OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced GCE

BIOLOGY 2805/01

Growth, Development and Reproduction

Friday **25 JUNE 2004** Afternoon 1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
Electronic calculator
Ruler (cm/mm)

Candidate Name	Centre Number	Candidate Number

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers, in blue or black ink, in the spaces provided on the question paper.
- Read each question carefully before starting your answer.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	18	
2	14	
3	21	
4	13	
5	15	
6	9	
TOTAL	90	

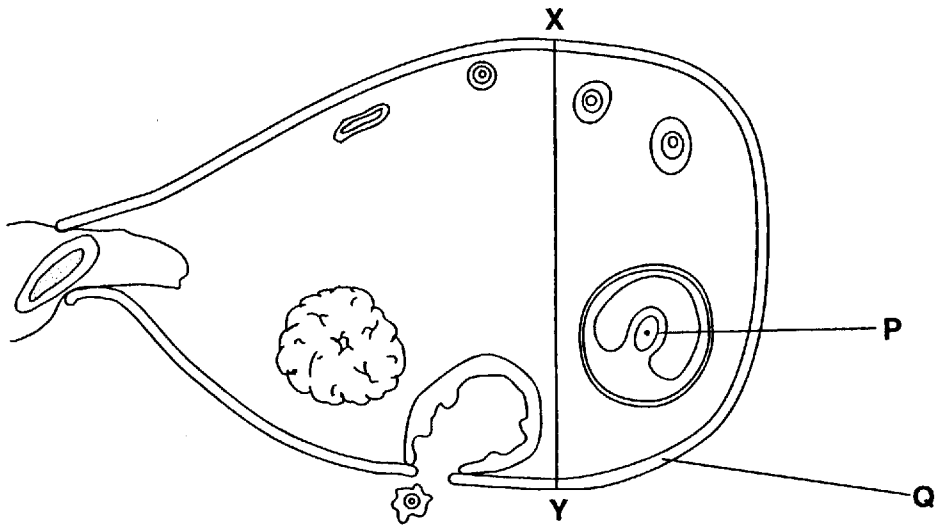
This question paper consists of 21 printed pages and 3 blank pages.

Registered Charity Number: 1066969
[Turn over

For Examiner's Use

Answer **all** the questions.

1 Fig. 1.1 is a diagram of a human ovary.



magnification x 6

Fig. 1.1

(a) (i) Calculate the actual distance between **X** and **Y**.
Show your working.

Answer ..... [2]

(ii) Identify structure **Q** and describe its function.

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.....[3]

(iii) Label on Fig. 1.1, with a line and the letter **R**, the structure that secretes oestrogen. [1]

(b) Make a fully labelled drawing to show the detailed structure of the secondary oocyte, which is labelled **P** on Fig. 1.1.

[4]

For Examiner's Use

(c) In this question, one mark is available for the quality of written communication.

Describe the hormonal control of gamete production in women.

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Quality of Written Communication [1]

[Total: 18]

