Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTER NUMBER						CANDIDATE NUMBER				

0751084485

BIOLOGY (US) **0438/33**

Paper 3 Extended **May/June 2015**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Center number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **20** printed pages.

CAMBRIDGE International Examinations

[Turn over

1 Fig. 1.1 shows seven different species of amphibian.

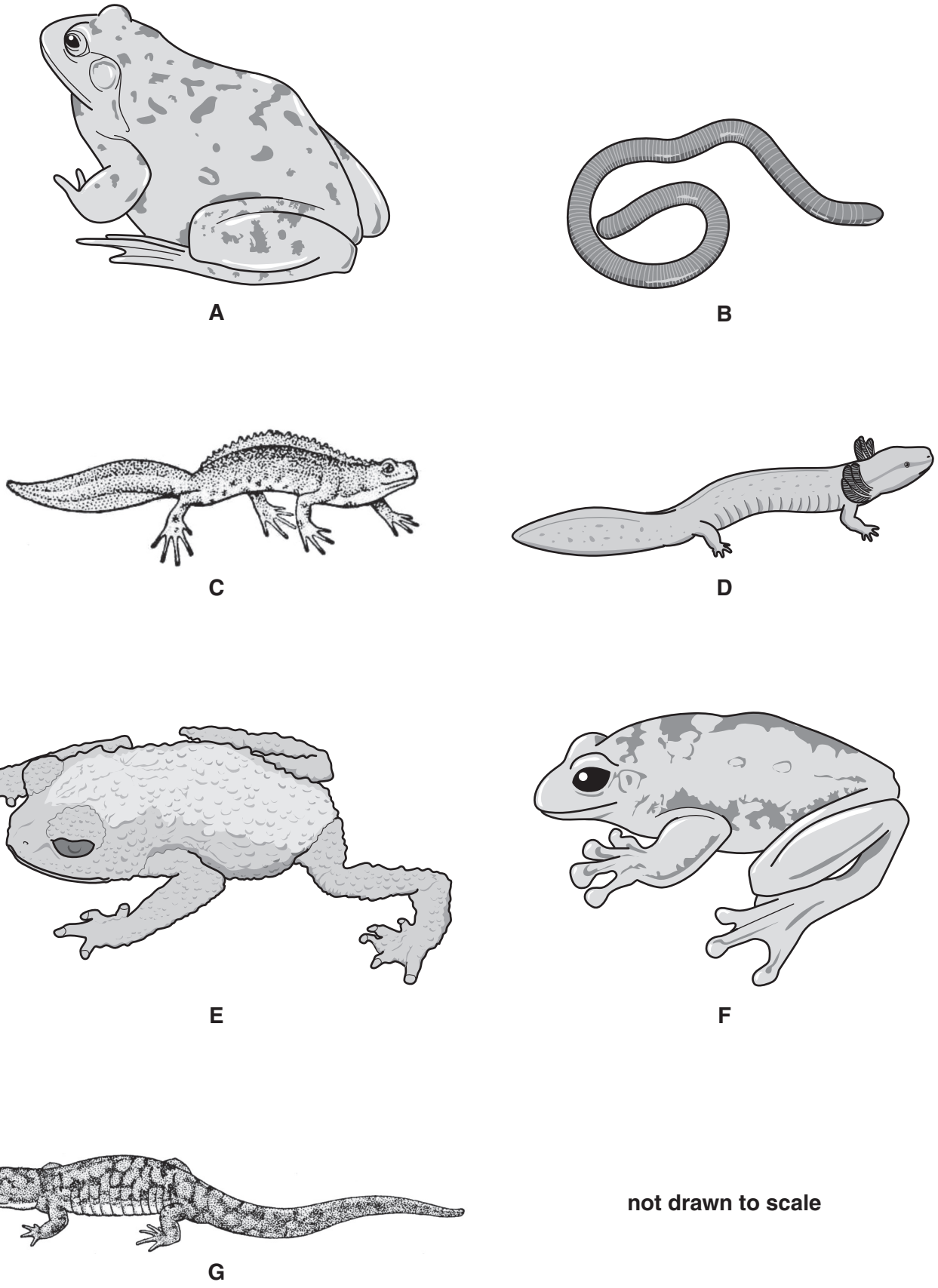

Fig. 1.1

(a) Use the key to identify each species. Write the letter of each species (**A** to **G**) in the correct box beside the key. One has been done for you.

