

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

BIOLOGY

2805/01

Growth, Development and Reproduction

Tuesday **31 JANUARY 2006** Afternoon 1 hour 30 minutes

Candidates answer on the question paper.

- Additional materials:
 Electronic calculator
 Ruler (cm/mm)

| | | | | | | | | | | | | | | |
|----------------|---|------------------|--|--|--|--|--|---|--|--|--|--|--|--|
| Candidate Name | Centre Number | Candidate Number | | | | | | | | | | | | |
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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 | 9 | |
| 2 | 16 | |
| 3 | 17 | |
| 4 | 17 | |
| 5 | 14 | |
| 6 | 17 | |
| TOTAL | 90 | |

This question paper consists of 19 printed pages, 1 blank page and an insert.

Answer all the questions.

1 (a) Fig. 1.1 shows the structure of a flower of the broad bean, *Vicia faba*.

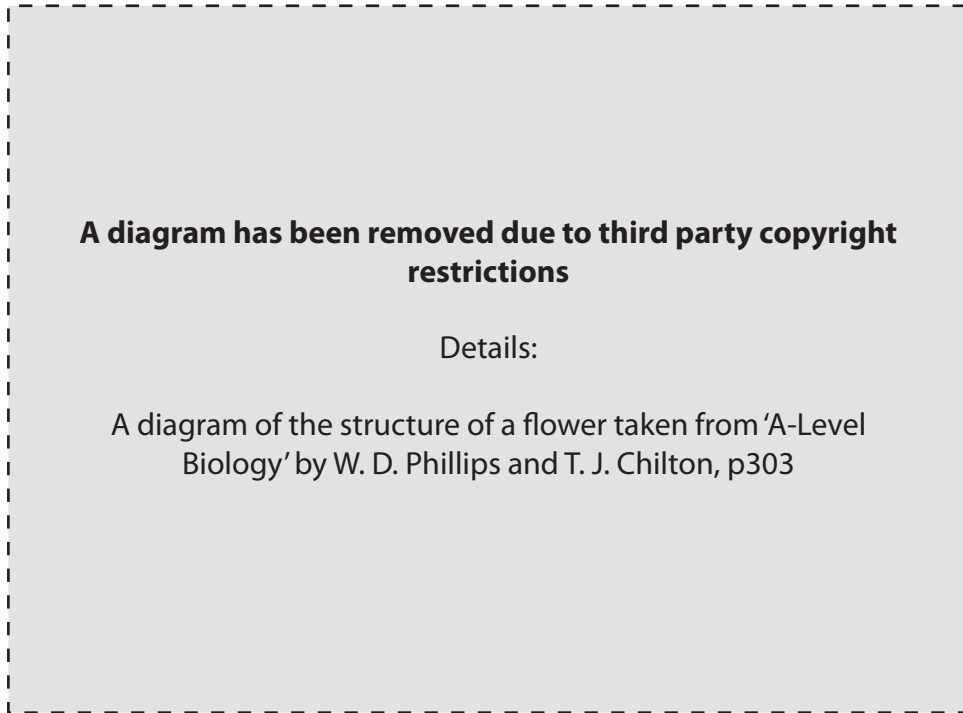


Fig. 1.1

(i) Name structures B to D in Fig. 1.1.

B

C

D [3]

(ii) *Vicia faba* is an insect-pollinated flower.

Describe one way in which the appearance of structure A would be different in a wind-pollinated flower.

.....

..... [1]

(b) Fig. 1.2 shows a transverse section of an unripe anther of Liliium.