For Examiner's Use

2 Fig. 2.1 shows the flower spike of the marsh woundwort, *Stachys palustris.*

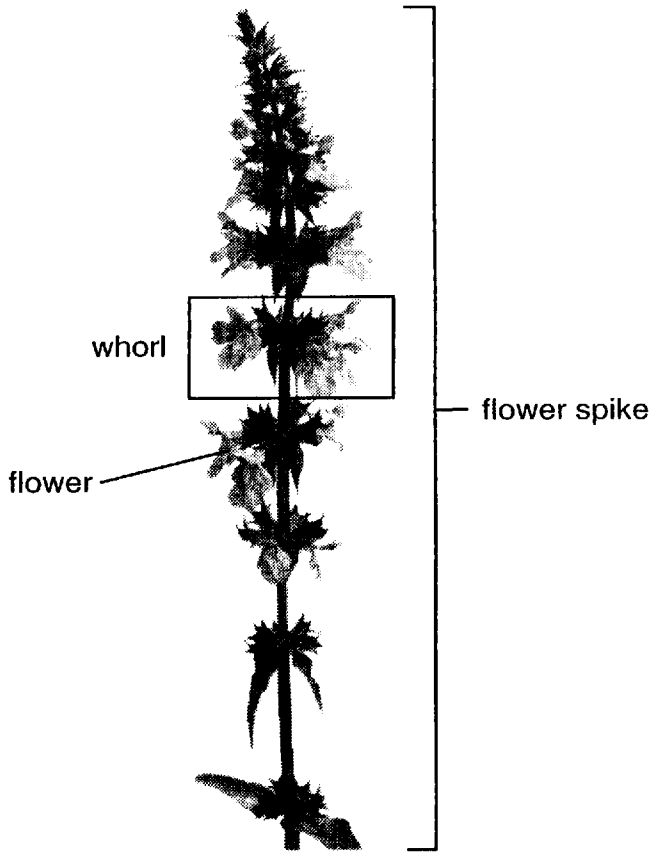

Fig. 2.1

- The flowers are found at intervals along the spike, in clusters around the stem called whorls.
- The whorls of flowers mature from the base of the spike upwards.
- The anthers mature before the stigma.

(a) (i) State the advantage to the plant of the flowers on the spike maturing at different times.

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(ii) State the term used to describe flowers in which the anthers mature first.

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[Turn over

(b) Bees visiting the flowers forage for nectar from the base of the spike upwards. To explain this pattern of foraging, it has been suggested that more nectar is produced in the flowers at the base of the spike than at the top. This may create a nectar gradient from the base to the top of the spike.

Fig. 2.2 shows the results of an investigation into the concentration of nectar in the whorls of the marsh woundwort, expressed as mean sugar concentration per flower.

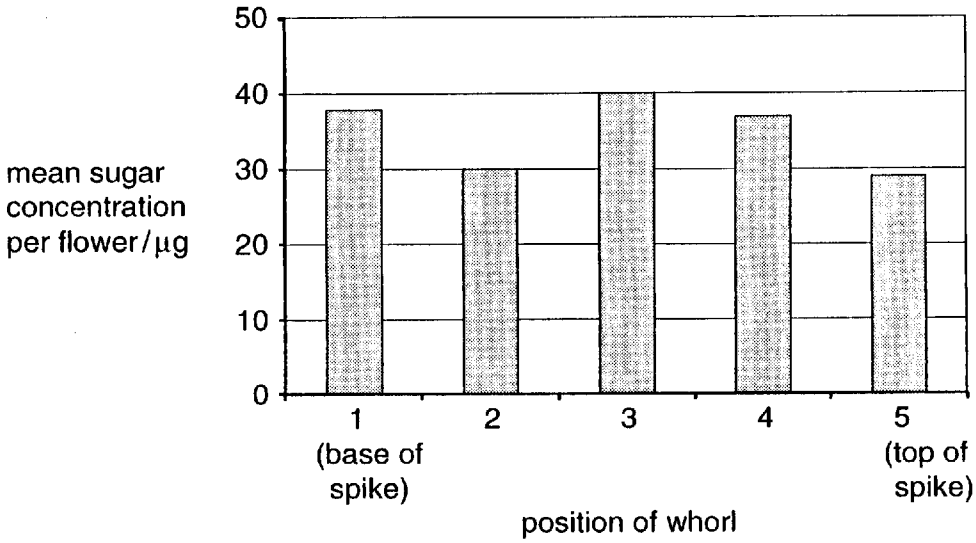

Fig. 2.2

(i) State whether the data shown in Fig. 2.2 support the suggestion that more nectar is produced in the flowers at the base of the spike than at the top.

Explain your answer.

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(ii) Suggest **two** alternative explanations for the pattern of foraging in bees.

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(c) A further investigation was conducted to discover if the number of flowers in each whorl affected the **rate** at which nectar was produced. The number of flowers in each whorl varied between one and six. The rate of nectar production in **each** flower was determined and expressed as the mean rate of sugar secretion per hour. The results of this investigation are shown in Fig. 2.3.

