

**ADVANCED GCE  
BIOLOGY**

Growth, Development and Reproduction

**MONDAY 28 JANUARY 2008**

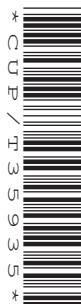
**2805/01**

Morning

Time: 1 hour 30 minutes

Candidates answer on the question paper.

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



Candidate  
Forename

Candidate  
Surname

Centre  
Number

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Candidate  
Number

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**INSTRUCTIONS TO CANDIDATES**

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

**INFORMATION FOR CANDIDATES**

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 90.
- 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	13	
2	18	
3	17	
4	11	
5	17	
6	14	
<b>TOTAL</b>	<b>90</b>	

This document consists of **18** printed pages, **2** blank pages and an insert.

**2**  
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Answer **all** the questions.

- 1 (a) There are examples of asexual reproduction in each of the five kingdoms.

Table 1.1 shows some methods of asexual reproduction.

Complete the table to show a kingdom in which each method occurs.

**Table 1.1**

method of asexual reproduction	kingdom
structures such as tubers are produced	.....
cells divide by binary fission	.....
spores are formed and dispersed by air currents	.....

[3]

- (b) Give **two** features shown by all organisms classified in the Kingdom Animalia.

1 .....

.....

2 .....

..... [2]

- (c) Asexual reproduction in the Kingdom Animalia is rare.

- (i) Name **one** organism from the Kingdom Animalia which reproduces asexually.

..... [1]

- (ii) Describe how the organism you have named in (c)(i) reproduces asexually.

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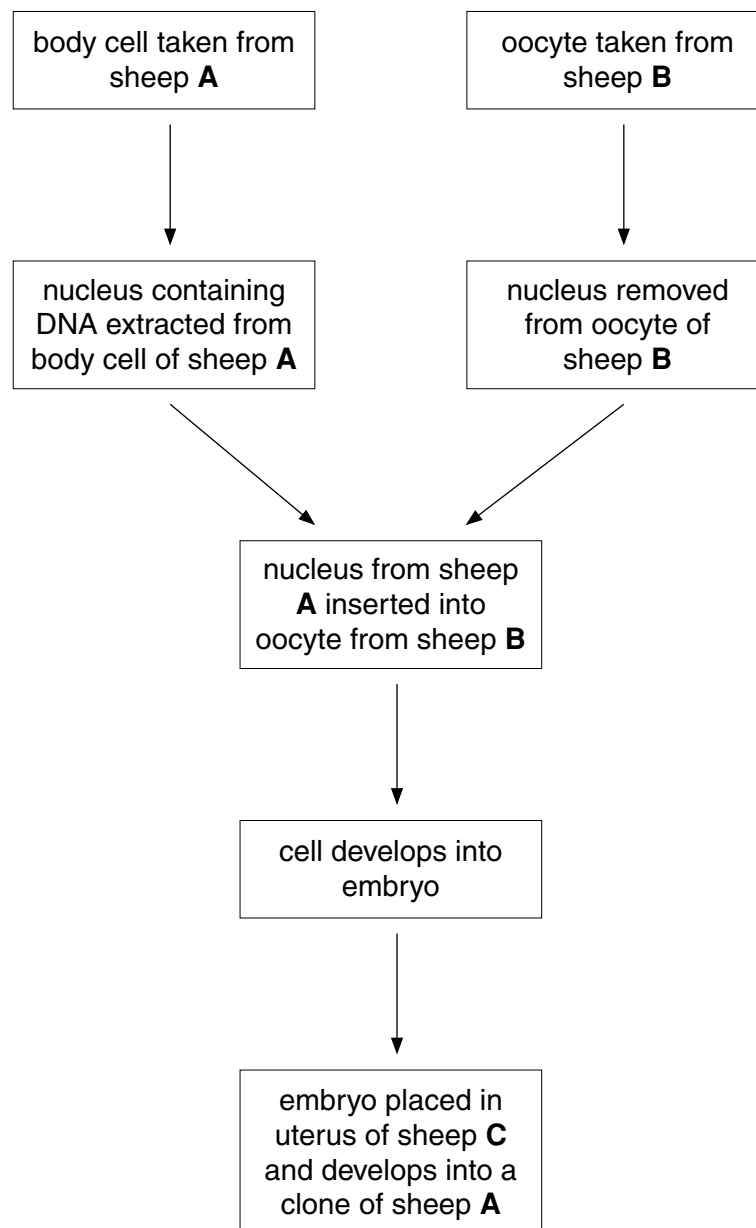
..... [3]