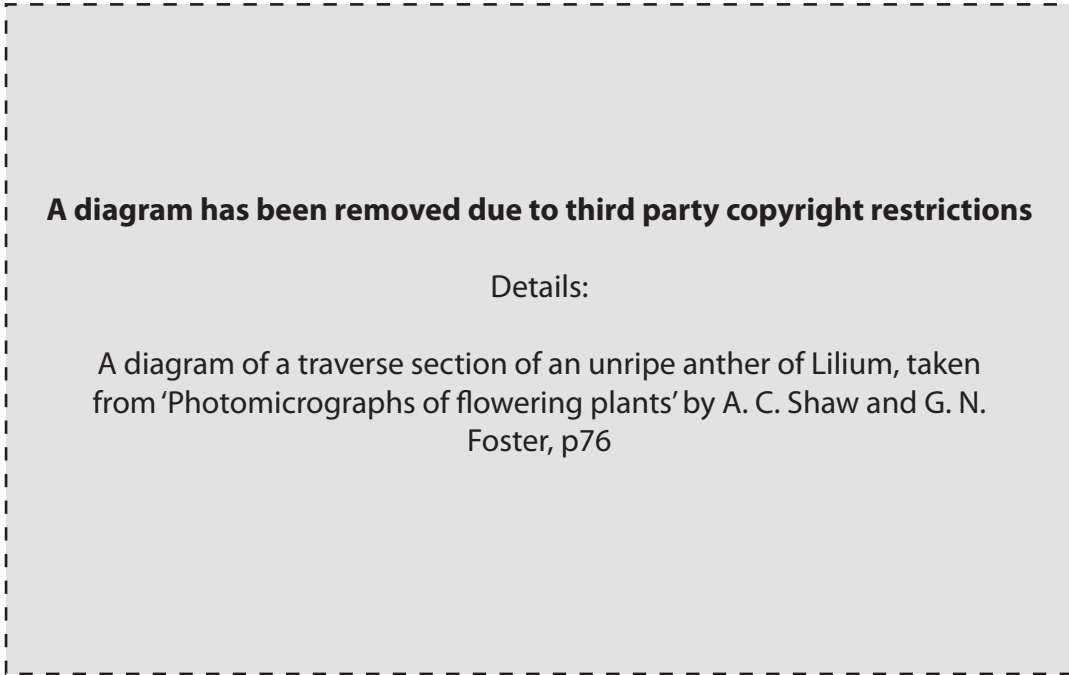


Fig. 1.2

Fig. 1.3, provided on an insert, is a photomicrograph of part of a pollen sac of Liliium.

(i) Describe how structure X, in Fig. 1.3, develops from one cell in the pollen sac.

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..... [3]

(ii) The cells in structure X develop into mature pollen grains.

Describe the structure of the outer wall of a mature pollen grain.

.....

.....

..... [2]

[Total: 9]

- 2 (a) One method of monitoring children’s growth is by measuring height at regular time intervals. The heights can be plotted to produce a growth curve.

Fig. 2.1 shows the mean growth curve obtained by measuring a large group of males between the ages of 2 and 20.

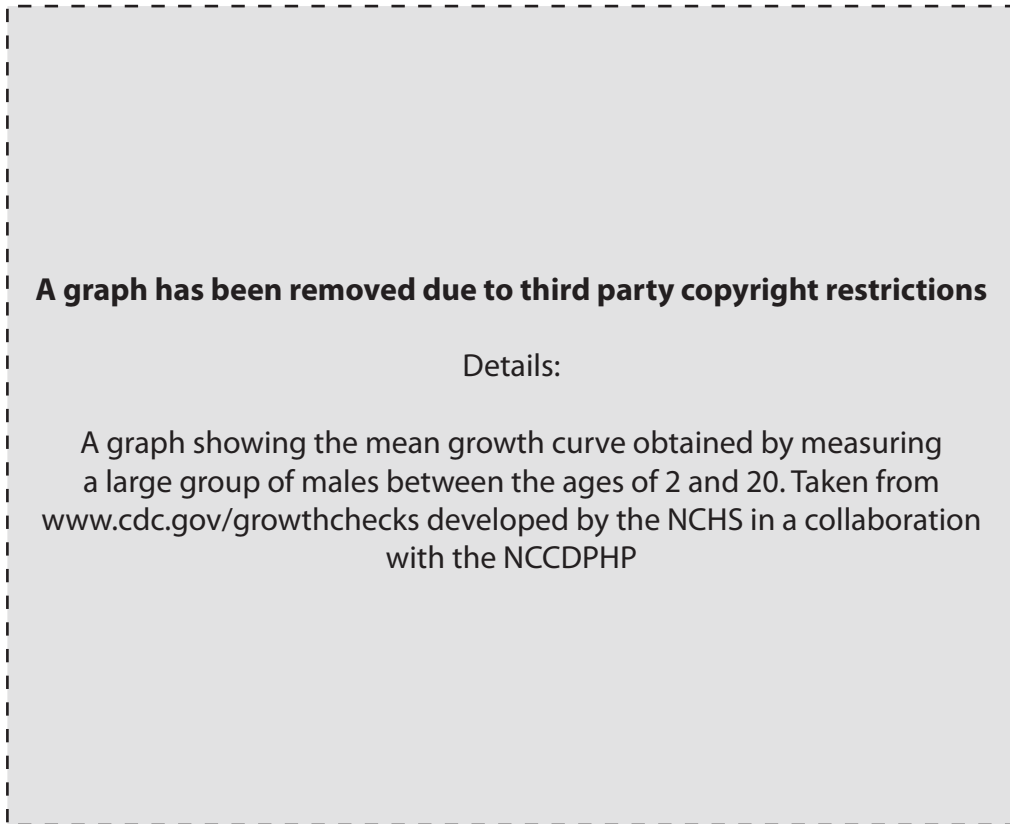


Fig. 2.1

- (i) Calculate the mean growth rate between the ages of 4 and 9 in cm yr^{-1} . Show your working.

