

**ADVANCED GCE
BIOLOGY**

Growth, Development and Reproduction

WEDNESDAY 18 JUNE 2008

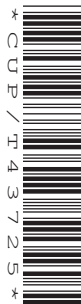
2805/01

Afternoon

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.
- 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	14	
2	17	
3	18	
4	14	
5	16	
6	11	
TOTAL	90	

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

Answer **all** the questions.

1 Hormones are involved in the control of human growth, development and reproduction.

(a) (i) Complete Table 1.1 to show **one** site of production of each of the named hormones.

Table 1.1

hormone	one site of production
progesterone
testosterone
gonadotrophin releasing hormone (GnRH)

[3]

(ii) Each of the hormones shown in Table 1.1 is involved in a negative feedback mechanism. State what is meant by the term *negative feedback*.

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..... [2]

- (b) When a baby suckles during breastfeeding, a woman may feel contractions of the uterus. This effect is caused by the hormone, oxytocin.

Explain how suckling causes the secretion of oxytocin **and** how oxytocin causes the contractions of the uterus.

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..... [4]

- (c) Human breast milk contains nutrients including lipids.

- (i) State **two** reasons why lipids are necessary for a growing baby.

1

2 [2]

- (ii) Breast milk contains essential and non-essential fatty acids.

Explain why breast milk contains essential fatty acids.

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- (iii) Suggest **one** advantage, **to a baby**, of being breastfed rather than bottle-fed.

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..... [1]

[Total: 14]

2 (a) Fig. 2.1 shows a human fetus within the uterus.

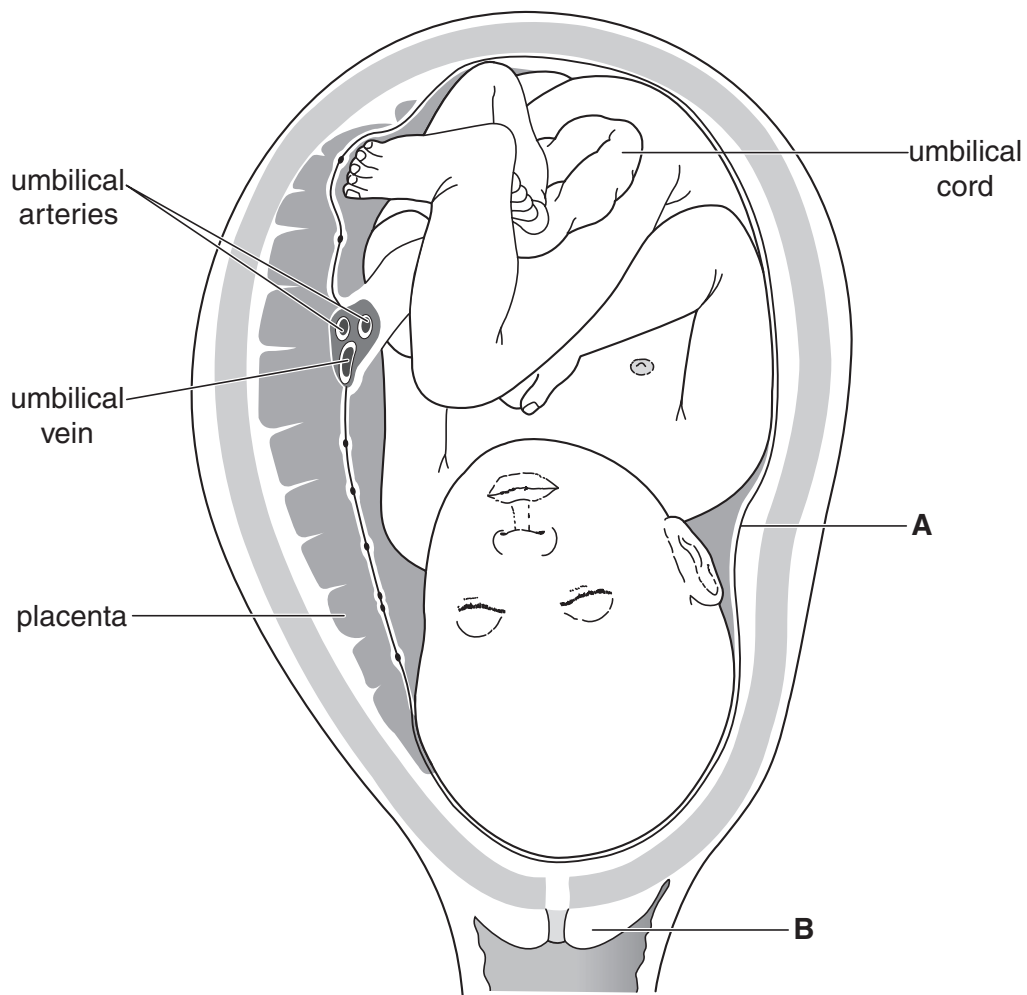


Fig. 2.1

(i) State **two** functions of the fluid secreted by structure **A** during pregnancy.