Key

1 (a)	long, narrow body, with or without legs	go to 2	
(b)	body not long and narrow, back legs are larger than the front legs	go to 5	
2 (a)	body without legs	*Gymnopis multiplicata*	**B**
(b)	body with legs which are all of the same size	go to 3	
3 (a)	raised crest along the back of the body	*Triturus cristatus*	
(b)	no crest along the back of the body	go to 4	
4 (a)	gills present	*Necturus maculosus*	
(b)	no gills present	*Ambystoma tigrinum*	
5 (a)	skin is smooth	go to 6	
(b)	skin is not smooth	*Oreophrynella quelchii*	
6 (a)	digits end in swellings	*Polypedates leucomystax*	
(b)	digits do not end in round swellings	*Rana temporaria*	

[3]

(b) Many amphibian species throughout the world are endangered.

Suggest **three** reasons why many amphibian species are endangered.

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2 .....

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3 .....

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[3]

[Total: 6]

2 Some plants can be grown in water using the technique of hydroponics. The roots are in water and supplied with the ions that they need at the concentrations that support maximum growth. Some ions can be absorbed both by diffusion and by active transport.

(a) (i) State **two** features of diffusion that do not apply to active transport.

1 .....

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2 .....

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[2]

(ii) Explain how roots are adapted to absorb ions.

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.....[2]

A group of students investigated the effect of soaking small onion bulbs in different concentrations of sodium chloride solution. They peeled off the outer papery leaves of the onion bulbs and divided the onions into 6 batches, each with 10 onions.

The onions were surface dried with paper towels and weighed. The mean mass of the onions in each batch was calculated. The onions were then left in sodium chloride solutions for three hours.

After three hours the students surface dried the onions and weighed them again. Their results are given in Table 2.1.

Table 2.1

concentration of sodium chloride solution / g dm^{-3}	mean mass of onions / g		percentage change in mass
	before soaking	after soaking for 3 hours	
0	147	173	+17.7
25	153	165	+7.8
50	176	172	–2.3
100	154	149	–3.2
150	149	142	–4.7
200	183	175	

(b) (i) Calculate the percentage change in mass of the onions that were in the most concentrated solution of sodium chloride. Show your working. Write your answer in Table 2.1.

[2]

(ii) Explain why the students calculated the percentage change in mass of the onions.

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.....[2]

(c) The students plotted a graph of the results as shown in Fig. 2.1.

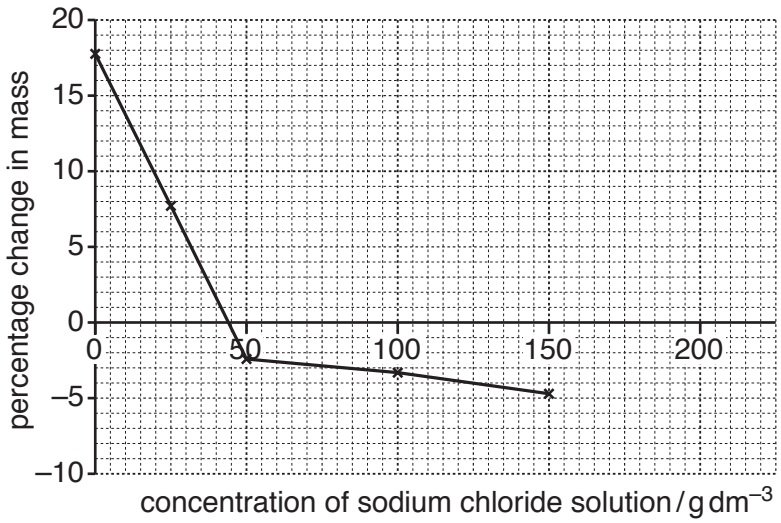

Fig. 2.1

(i) Complete the graph using your answer to **(b)(i)**. [1]

(ii) Use the graph in Fig. 2.1 to estimate the concentration of the sodium chloride solution that has the same water potential as the onions.