(iii) State **two** advantages of asexual reproduction.

- 1 .....
- .....
- 2 .....
- ..... [2]

(d) The first cloned sheep was produced in the UK.

Fig. 1.1 shows some steps of the cloning process in sheep.



**Fig. 1.1**

- (i) Suggest a reason for removing the nucleus from the oocyte of sheep **B**.

.....  
..... [1]

- (ii) Suggest why an oocyte, rather than a body cell from sheep **B**, is used in the process shown in Fig. 1.1.

.....  
..... [1]

[Total: 13]

- 2 In this question, one mark is available for the quality of spelling, punctuation and grammar.

Fig. 2.1, **on the insert**, shows a string of mature pollen grains released by ripe anthers of the evening primrose, *Oenothera biennis*.

- (a) Describe the roles of meiosis **and** mitosis in the production of pollen grains such as those shown in Fig. 2.1.

meiosis .....

.....

.....

.....

.....

.....

.....

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mitosis .....

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..... [7]

Quality of Written Communication [1]

- (b) Fig. 2.2, **on the insert**, shows flowers of *O. biennis* in daylight and in UV light.

Using Fig. 2.1 and Fig. 2.2, explain how the flowers **and** pollen of *O. biennis* are adapted for insect pollination.

.....

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.....

..... [3]

- (c) Flowering plants have mechanisms that favour cross-pollination. For example, common holly, *Ilex aquifolium*, has separate male and female **plants**.

- (i) State the term used to describe plants that have separate male and female **plants**.

..... [1]

- (ii) Suggest **one disadvantage** to *I. aquifolium* of having separate male and female plants.

.....

..... [1]

- (iii) Name **one other** mechanism that favours cross-pollination in flowering plants.

..... [1]

- (d) Cross-pollination in flowering plants increases variation in the offspring.

Explain why variation is important for selection.

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..... [4]

[Total: 18]



- 3 (a) After sexual intercourse, sperm pass through the uterus towards the oviduct. During this passage a process called capacitation occurs.

Describe the process of capacitation.

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.....

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.....

.....

..... [3]

- (b) The structure of sperm is adapted to allow them to reach the oviduct **and** fertilise a secondary oocyte.

Describe the functions of the mitochondria **and** the acrosome of the sperm in these processes.

mitochondria .....

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acrosome .....

.....

.....

.....

.....

..... [5]

(c) The following information is about some of the stages of *in vitro* fertilisation (IVF).

- This treatment may be suitable for women with blocked or damaged oviducts.
- A hormone is given to suppress the ovaries.
- Other hormones stimulate several secondary oocytes to develop.
- The oocytes are collected by passing a thin needle, through the vagina or through the wall of the abdomen, into the ovary.
- The oocytes are mixed with sperm and are checked under a microscope after 12 to 18 hours to see if they have been fertilised.
- One or more embryos are introduced into the uterus through the cervix.

(i) State **one** possible cause of blocked or damaged oviducts.

.....  
 ..... [1]

(ii) Suggest **one** reason for suppressing the ovaries at the start of the treatment.

.....  
 ..... [1]

(iii) State **one** way in which the oocyte collection process could be a risk to health.