1

2 [2]

(ii) State **one** function of structure **B** during labour.

..... [1]

- (iii) Exchange of substances between the mother and the fetus occurs in the placenta.

Describe how the structure of the placenta is adapted for this function.

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..... [3]

- (iv) The umbilical cord contains two arteries and one vein.

State **two** ways in which the **composition** of blood in the umbilical arteries differs from the **composition** of blood in the umbilical vein.

1

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2

..... [2]

(b) The birth mass of babies is affected by many factors. Scientists in Peru investigated the relationship between altitude and birth mass.

- Data were collected from 11 communities at altitudes between 120 and 4250 metres.
- The partial pressure of oxygen in the atmosphere was measured at each altitude.
- The birth masses of babies born at each altitude were measured and the mean values calculated.
- Stillborn and premature babies were not included in the data.

The results are shown in Table 2.1.

Table 2.1

altitude / m	partial pressure of oxygen / kPa	mean birth mass of babies / g
120	100.28	3240
900	91.51	3260
1400	85.92	3230
2390	76.21	3110
2950	70.89	3200
3100	69.83	3120
3600	65.31	3000
4080	61.98	3150
4100	61.45	3090
4200	60.52	3150
4250	59.86	2910

(i) Calculate the percentage reduction in mean birth mass between 120 metres and 4250 metres.

Show your working and give your answer **to one decimal place**.

Answer = % [2]

- (ii) The scientists concluded that the reduction in mean birth mass was due mainly to oxygen supply.

Describe the results shown in Table 2.1 **and** suggest an explanation for these results.

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..... [5]

- (iii) The scientists stated that other factors could affect the birth masses of babies.

Suggest **two** factors, **other than altitude**, that could affect the birth masses of the babies investigated in this study.

1

2 [2]

[Total: 17]

A group of students wish to investigate the effect of different concentrations of nitrate on the growth of wheat seedlings, by measuring the change in their dry mass.

Describe **one** method that the students could use to measure the dry mass **and** explain how the data collected could be plotted on graphs to produce growth curves.

..... [7

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Fig. 3.1 shows mung beans, *Vigna radiata*, at two different stages of early growth of the seedlings.

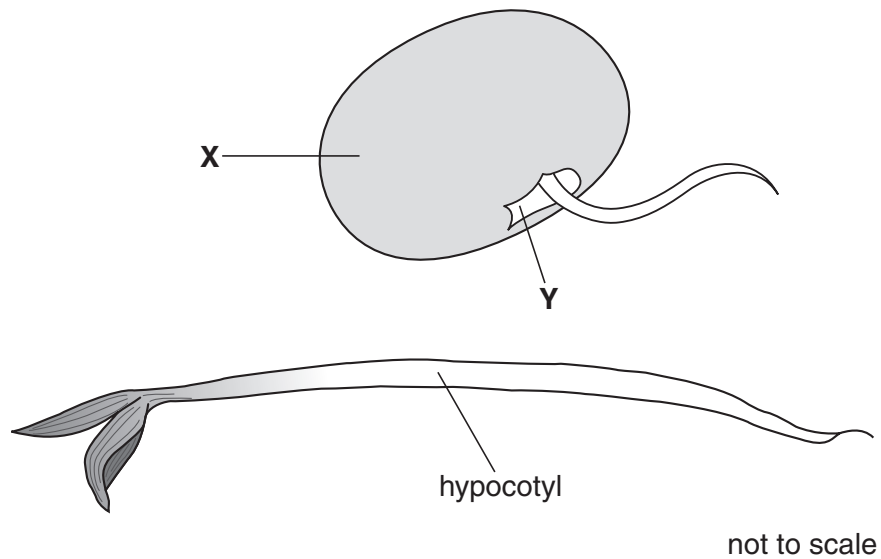


Fig. 3.1

(b) Name the parts of the seedling labelled **X** and **Y** in Fig. 3.1.