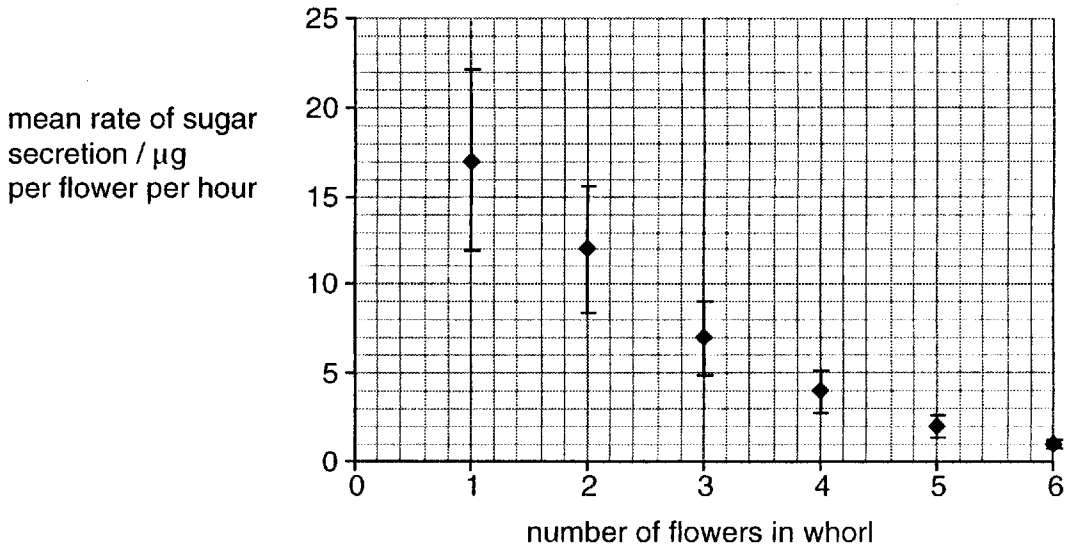

Fig. 2.3

(i) Using the data in Fig. 2.3, describe the results of this investigation.

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(ii) State the source of the sugar that is secreted by the nectaries **and** describe how it reaches them.

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[Turn over

For Examiner's Use

(iii) Explain the precautions that would be taken in this investigation so that valid conclusions could be drawn.

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[Total: 14]

3 **(a)** Fig. 3.1 is a diagram of the hypothalamus and the pituitary gland.