Answer = cm yr^{-1} [2]

- (ii) A similar mean growth curve could be plotted for a large group of females between the ages of 2 and 20.

State one way in which the mean growth curve for females would differ from Fig. 2.1.

.....
 [1]

- (b) Before the age of two, children’s growth is usually monitored by measuring mass at regular time intervals. Table 2.1 shows the mean gain in mass for a child up to the age of 12 months.

Table 2.1

A table has been removed due to third party copyright restrictions

Details:

A table showing the mean gain in mass per month for children of different ages taken from www.kidsgrowth.com

- (i) Name the type of growth curve that would be obtained if the data in Table 2.1 were plotted on a graph.

..... [1]

- (ii) A baby aged 2 months has a mass of 5 kg.

During the next month, it gains mass at the mean rate.

Calculate the percentage increase in growth during that month. Show your working.

Answer =% [2]

- (iii) Regular monitoring of children’s growth is one way of checking healthy development.

Suggest two advantages of measuring mass rather than height to monitor children’s growth before the age of two years.

1

.....

2

..... [2]

- 3 (a) The process of oogenesis begins before birth when cells of the germinal epithelium in the ovary start to divide by mitosis. The cells that are produced grow and then begin to divide by meiosis.

The later stages of meiosis occur after puberty and at fertilisation.

Complete the table by naming the cells produced at each stage of oogenesis.

| stage of oogenesis | cells produced |
|--------------------|----------------|
| mitosis | oogonia |
| growth | |
| meiosis I | |
| meiosis II | |

[3]

- (b) Mitosis and meiosis also occur in **spermatogenesis**.

Explain the importance of mitosis and meiosis in the production of sperm.

mitosis

.....

.....

.....

.....

meiosis

.....

.....

.....

.....

..... [4]

(c)

An extract has been removed due to third party copyright restrictions

Details:

Taken from 'Biological Sciences Review' by Dr T Forde, p38

(i) Explain why an active corpus luteum is necessary in order for pregnancy to occur.

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..... [3]

(ii) A couple are hoping to conceive a child, so they are not using any form of contraception. Despite having a normal menstrual cycle, the otherwise healthy woman fails to become pregnant.

Suggest two possible reasons for this.

1

.....

2

..... [2]

4 (a)

An extract has been removed due to third party copyright restrictions

Details:

An extract from 'New Scientist' by D. Macklin about using cuttings from large trees to plant new forests.

(i) Explain the meaning of the term clone.

.....

.....

.....

..... [2]

(ii) State two advantages of using clones instead of saplings grown from seed.

1

.....

2

..... [2]

(iii) Each cutting is given a coating of auxin on its cut surface before it is planted in a rooting medium. This encourages the rooting process.

State two other commercial uses of auxin.

1

.....

2

..... [2]

- (iv) Auxin stimulates the growing roots to develop root hairs. These are projections from specialised epidermal cells.

Explain in detail why it is important for the cuttings to develop root hairs.

.....

.....

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.....

.....

..... [4]

- (b) Micropropagation has been used to produce clones of some pine trees. New plants are grown by culturing tissues from trees with high productivity. The tissues from the trees are grown in artificial conditions in a culture medium.

List **three** constituents of the culture medium.

1

2

3 [3]

- (c) One disadvantage of micropropagation is that it can be more expensive than traditional methods.

Suggest **three** factors which may contribute to this extra cost.

1

.....

2

.....

3

..... [3]

(d) Name **one** technique for producing clones of trees, other than taking cuttings, or micropropagation.

..... [1]

[Total: 17]

- 5 (a) The effect of temperature on the germination of seeds of a tropical legume, *Dolichos biflorus*, was investigated.

The mean germination rate of the seeds was determined, and the results are shown in Fig. 5.1.