X

Y [2]

(c) Growth of mung beans can be investigated by measuring the length of the hypocotyls. Measuring the length of the hypocotyls is quicker and easier than measuring dry mass.

State **one other** advantage of measuring the length of the hypocotyls rather than measuring dry mass.

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..... [1]

(d) Scientists carried out an investigation into the growth of mung beans.

- The lengths of the hypocotyls were measured each day for 12 days after sowing. Each day the mean lengths were calculated.
- The concentrations of gibberellin in the seedlings were measured at the same time.

The results are shown in Fig. 3.2.

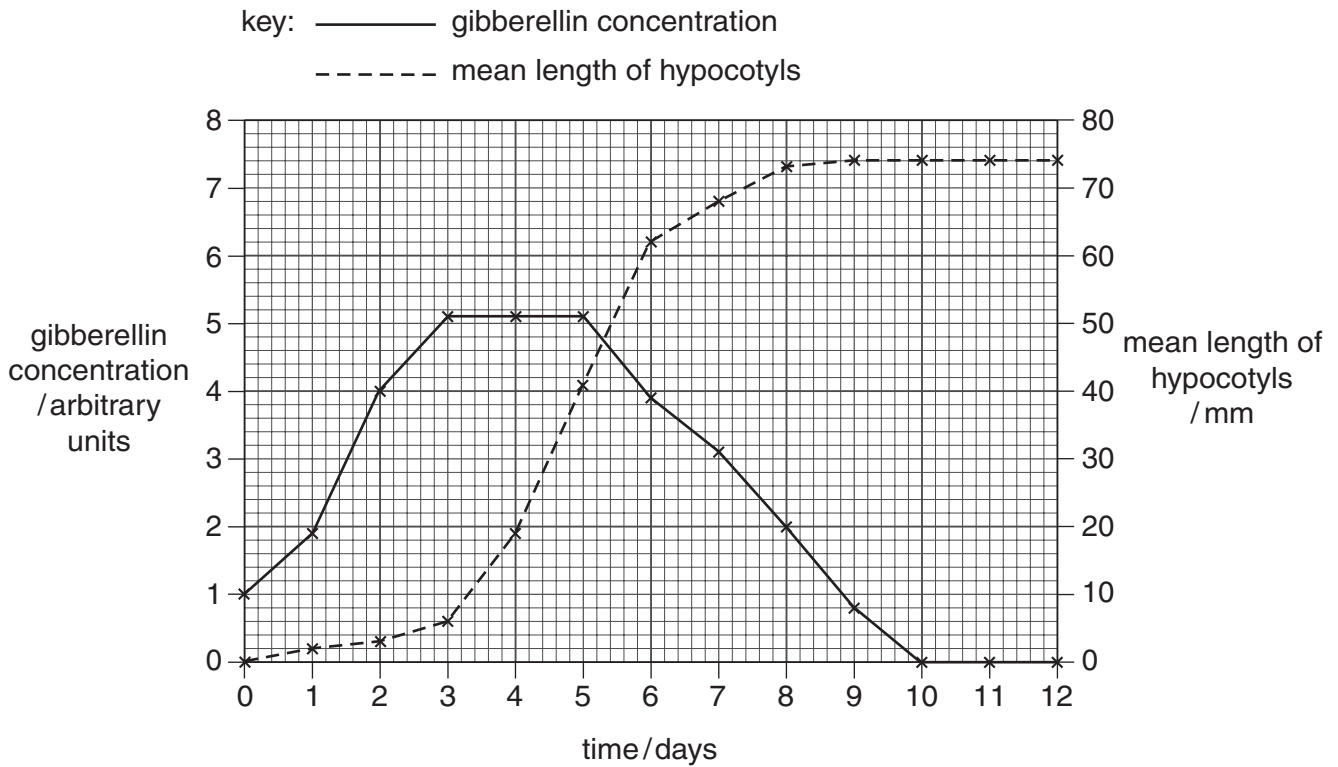


Fig. 3.2

- (i) Calculate the rate of growth of the hypocotyls, in mm per day, between days 4 and 6.
Show your working and give your answer **to one decimal place**.

Answer = mm per day [2]

- (ii) Describe **and** explain the trends shown in Fig. 3.2.

