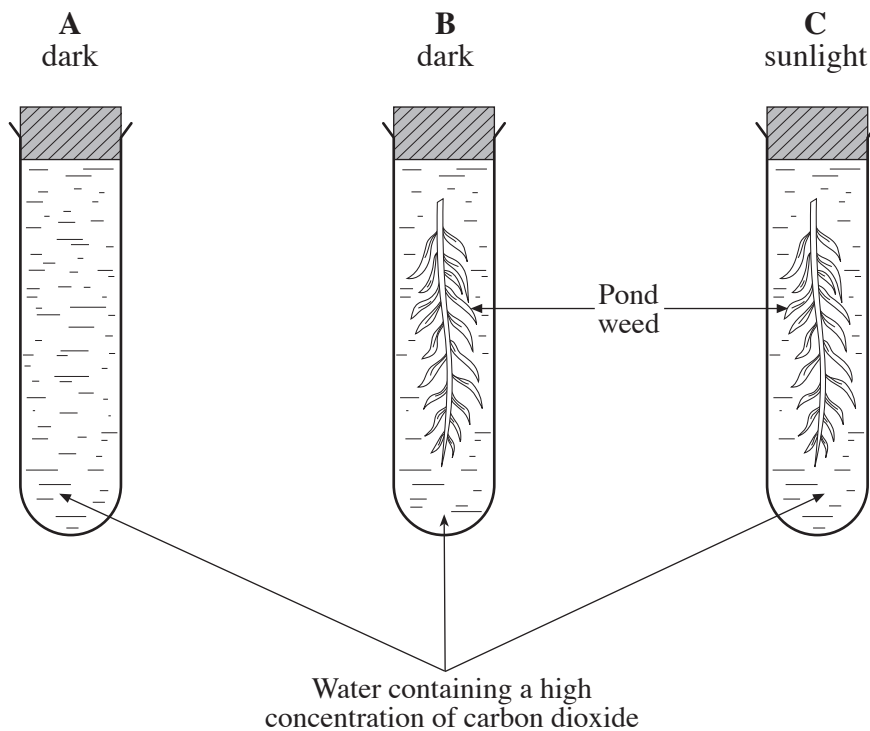
- (iii) (I) Name an enzyme that you would add to the contents of the visking tubing so that glucose was present in the sampled water. [1]

.....

- (II) State where in the digestive system this enzyme is made. [1]

.....

2. An experiment was carried out using the apparatus shown below.



Tubes **A**, **B** and **C** were of equal volume and were kept at the same temperature. Tubes **A** and **B** were kept in the dark, but tube **C** was put in strong sunlight. At the end of 1 hour, the volume of oxygen in each tube was measured. The results are shown below.

<i>Tube</i>	<i>Volume of oxygen at start of experiment /cm³</i>	<i>Volume of oxygen after 1 hour /cm³</i>
A	0.25	0.25
B	0.25	0.21
C	0.25	0.62

(a) Explain the purpose of tube **A**. [1]

.....

(b) Why is there less oxygen in tube **B** than tube **A** after 1 hour? [1]

.....

(c) Explain why the greatest volume of oxygen is in tube **C**. [1]

.....

(d) (i) Name the chemical that absorbs sunlight in green plants. [1]

.....

(ii) Where in the cell is this chemical found? [1]