.....[2]

(d) Using the term **water potential**, explain why the onions:

gained mass when soaked in dilute solutions of sodium chloride

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lost mass when soaked in concentrated solutions of sodium chloride.

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[4]

[Total: 15]

Question 3 begins on page 8.

3 Researchers in Michigan investigated the rate of photosynthesis in leaves of big-tooth aspen trees, *Populus grandidentata*, by placing some of the growing leaves inside transparent boxes.

The researchers measured the uptake of carbon dioxide by the leaves over a range of temperatures from 10–40 °C. They carried out their measurements at two different concentrations of carbon dioxide:

H – 325 ppm carbon dioxide which is close to the concentration in the atmosphere;

J – 1935 ppm carbon dioxide which is a very high concentration.

The results are shown in Fig. 3.1.

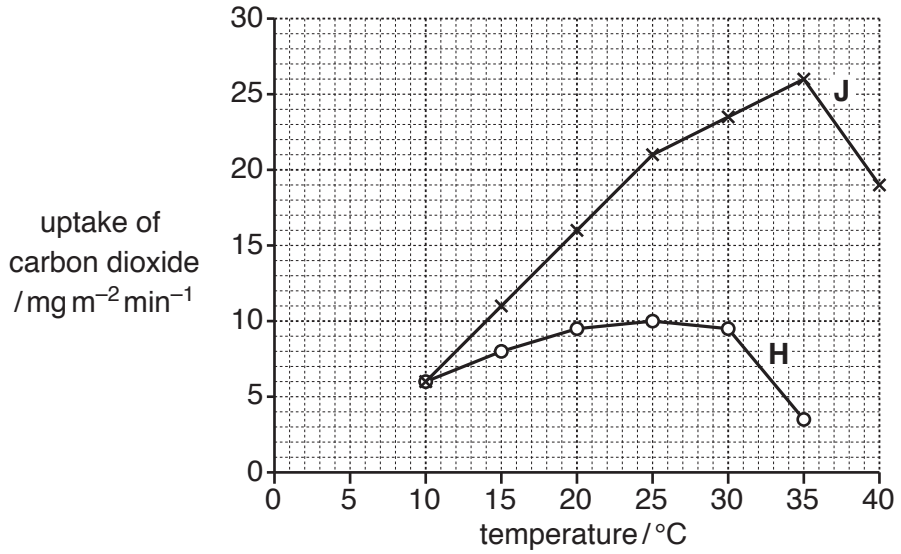

Fig. 3.1

(a) Describe how the results for the aspen leaves in batch **J** differ from the results for the aspen leaves in batch **H**. Use data from Fig. 3.1 in your answer.

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.....[3]

(b) Explain why the rate of photosynthesis in the leaves in batch **J**:

(i) increases with an increase in temperature from 15 °C to 35 °C

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.....[2]

(ii) decreases at temperatures above 35 °C.

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.....[2]

(c) Use the results in Fig. 3.1 to suggest **and** explain the likely effect on plant growth of an increase in carbon dioxide concentration in the atmosphere as a result of the combustion of fossil fuels.

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.....[5]

[Total: 12]

[Turn over

4 The lungs and the kidneys are excretory organs of the human body.

(a) (i) Define the term *excretion*.

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.....[3]

(ii) State an excretory product that is passed out through the lungs.

.....[1]

(iii) Outline the role of the liver in excretion.

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.....[3]

(b) Fig. 4.1 is a vertical section of the kidney.

