

OXFORD CAMBRIDGE AND RSA EXAMINATIONS**Advanced GCE****BIOLOGY****2805/01**

Growth, Development and Reproduction

Monday

31 JANUARY 2005

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	14	
2	17	
3	14	
4	23	
5	11	
6	11	
TOTAL	90	

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

Answer all the questions.

- 1 The thyroid gland is made up of many follicles. Each follicle consists of a single layer of secretory epithelial cells surrounding a cavity (the lumen). The secretion, a colloid called thyroglobulin, is stored in the lumen of the follicle.

Fig. 1.1 is a drawing of a section through follicles in the thyroid gland.

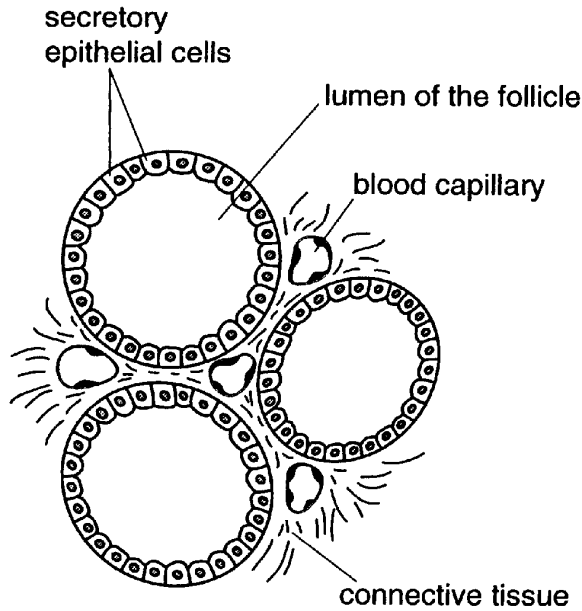


Fig. 1.1

- (a) (i) State the features of an endocrine gland, using the information on Fig. 1.1.

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..... [3]

- (ii) Explain the advantage of storing thyroxine molecules as thyroglobulin.

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..... [2]

2 (a) Most of the research on the **ripening** of fruit has been conducted on tomatoes.

Explain the advantage of enclosing seeds in a fruit like the tomato.

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(b) It has been discovered that as tomato fruits ripen, the following changes occur:

- the rate of respiration increases;
- chlorophyll production stops;
- starch is converted into simple sugars;
- ethene production increases and is released into the environment;
- more of the red pigment lycopene is synthesised;
- the concentration of polygalacturonase, an enzyme which breaks down the pectin in the cells walls, increases.

Explain how the changes outlined above allow the tomato fruits to carry out their function.

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(c) Cell walls of tomato fruits contain cellulose that is also broken down as the fruits soften. Tomato fruits do **not** have a cellulose-digesting enzyme.

(i) Suggest why tomato fruits do not contain a cellulose-digesting enzyme.

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..... [1]

- 3 (a) Crayfish are a type of freshwater crustacean. An American species of crayfish has a distinctive marbled appearance and is able to reproduce asexually as well as sexually. This is an interesting feature, as asexual reproduction is rare in the animal kingdom.

This crayfish was introduced into Europe from America in the 1990s. The introduction of the American crayfish to European fresh water is considered a serious danger to the European species of crayfish.

Outline reasons to explain why this crayfish is 'considered a serious danger to the European species of crayfish'.

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- (b) *Penicillium camemberti* is a fungus which grows on Camembert cheese, giving the cheese its characteristic flavour.

(i) Describe how a fungus reproduces asexually.

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- (ii) *Penicillium* feeds by growing hyphae over the surface of the cheese, making the cheese softer. The fungal hyphae then absorb the soluble nutrients.

Describe how the protein and fat in the cheese are broken down by the fungus so that the soluble nutrients may be absorbed.

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- (iii) *Penicillium* was formerly classified as a plant. Explain why fungi should **not** be classified as plants.

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[Total: 14]

4 (a) Fig. 4.1 shows part of a section of a seminiferous tubule.