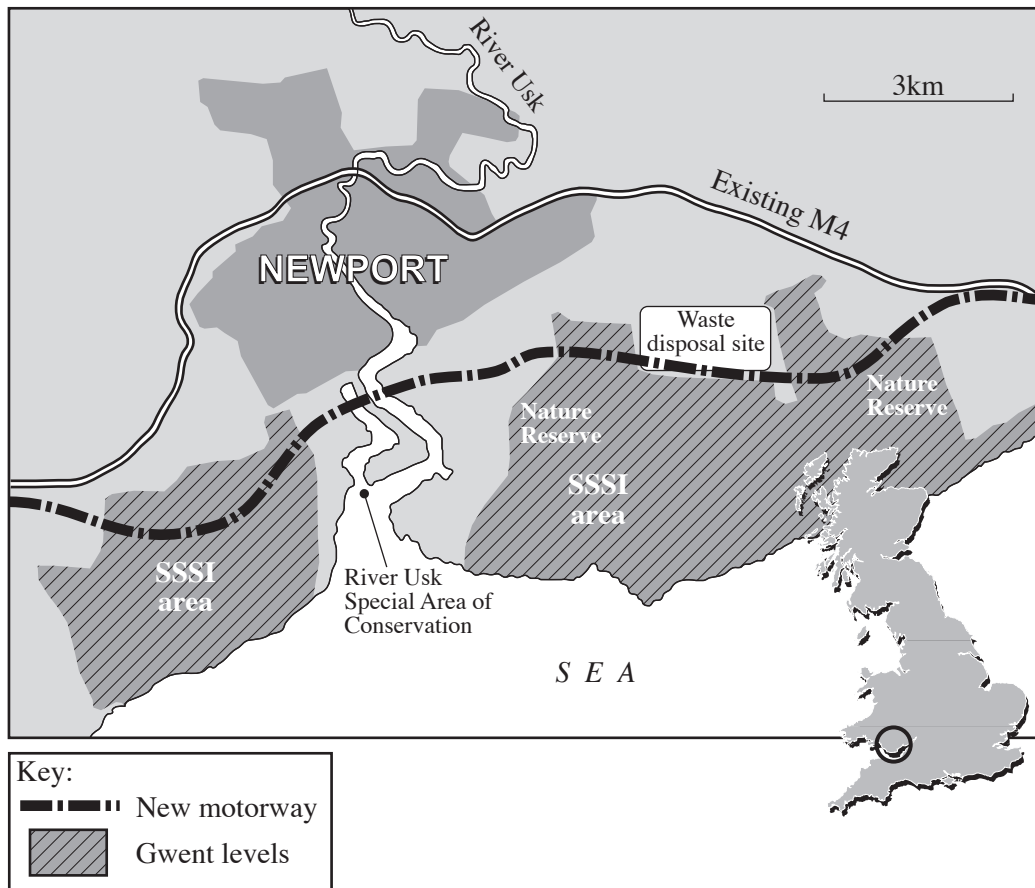
.....

(e) State **one** use made by plant cells of the glucose produced in photosynthesis. [1]

.....

3. The Welsh Assembly Government is backing plans for a 24 kilometre motorway to act as a relief road for the main route into south Wales. The road will run south of Newport and will cut across the northern section of the Gwent Levels. Most of the Gwent Levels are a Site of Special Scientific Interest (SSSI) and Wales' most important coastal wetlands.

The water from the Gwent Levels drains into the sea via an extensive interconnecting system of drainage ditches which contain a great variety of wildlife. The Gwent Levels contain 144 species of nationally rare or scarce invertebrates, nationally scarce plants, otters and water voles.



- (a) Suggest **two** reasons why large areas of the Gwent Levels are an SSSI. [2]

(i)

(ii)

- (b) Suggest a reason why the proposed motorway is considered to be important to the economic development of the region. [1]

- (c) The map shows that the motorway route will run through the waste disposal site of an old steelworks. Suggest **one** effect that the disturbance of this site could have on the environment. [1]

The UK's birds can be split into three categories of conservation importance:

- RED - decline in UK breeding population over 100 years
- AMBER - decline in UK breeding population over 30 years
- GREEN - no identified threat to status

Some of the birds found on the Gwent Levels include:

<i>Bird species</i>	<i>Category of conservation importance</i>
Barn owl	Amber
Avocet	Amber
Snipe	Amber
Lapwing	Amber
Hobby	Green
Short eared owl	Amber
Hen harrier	Red
Marsh harrier	Amber
Bittern	Red

(d) Which of the above bird species are of greatest conservation concern? [1]

.....

(e) Explain how the construction of the proposed motorway could affect the biodiversity of the Gwent Levels. [3]

.....

.....

.....