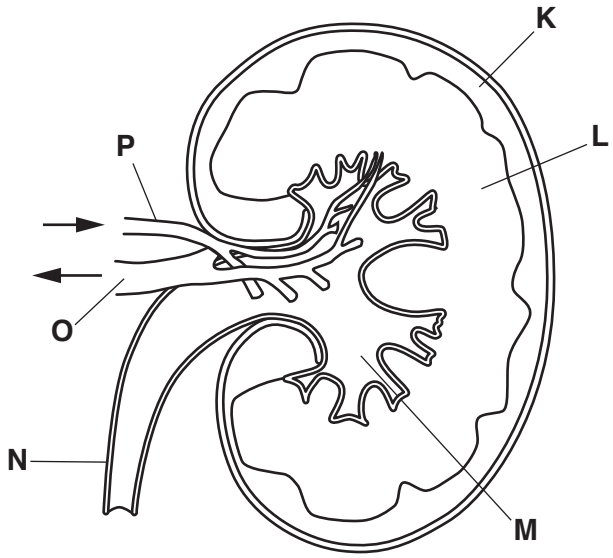

Fig. 4.1

Table 4.1 shows the functions of parts of the kidney.

Complete the table by:

- naming the part of the kidney that carries out each function
- using letters from Fig. 4.1 to identify the part of the kidney named.

One row has been completed for you.

Table 4.1

function	name of part	letter from Fig. 4.1
blood is filtered		
concentration of urine is determined	medulla	**L**
urine flows to the bladder		
blood is carried into the kidney		
blood flows out of the kidney		

[4]

[Turn over

(c) People with kidney disease are often treated in renal dialysis clinics. Their blood passes through tubes lined with a special membrane for about three hours.

(i) State **two** waste substances that are removed from the blood by dialysis.

1 .....

2 .....
[2]

(ii) Kidney patients may be given a kidney transplant. State **one** advantage and **one** disadvantage of kidney transplants compared with dialysis.

advantage .....

.....

.....

disadvantage .....

.....

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[2]

[Total: 15]

Question 5 begins on page 14.

5 The menstrual cycle involves monthly changes in the ovary and the uterus.

(a) Fig. 5.1 shows the sequence of changes within the ovary that occur during the menstrual cycle.

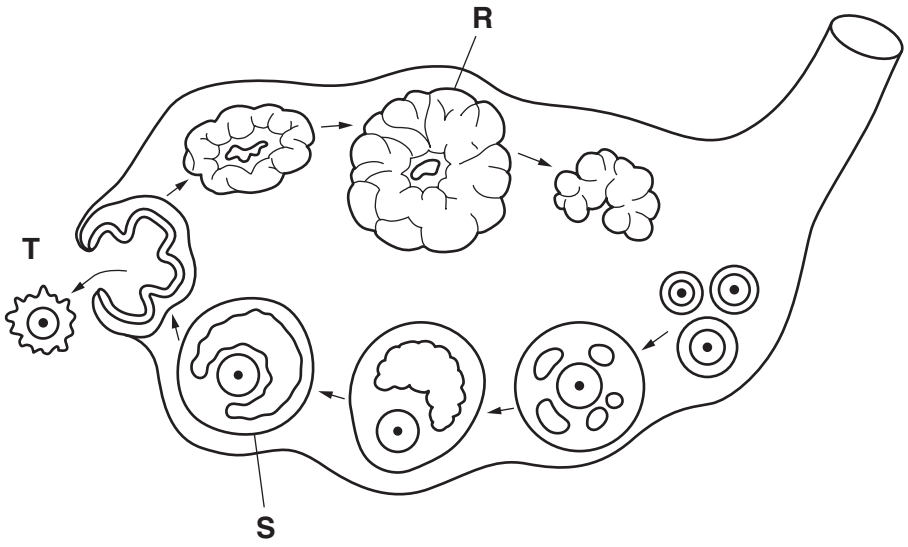

Fig. 5.1

(i) Name structures **R** and **S**.

R .....

S .....
[2]

(ii) State the name of the process that is occurring at **T**.

.....[1]

(b) The ovary secretes hormones that control the growth and maintenance of the lining of the uterus.

Name the hormone that stimulates:

(i) the growth of the lining of the uterus during the first half of the menstrual cycle

.....[1]

(ii) the maintenance of the lining of the uterus during the second half of the menstrual cycle.

.....[1]

(c) Fig. 5.2 is an electron micrograph showing a sperm cell on the surface of an egg cell.