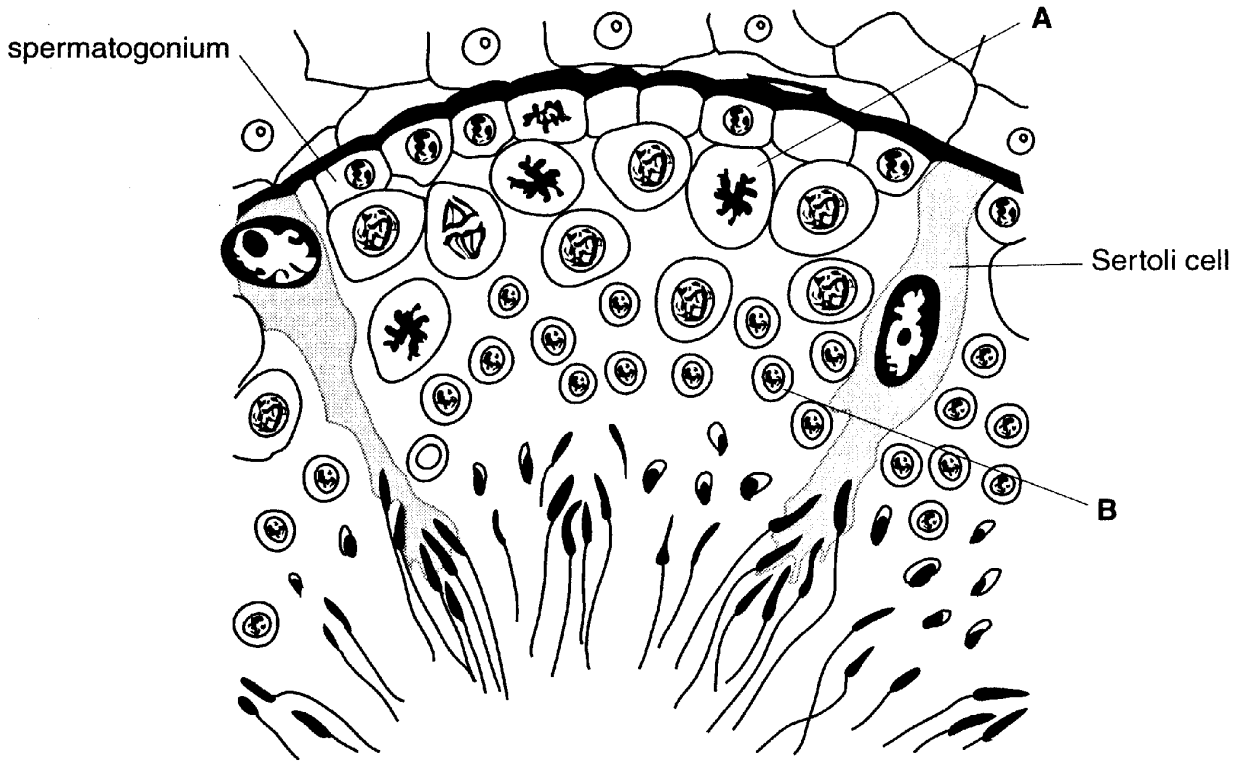


Fig. 4.1

Name the cells labelled A and B.

A

B

[2]

(c) Fig. 4.2 is a drawing of a human sperm in longitudinal section.