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..... [5]

[Total: 18]

- 4 Many plants flower in response to changes in day length. This effect has been shown to be due to pigments called phytochromes. Two forms of phytochrome have been identified, P_R and P_{FR} .

P_R and P_{FR} can be converted from one form to the other, in response to differences in daylength.

- (a) Cocklebur, *Xanthium strumarium*, a short-day plant, has been used to study the effects of day length on flowering.

Cocklebur plants were treated with varying conditions of light and dark. In some treatments, periods of darkness were interrupted by flashes of light.

Fig. 4.1 shows the results of this investigation.

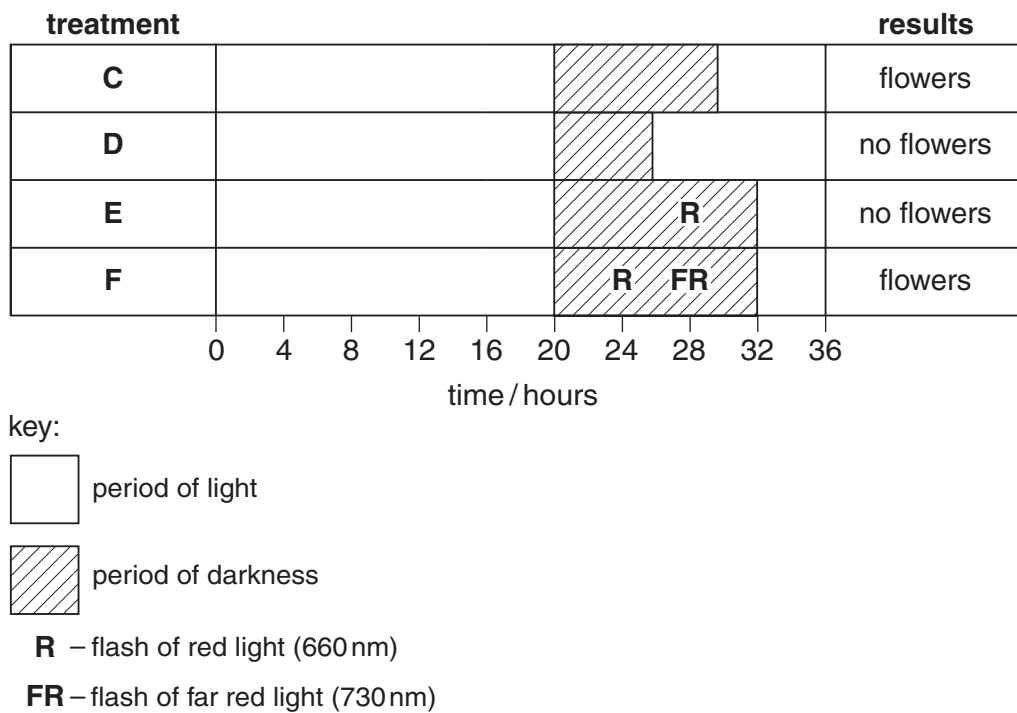


Fig. 4.1

- (i) Explain why plants flowered after treatment **C** but not after treatment **D**.

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- (ii) Explain why plants flowered after treatment **F** but not after treatment **E**.

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(b) More recent research into flowering has been carried out with the long-day plant, thale cress, *Arabidopsis thaliana*. Some results of this research are shown below:

- A protein, known as constans, switches on a gene needed to begin the production of flower buds.
- The mRNA coding for the production of constans has been isolated.
- Concentrations of constans and this mRNA in the cells of the plant were measured.
- The concentrations of this mRNA vary throughout the day.
- The concentrations of constans are highest in late afternoon.

(i) Describe the sequence of events that follows the production of mRNA and leads to the production of the protein, constans, in the cytoplasm.

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..... [4]

(ii) Suggest why *A. thaliana* does not flower after short days.

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..... [2]

[Total: 14]

- 5 (a) Fungi reproduce by a variety of different methods.

Describe **one** method of asexual reproduction in fungi.

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- (b) *Saccharomyces cerevisiae* is a species of yeast used in brewing. During the fermentation process, *S. cerevisiae* produces ethanol.

- (i) Describe how ethanol is produced by cells of *S. cerevisiae*.

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..... [3]

- (ii) When a high concentration of ethanol has been produced, fermentation stops.
Suggest why this occurs.

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..... [2]

Explain the roles of mitosis **and** meiosis in these two forms of reproduction.

.....[7]

[Total: 16]

- 6 (a) The following paragraph describes the production and secretion of thyroxine.