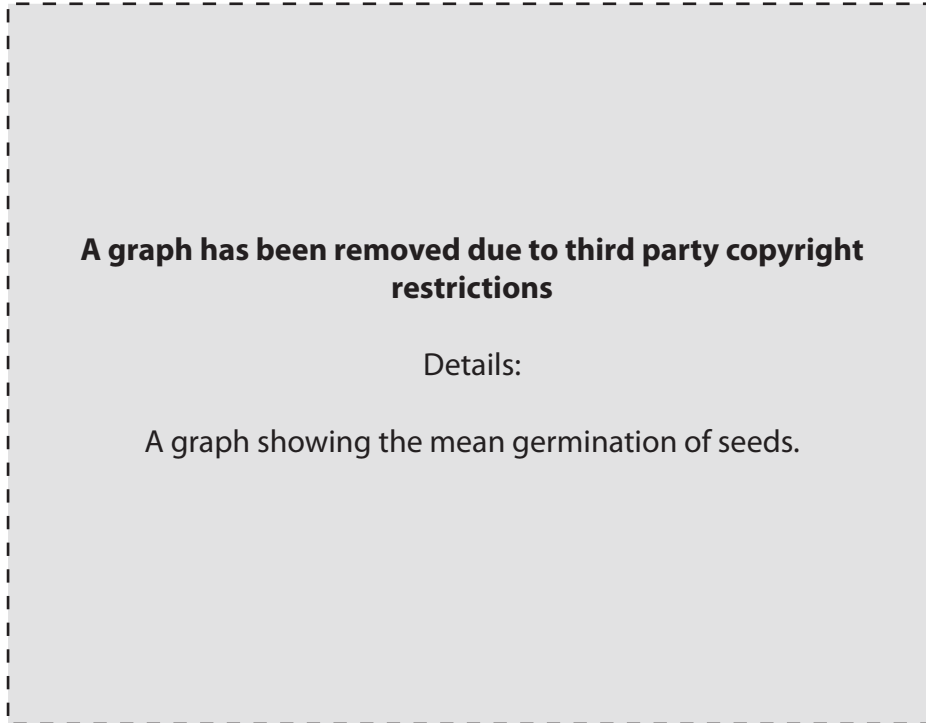


Fig. 5.1

(i) Describe the trends shown by the graph in Fig. 5.1.

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..... [2]

(ii) Explain why temperature affects the mean germination rate.

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..... [4]

(b) 'Biological Science 1 and 2' by D J Taylor, p763 - Stimulation of... ..inhibited by light.

Suggest one advantage of inhibition of germination by light.

.....

..... [1]

- 6 During pregnancy, women are given advice about their diet in order to keep themselves and their unborn babies healthy.

Table 6.1 shows suggested nutrient intakes for three nutrients for pregnant women of different ages.

Table 6.1

| age of pregnant women / years | calcium / mg day ⁻¹ | iron / mg day ⁻¹ | vitamin A / µg day ⁻¹ |
|-------------------------------|--------------------------------|-----------------------------|----------------------------------|
| 17–18 | 800 | 14.8 | 700 |
| 19–50 | 700 | 14.8 | 700 |

- (a) (i) Suggest why the values for calcium vary with age.

.....

 [2]

- (ii) Suggest, and give a reason for, **one other specific piece of dietary advice** that could be given to pregnant women.

advice

 reason
 [2]

- (b) Describe the **mechanisms** by which nutrients are transported across the placenta to the fetus.

.....

 [5]

- (c) During pregnancy, a woman must supply approximately 300 mg of iron to the growing fetus. Despite this, healthy women do not normally need to include extra iron in their diets. However, during routine blood tests in pregnancy, the haemoglobin concentration of the blood is measured.

If blood haemoglobin concentration falls below 110 g dm^{-3} , a woman is considered to be anaemic and iron supplements are usually prescribed.

- (i) State **two** reasons why healthy pregnant women do not normally need to provide extra iron in their diets.

1

.....

2

..... [2]

- (ii) Explain the possible consequences for the fetus if the mother is anaemic during pregnancy.

.....

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..... [4]

- (d) Haemolytic disease of the newborn can occur if red blood cells are broken down too rapidly.

This is caused by antibodies, produced by the mother, crossing the placenta into the fetal circulation.

Suggest how antibodies cause the breakdown of red blood cells in haemolytic disease of the newborn.

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..... [2]

[Total: 17]

END OF QUESTION PAPER

Copyright Acknowledgements:

- Fig. 1.1 diagram adapted from © WD Phillips & TJ Chilton; *A Level Biology*; p303; Oxford University Press; 1989
Fig. 1.2 © AC Shaw, SK Lazell & GN Foster; *Photomicrographs of flowering plants*; p 76; published by Longman (1965), Copyright Pearson Education Ltd
Fig. 1.3 © Biophoto Associates
Fig. 2.1& graph adapted from © <http://www.cdc.gov/growthcharts>; developed by NCHS in collaboration with NCCDPHP; 30 May, 2000
Table 2.1 data source © www.kidsgrowth.com
Q3c text adapted from © Dr T Forde; *Biological Sciences Review*; p 38; Vol 13 no 3; Philip Allan Publishers Ltd; 2001
Q4 text adapted from © DMacklin, *New Scientist*; Dec 1989, volume 124 issue 1693
Q5b text adapted from © DJTaylor, NP O Green & GWS Stout; *Biological Science 1&2*; p 763; 1984; Cambridge University Press
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