.....  
 ..... [1]

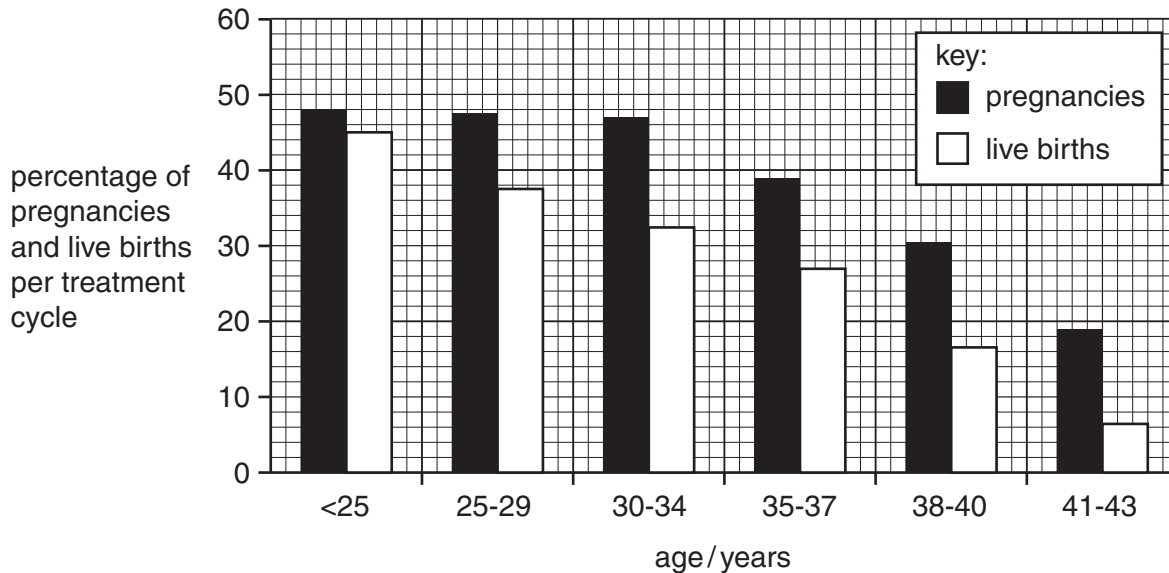
(iv) Suggest **one** advantage and **one** disadvantage of introducing more than one embryo into the uterus.

advantage .....  
 .....  
 .....  
 disadvantage .....  
 .....  
 ..... [2]

- (d) Several factors affect the success rates of IVF treatment, including the age of the women.

At one IVF clinic, over 1000 treatment cycles were monitored. The numbers of pregnancies and live births were recorded as a percentage of the number of treatment cycles. The results were plotted against the age of the women.

The results are shown in Fig. 3.1.



**Fig. 3.1**

Describe **and** explain the results shown in Fig. 3.1.

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.....

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..... [4]

[Total: 17]

- 4 (a) Fig. 4.1, **on the insert**, shows a longitudinal section through part of a root tip of *Lilium*.

Three areas of the root tip in Fig. 4.1 are labelled **A**, **B** and **C**.

A student chose ten cells at random from each of the areas **A**, **B** and **C** of several root tips.

Using a microscope with an eyepiece graticule, the student measured the length and width of each cell.

The mean results are shown in Table 4.1.

**Table 4.1**

area of root tip	mean cell length/ $\mu\text{m}$	mean cell width/ $\mu\text{m}$
<b>A</b>	171.0	101.5
<b>B</b>	113.5	99.0
<b>C</b>	86.5	91.0

- (i) Calculate the percentage increase in mean cell length between area **C** and area **A**.  
Show your working.

Answer = ..... % [2]

- (ii) Describe how the changes in cell size, shown in Table 4.1, occur.

.....

.....

.....

.....

.....

..... [3]

(b) Root tip cells contain the enzyme sucrase (invertase) which converts sucrose into glucose and fructose.