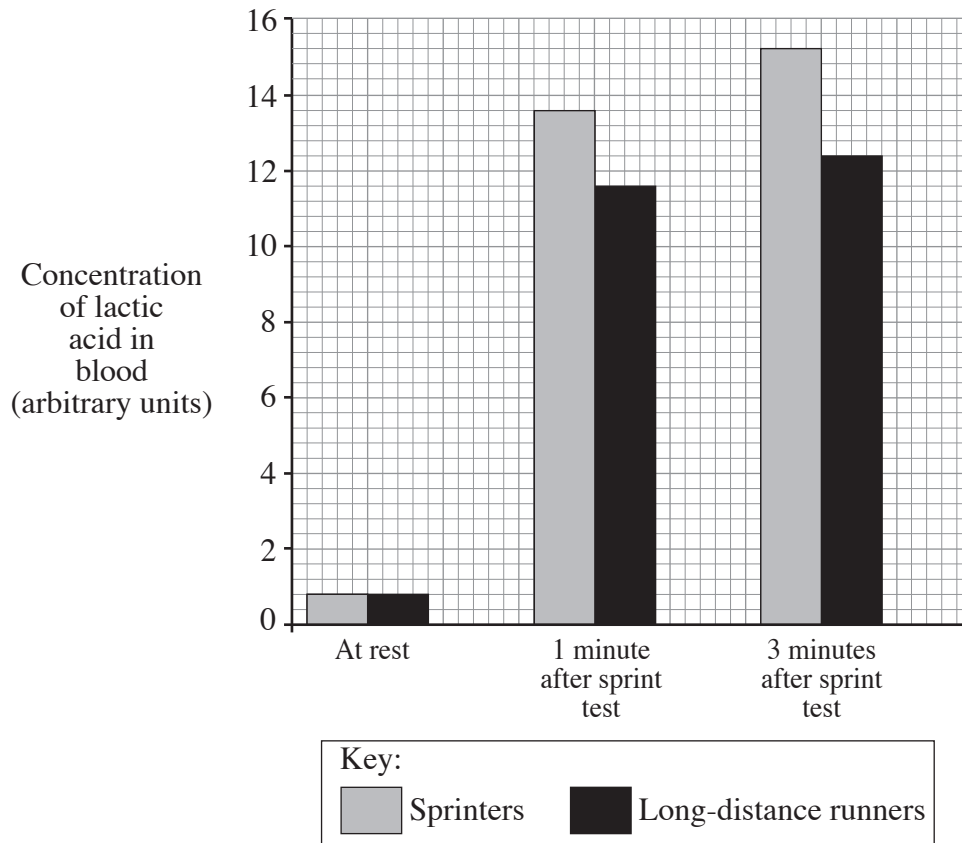
.....

(f) Apart from road building, state **two** other human activities which destroy habitats. [2]

(i)

(ii)

4. In an investigation, two groups of trained athletes ran a short sprint race over 100 m. One group had been trained as sprinters, the other as long-distance runners. The bar chart below shows the changes in lactic acid concentration in the blood for each group at rest, one minute after the race and three minutes after the race.



- (a) The rate of oxygen uptake during exercise was found to be greater for the long-distance runners than for the sprinters.
Suggest how this could explain the differences in lactic acid concentrations between the two groups. [1]

.....

.....

- (b) (i) What would you expect to happen to the lactic acid concentration 15 minutes after the race? [1]

.....

- (ii) Explain your answer to part (b) (i). [1]

.....

.....

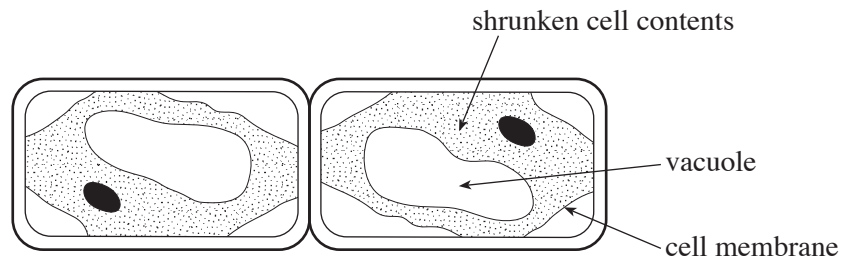
5. In an experiment, a cylinder of potato (A) was kept in pure water for one hour. An identical cylinder (B) was kept in a 10% salt solution for one hour.