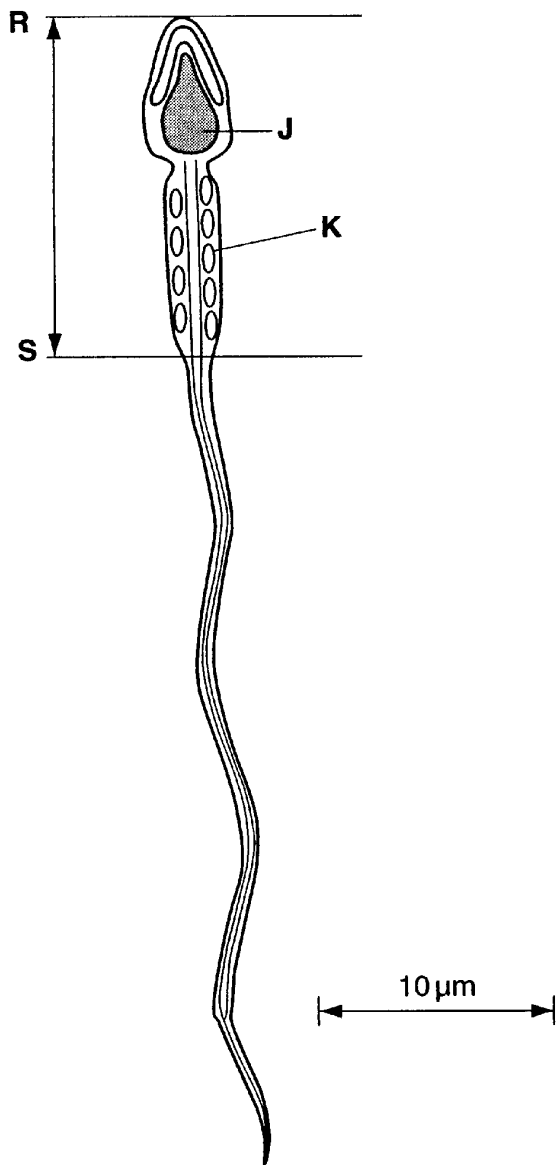


Fig. 4.2.

- (i) Calculate the actual distance between R and S shown on Fig. 4.2.
Show your working and give your answer to the nearest 0.1 of a micrometre (μm).

Answer = μm [2]

(ii) Describe the contents of structure J.

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(iii) Outline the function of the structure labelled K.

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- (d) Dioxin has long been recognised as an extremely toxic substance which, amongst other things, affects the reproductive system in humans.

In 1976, an industrial accident resulted in a massive release of dioxin into the air around a factory in Europe. The concentration of dioxin gas in the air breathed by the local population became twenty times higher than the normal level.

An investigation was conducted between 1977 and 1996 on the population surrounding the factory to discover:

- if exposure to dioxin changed the proportion of male and female births
- whether the father's or the mother's exposure had the greatest effect on the proportion of male and female births.

The results of this investigation are shown in Table 4.1.

Table 4.1

concentration of dioxin in father's blood / ppt	concentration of dioxin in mother's blood / ppt	number of male births	number of female births	proportion of male births in total births
not exposed	not exposed	31	30	
15	15	96	121	0.442
15	not exposed	81	105	0.435
not exposed	15	120	117	0.506

ppt = parts per trillion

- (i) Calculate the proportion of male births in the total sample, where neither the father nor the mother was exposed to dioxin, and write the answer in Table 4.1. Show your working in the space below.

[2]

5 Fig. 5.1 shows pollen clustering around the stigmas of Morning Glory, *Ipomoea purpurea*.

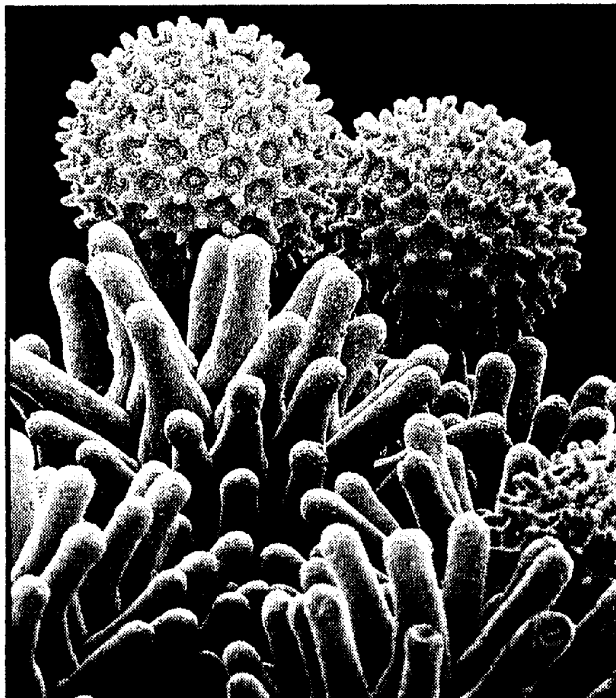


Fig. 5.1

(a) Explain how the stigma of Morning Glory avoids pollination by other plant species.