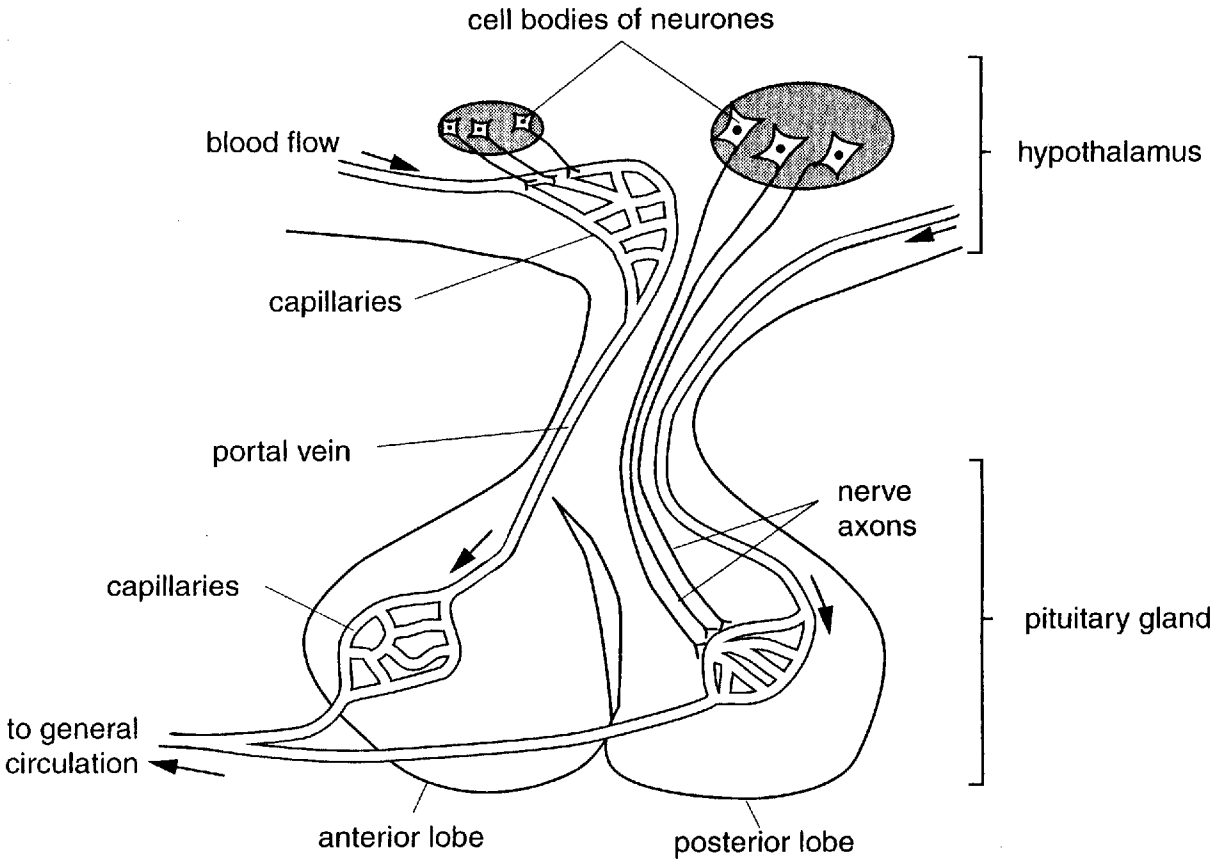

Fig. 3.1

(i) Describe the role of the portal vein.

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(ii) Describe the **specialised** function of the neurones shown in Fig. 3.1.

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(b) Describe the functions of

oxytocin .....

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prolactin releasing factor (PRF) .....

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[Turn over

Fig. 3.2 shows the relative concentrations, in the blood, of human chorionic gonadotrophin (HCG) and progesterone, and the mass of the placenta during pregnancy.