(a) Describe the difference you would expect to observe between the potato cylinders when removed from the liquids.

Cylinder A [1]

Cylinder B [1]

(b) The diagram below shows the inside of cells from the potato cylinder which had been kept in 10% salt solution.



Explain why the contents have shrunk. [4]

.....

.....

.....

.....

- (c) In another experiment, some strips of cells from red onions were placed on microscope slides in sugar solutions of various concentrations. After 15 minutes, the number of cells with shrunken contents was counted. The results are shown in the table:

	<i>Slide</i>				
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
Sugar concentration (g/dm ³)	0	40	80	120	160
Total cell number	127	132	117	125	139
Number with shrunken contents	0	11	68		139
% with shrunken contents	0	8.3	58.1	80	100

- (i) Complete the table by calculating the missing value for solution D. [2]

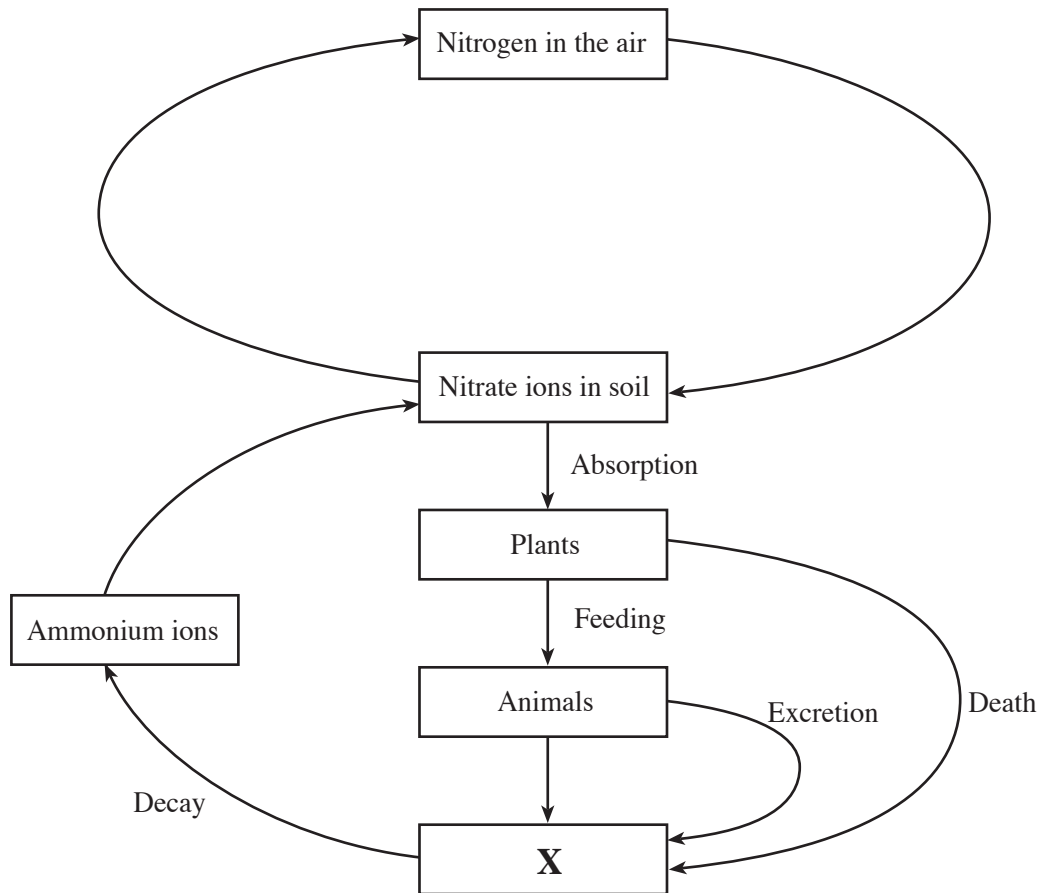
- (ii) Describe the relationship between the concentration of sugar solution and the percentage of cells with shrunken contents. [1]

.....