Complete the paragraph by using the appropriate words from the list below.

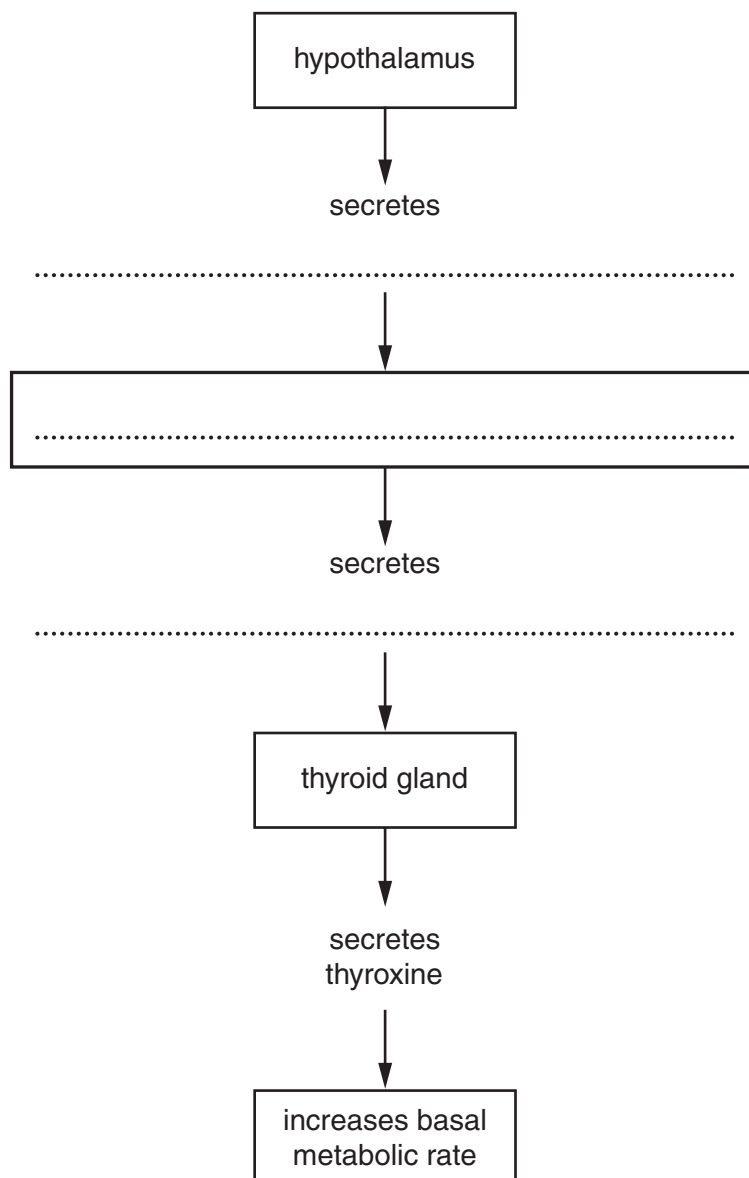
capillaries	albumen	thyroglobulin	cells	insulin
endocytosis	condensation	hydrolysis	diffusion	follicles

Thyroxine is produced and secreted by the thyroid gland. The thyroid gland contains many , each lined by a layer of endocrine cells. These cells secrete a protein called , which is stored in the thyroid gland. The secretory cells then take up some of this protein by the process of The protein is then converted to thyroxine by the process of

[4]

- (b) An increase in the production of thyroxine increases the basal metabolic rate (BMR).

The following flow chart shows how the secretion of thyroxine is controlled.



- (i) Complete the flow chart.

[3]

- (ii) State **two** ways in which the hypothalamus can be stimulated in order to cause the secretion shown in the flow chart.

1

2 [2]

- (iii) State **two** effects of thyroxine secretion, **other than** stimulating an increase in BMR.

1

2 [2]

[Total: 11]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE

Copyright acknowledgments:

Table 2.1 data Source: J.P. Mortola *et al.*, *Birth weight and altitude: A study in Peruvian communities*, Journal of Pediatrics, March 2000, vol. 136 (3), pp. 324-328.
Fig. 3.2 data Source: *University of Toronto National Biology Competition 2001*, www.biocomp.utoronto.ca.
Fig. 4.1 Adapted from *Kimball's Biology Pages*, www.biology-pages.info, by kind permission of Dr John Kimball.

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