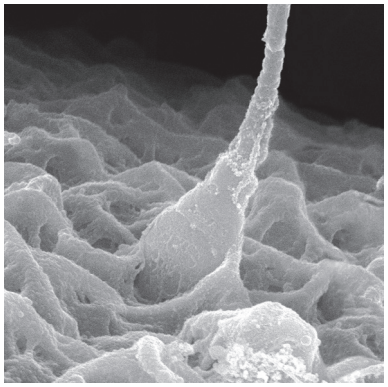

Fig. 5.2

(i) State **three** ways in which a sperm cell differs from an egg cell.

1 .....

2 .....

3 .....[3]

(ii) Human body cells have 46 chromosomes. Human egg and sperm cells have 23 chromosomes each.

What term is used to describe the number of chromosomes in a gamete, such as an egg cell or a sperm cell?

.....[1]

(iii) State the organ in which fertilization occurs in humans.

.....[1]

(iv) Describe what happens between the event shown in Fig. 5.2 and implantation in the uterus.

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.....[4]

(d) Clomiphene citrate is a fertility drug that has been available for over 50 years. As part of a fertility treatment clomiphene citrate is taken once a day (daily dose) for about five days.

Researchers investigated the use of the drug in Denmark between 1974 and 1993. The results of their study are shown in Fig. 5.3.

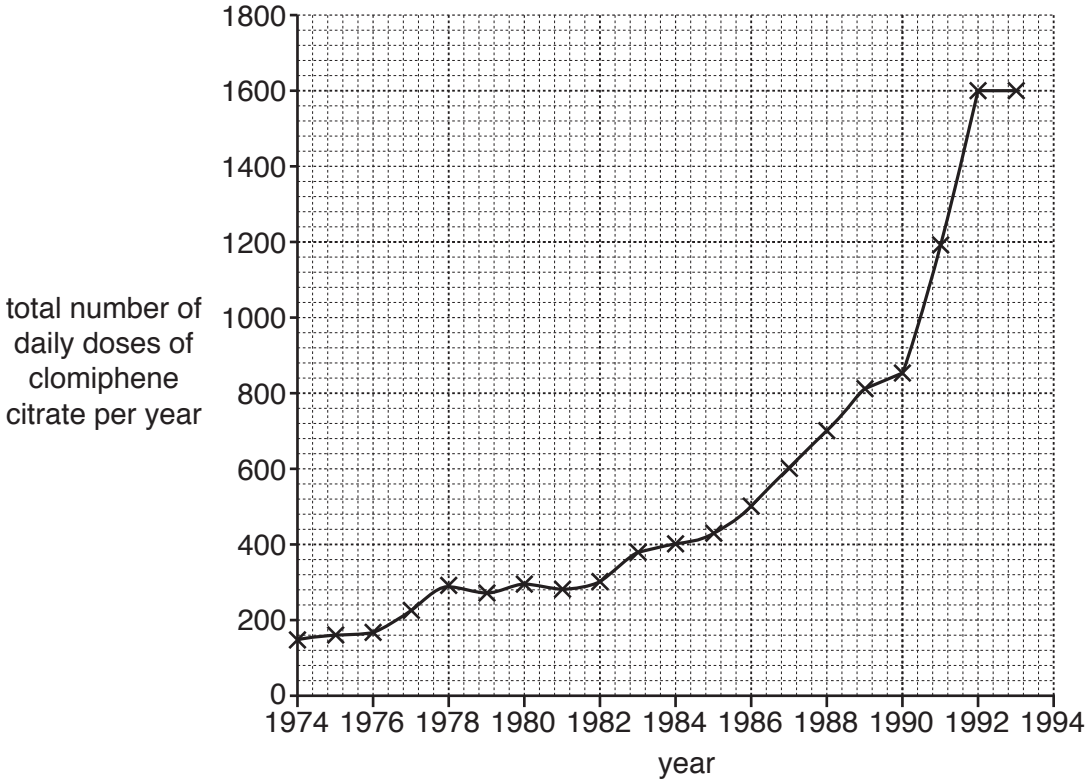

Fig. 5.3

(i) Describe the change in the use of clomiphene citrate in Denmark between 1974 and 1993. Use data from Fig. 5.3 in your answer.