- (iii) Which slide has the solution with the highest water concentration? [1]

.....

6. The diagram shows part of the nitrogen cycle.



(a) Name **two** types of organisms which occur at **X**. [2]

(i)

(ii)

(b) In what form is nitrogen found in animals? [1]

.....

(c) Name the enzyme which changes urea into ammonium compounds. [1]

.....

(d) When large amounts of nitrates are washed into lakes, the water may become green and cloudy and fish often die.

(i) Explain what causes the green cloudiness of the water. [2]

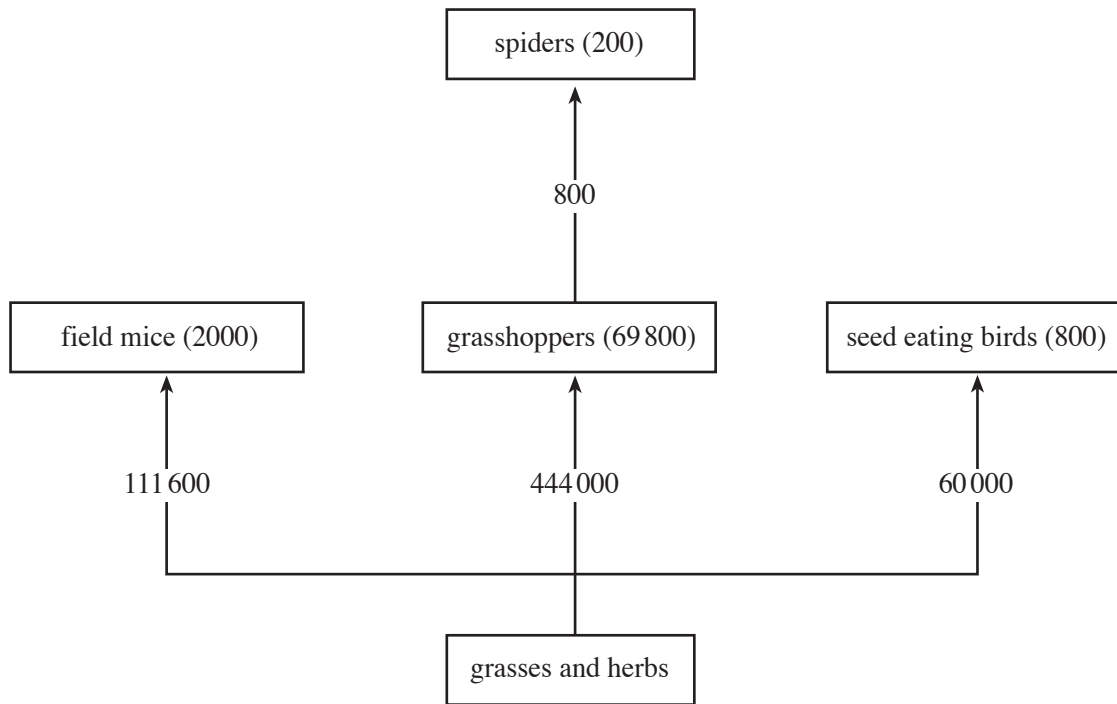
.....
.....
.....

(ii) The fish die due to the lack of oxygen in the water. Explain how and why the oxygen is removed from the water. [3]

.....
.....
.....
.....
.....

(Question 7 on next page)

7. The flow diagram shows how energy is passed through a food web. Numbers on the arrows show the energy available to organisms in kJ per m² per year. Numbers in brackets show the energy that becomes part of the biomass of the organisms, in kJ per m² per year.



The energy efficiency of an organism is a measure of how much of the energy available to the organism becomes part of its biomass. The equation below shows how to calculate energy efficiency (E) as a percentage:

$$E \% = \frac{\text{energy that becomes part of biomass}}{\text{energy available}} \times 100$$

- (a) Calculate the energy efficiency of the spiders. [1]

E = %

- (b) The energy available to organisms towards the top of the food chain is less than that available to those at the start because energy is “lost”. Give **two** ways in which the energy is “lost” between organisms. [2]

(i)

(ii)