- Sucrase is secreted through cell membranes into cell walls.
- Hydrogen ions are also secreted into cell walls.
- Glucose and fructose are taken up by the cells through their membranes.

(i) Explain how sucrose is converted into glucose and fructose by sucrase.

.....

.....

.....

.....

.....

..... [3]

(ii) Suggest the role of hydrogen ions in this reaction.

.....

..... [1]

(iii) Describe **two** functions of glucose and fructose in the root tip.

1 .....

.....

2 .....

..... [2]

[Total: 11]

**14**  
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- 5 (a) Complete the table below to show **one** function of each of the named structures in the female reproductive system.

structure	function
vagina	
cervix	
wall of uterus	
oviduct (fallopian tube)	
fimbriae	

[5]

- (b) The ovaries are described as endocrine glands.

State **two** reasons why ovaries are described as endocrine glands.

1 .....

.....

2 .....

..... [2]

A diagram illustrating the changes in the uterine lining (endometrium) over a 28-day menstrual cycle. The x-axis represents the days of the cycle, numbered 1 to 28. The y-axis represents the thickness of the lining. The diagram shows the progression of the menstrual cycle, including menstruation (days 1-5), the proliferative phase (days 6-14), and the secretory phase (days 15-28). The lining is shown as a series of wavy lines, with the thickness increasing significantly during the secretory phase, peaking around day 24, and then shedding during menstruation.

Describe the changes shown in Fig.5.1 **and** explain how they are brought about by hormones.

This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



**(d)** If a woman's diet is deficient in certain nutrients, her menstrual cycles may be affected.

Suggest **two** specific nutrients needed for a normal menstrual cycle.

In each case give a reason for your answer.

nutrient 1 .....

reason .....

nutrient 2 .....

reason .....

..... [2]

[Total: 17]

- 6 The cultivation of tomatoes is a major industry and this has resulted in considerable research in order to produce a product that arrives in the shops at a perfect stage of ripening.

- (a) Two students were discussing tomatoes. The first student stated that a tomato is a fruit. The second student disagreed with this statement.

State **one** piece of evidence to support the first student's statement.

.....  
 ..... [1]

- (b) Fig. 6.1, **on the insert**, shows a section through a ripe tomato.

Each of the structures **X**, **Y** and **Z**, labelled in Fig. 6.1, developed from a structure present in the **flower**.

Name the structures present in the **flower** that developed into **X**, **Y** and **Z**.

**X** .....  
**Y** .....  
**Z** ..... [3]

- (c) The ripening process in tomatoes is controlled by many genes including genes **P** and **Q**.

Gene **P**, when activated, starts a series of enzyme-controlled reactions that produce ethene.

Gene **Q** codes for pectinase, an enzyme that breaks down calcium pectate in cell walls of tomatoes.

- (i) Suggest how genes **P** and **Q** are activated during the ripening process.

.....  
 .....  
 .....  
 ..... [2]

- (ii) Suggest how inhibition of gene **Q** may slow down the ripening of tomatoes.

.....

.....

.....

..... [2]

- (iii) State **two other** ways of slowing down the ripening of tomatoes.

1 .....

.....

2 .....

..... [2]

- (iv) Suggest **one** commercial advantage of slowing down the ripening of tomatoes.

.....

..... [1]

- (d) It is important to all fruit growers that the fruit does not fall from the plants too early.

Fruit fall is controlled in a similar way to leaf fall.

Describe the role of plant growth regulators in the control of fruit fall.

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..... [3]

[Total: 14]

**END OF QUESTION PAPER**

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*Copyright Acknowledgements:*

Fig. 3.1                      Source: Hôpital Erasme, Université Libre de Bruxelles, <http://www.ulb.ac.be/erasme/>  
Fig. 5.1                      Adapted from C.J. Clegg and D.G. Mackean, *Advanced Biology Principles and Applications*, p 601, John Murray Publishers, 1994.  
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