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(b) Describe how the male gamete in the pollen grain reaches the female gamete in the ovule.

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(c) Describe the process of fertilisation in a flowering plant, such as Morning Glory, and explain its importance in the life cycle of the plant.

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[Total: 11]

6 (a) (i) State what is meant by the term *growth*.

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(ii) Explain how you would determine the **relative** growth rate of a small mammal.

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Question 6 is continued on page 18

- (b) The gestation period (the time from conception to birth) can be divided into three sections. These are called trimesters.

Some pregnant cows were divided into four groups, **A**, **B**, **C** and **D**. Each group was fed different concentrations of protein supplement in each trimester as follows:

- A** High protein in all three trimesters (HHH).
- B** High protein in the first two trimesters
Low protein in the third trimester (HHL).
- C** High protein in the first trimester
Low protein in the second trimester
High protein in the third trimester (HLH).
- D** Low protein in all three trimesters (LLL).

The mean mass of the calves at birth was then determined for each sample.

Fig. 6.1 shows the results of this experiment.

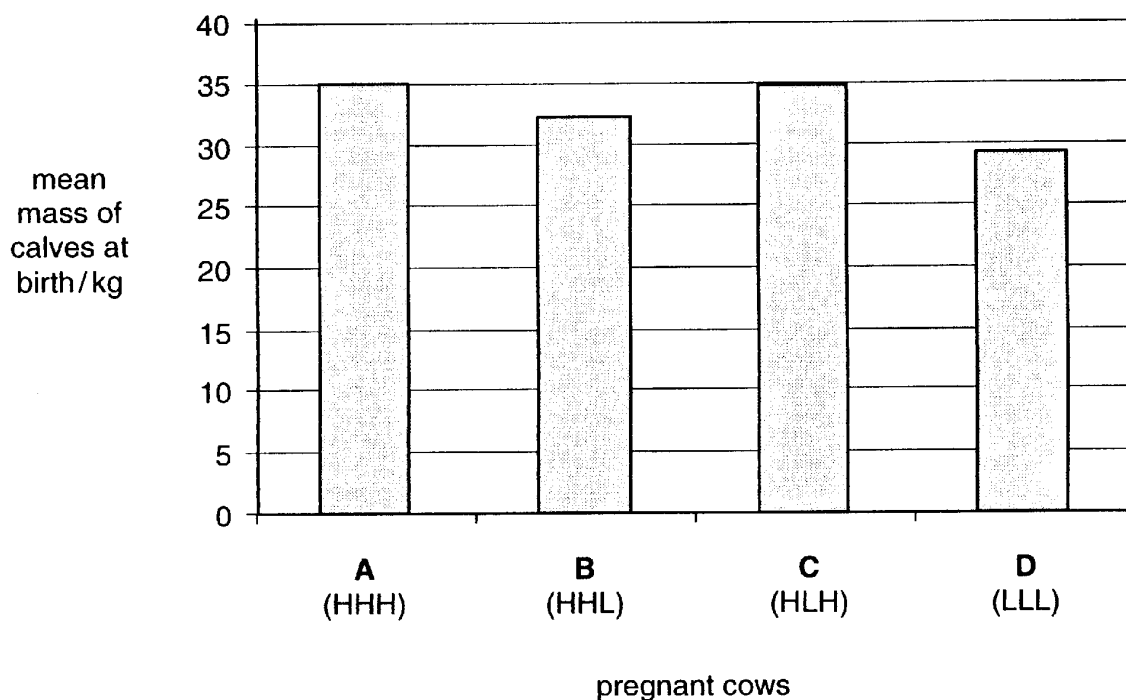


Fig. 6.1