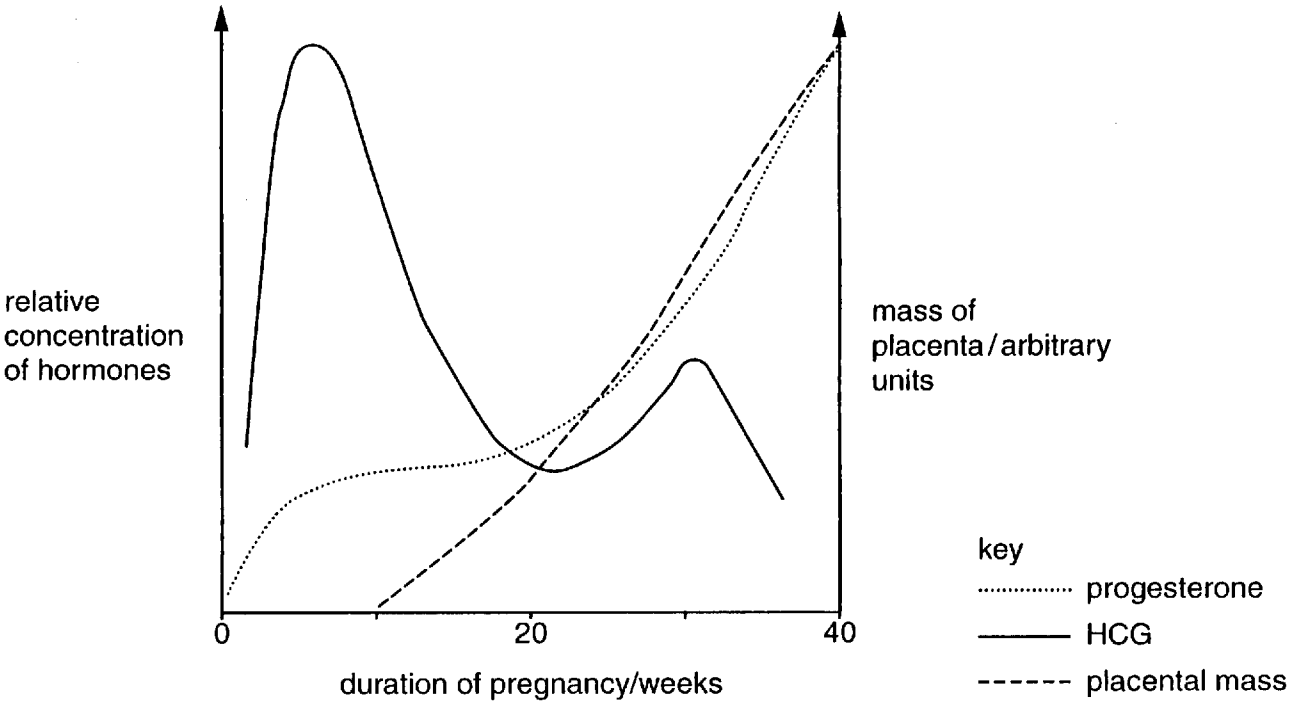

Fig. 3.2

(c) Using the information in Fig. 3.2, describe **and** explain the changes that occur in the concentration of progesterone during pregnancy.

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For Examiner's Use

(d) State the site of production of HCG **and** explain how it reaches its target organ.

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(e) Shortly after implantation occurs, HCG appears in the urine of pregnant women. The HCG can be detected using pregnancy testing kits, which contain antibodies specific to HCG. If HCG is present in the sample of urine placed in the testing kit, the antibodies bind to the HCG. This results in a colour change.

(i) State how antibodies used in the pregnancy testing kits are specific to HCG.

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(ii) The antibodies used in the testing kit are produced by cells that have been cloned.

Suggest an advantage of using antibodies produced by cells that are all part of the same clone.

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[Total: 21]

[Turn over

4 Transfer of nutrients into the endosperm of a seed, after fertilisation, was investigated in maize, *Zea mays*.

Fig. 4.1 shows the pathway taken by nutrients as they are transferred to the endosperm from the parent plant.

Fig. 4.2 shows the concentration of these nutrients at particular points in the pathway.