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.....[2]

(ii) Clomiphene citrate is used as part of a treatment cycle to help women become pregnant. Often this involves artificial insemination (AI).

Describe how a treatment cycle involving fertility drugs **and** AI would be carried out.

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.....[3]

[Total: 19]

6 Some integrated farming systems involve making best use of all available resources without the use of large inputs of energy in the form of fossil fuels.

A study looked at what happened to the light energy that was the major energy input to farms in the Zhujiang delta in China. The farms are based on a dyke-pond system as shown in Fig. 6.1.

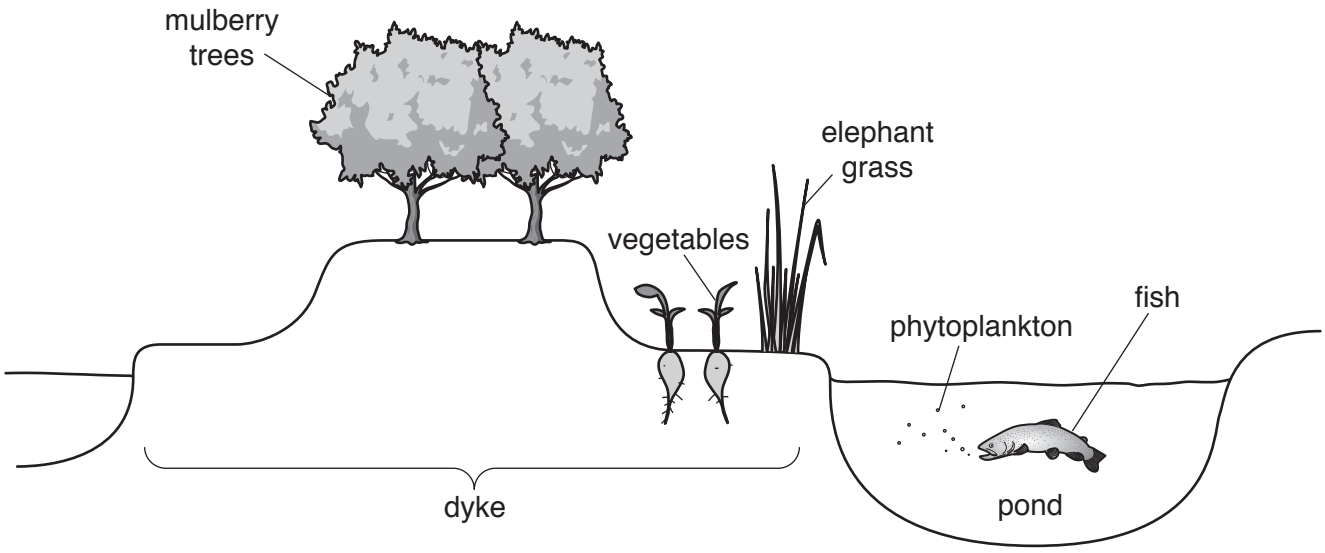

Fig. 6.1

Elephant grass, vegetables and mulberry trees are grown on the dykes in between the ponds. The elephant grass is grown and then cut to feed the fish. Vegetables and fish are used for human consumption. Silkworms feed on the mulberry trees. Phytoplankton are the main producers in the pond and are eaten by the fish.

(a) (i) Explain the meaning of the term *producer*.

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.....[2]

(ii) Use the information provided in the passage on page 18 and in Fig. 6.1 to **complete** a food web for the farm. Some of the producers have been drawn for you.

mulberry trees	vegetables	phytoplankton in the pond

[5]

(b) In the study the researchers discovered that the vegetables absorbed 1560 MJ m^{-2} per year of light energy. The energy which was transferred from the vegetables to humans was 3 MJ m^{-2} per year.

Explain what happens to the energy that is absorbed by the vegetables but is not transferred to humans.

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.....[3]

[Turn over

(c) Suggest the advantages to a farmer of including ponds stocked with fish in an integrated farming system.

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.....[3]

[Total: 13]