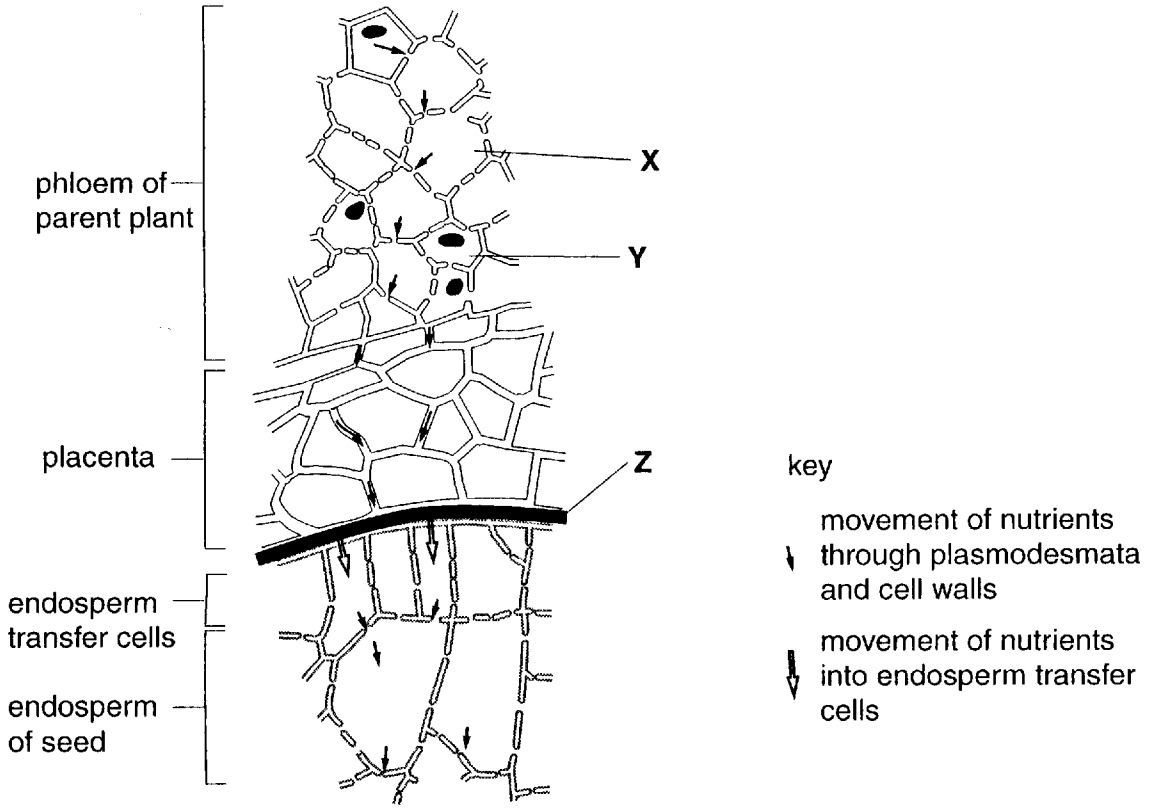

Fig. 4.1

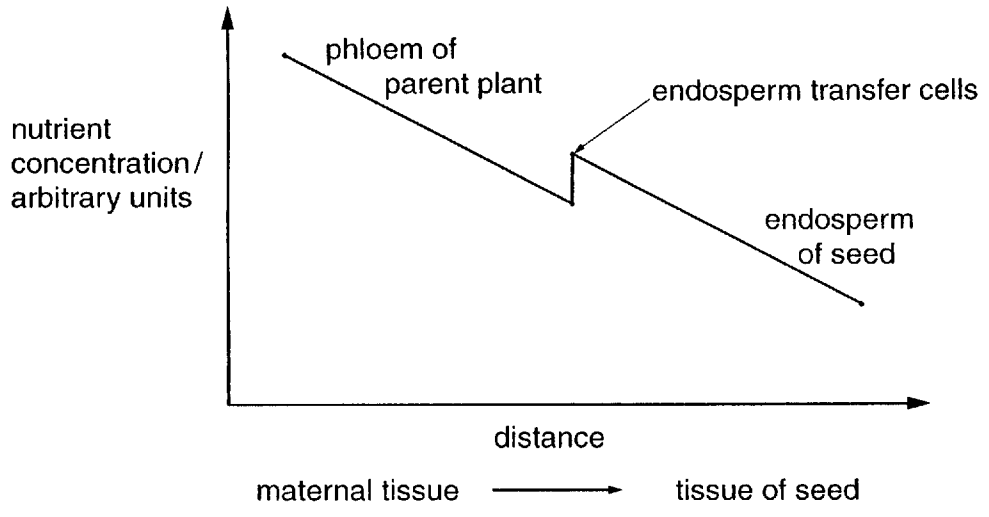

Fig. 4.2

For Examiner's Use

(a) Name the cells **X** and **Y** and the structure **Z** on Fig. 4.1.

cell **X** .....

cell **Y** .....

structure **Z** ..... [3]

(b) Using the information in Fig. 4.1 and Fig. 4.2, describe how nutrients are transferred

(i) from the phloem to the placenta;

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(ii) from the placenta to the endosperm transfer cells.

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[Turn over

For Examiner's Use

(c) Describe the changes which may occur

(i) in the endosperm as an ovule develops into a seed;

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(ii) in the ovary wall as an ovary develops into a fruit.

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[Total: 13]

5 A series of investigations were carried out on the effect of temperature on the growth, development and reproduction of millet, *Sorghum vulgare*. These were:

- the percentage germination of the grains
- the number of grains produced per flower head
- the rate of root growth per day.

The results of these investigations are shown in Fig. 5.1.

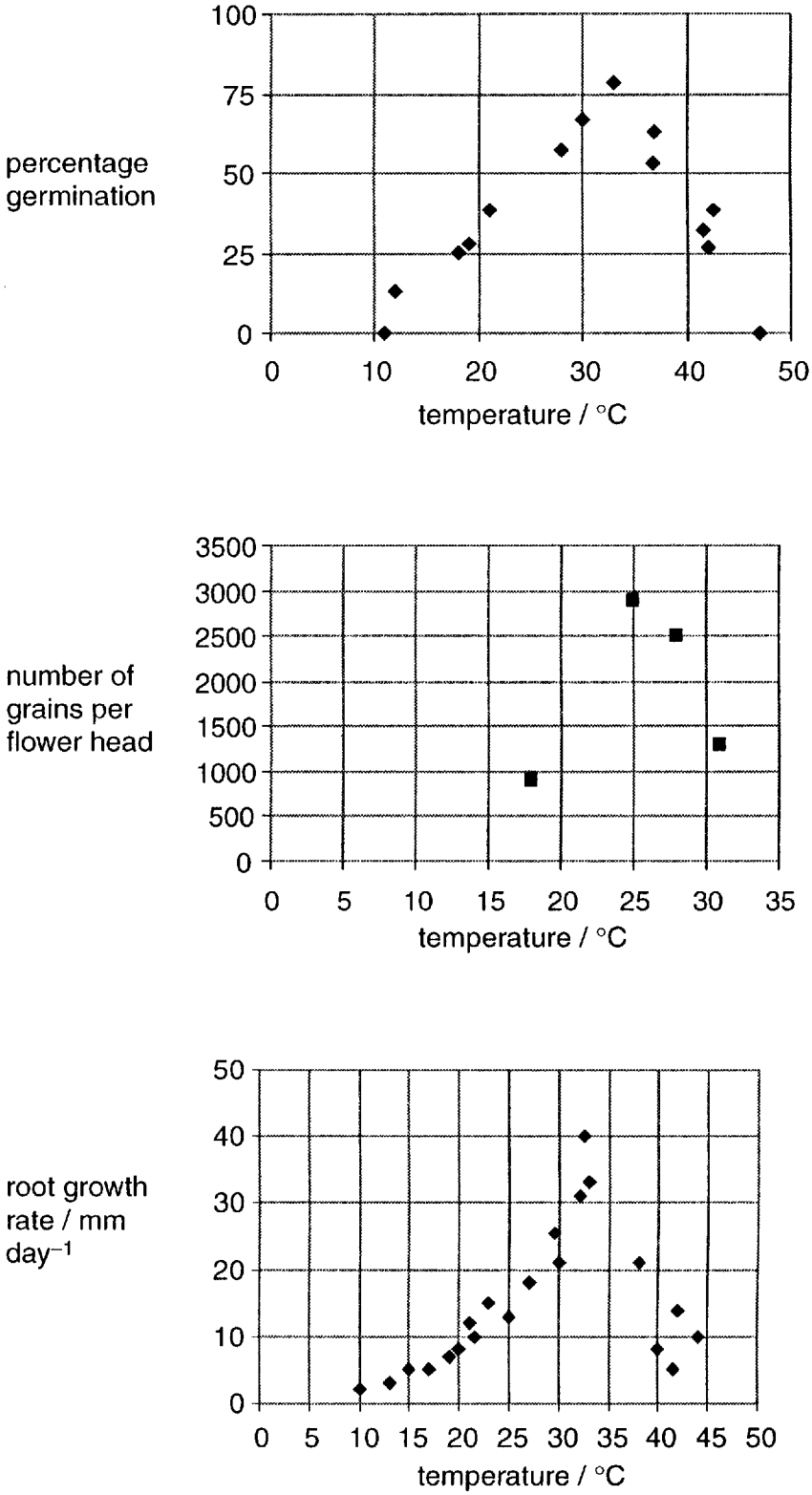

Fig. 5.1

For Examiner's Use

(a) In this question, one mark is available for the quality of written communication.

Describe the data shown in Fig. 5.1.
Use these data to determine the optimum climatic conditions for the growth of millet as a food crop.

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Quality of Written Communication [1]

[Turn over

For Examiner's Use

(b) Explain, **in detail**, how temperature may affect the metabolism of seeds so that fewer germinate when kept at 47 °C compared to 32 °C.

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(c) Describe the role of enzymes in root growth.

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[Total: 15]

For Examiner's Use

6 Some human stem cells can develop into any type of tissue, in a similar way to meristematic cells in plants. These cells are said to be *multipotent*. The possible use of stem cells to replace tissues damaged as a result of accident or degenerative disease has opened up exciting avenues of research. Stem cells may be obtained from human embryos, blood from the umbilical cord, and from the blood-forming tissue of adults. Stem cells may be collected and stored. The stored cells need to be cultured and tested before being reintroduced back into a patient.

(a) Describe **one** ethical objection to the use of stem cells from embryos.

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(b) Describe the main features of a *multipotent* stem cell.

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(c) Describe how a stem cell from blood-forming tissue could develop into an erythrocyte (red blood cell).

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Question 6 continues on page 22

For Examiner's Use

(d) Suggest how stem cells would be **cultured** and **tested**.

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[Total: 9]

END OF QUESTION PAPER