

**ADVANCED GCE****BIOLOGY**

Growth, Development and Reproduction

2805/01

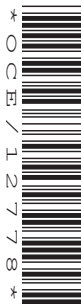
Candidates answer on the Question Paper

OCR Supplied Materials:

None

Other Materials Required:

- Electronic calculator
- Ruler (cm/mm)

Monday 25 January 2010**Afternoon****Duration:** 1 hour 30 minutes

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use 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, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks 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.
- This document consists of **20** pages. Any blank pages are indicated.

Examiner's Use Only:			
1			
2			
3			
4			
5			
6			
Total			

Answer **all** the questions.

- 1 Fig. 1.1 is a diagram of part of the human placenta.

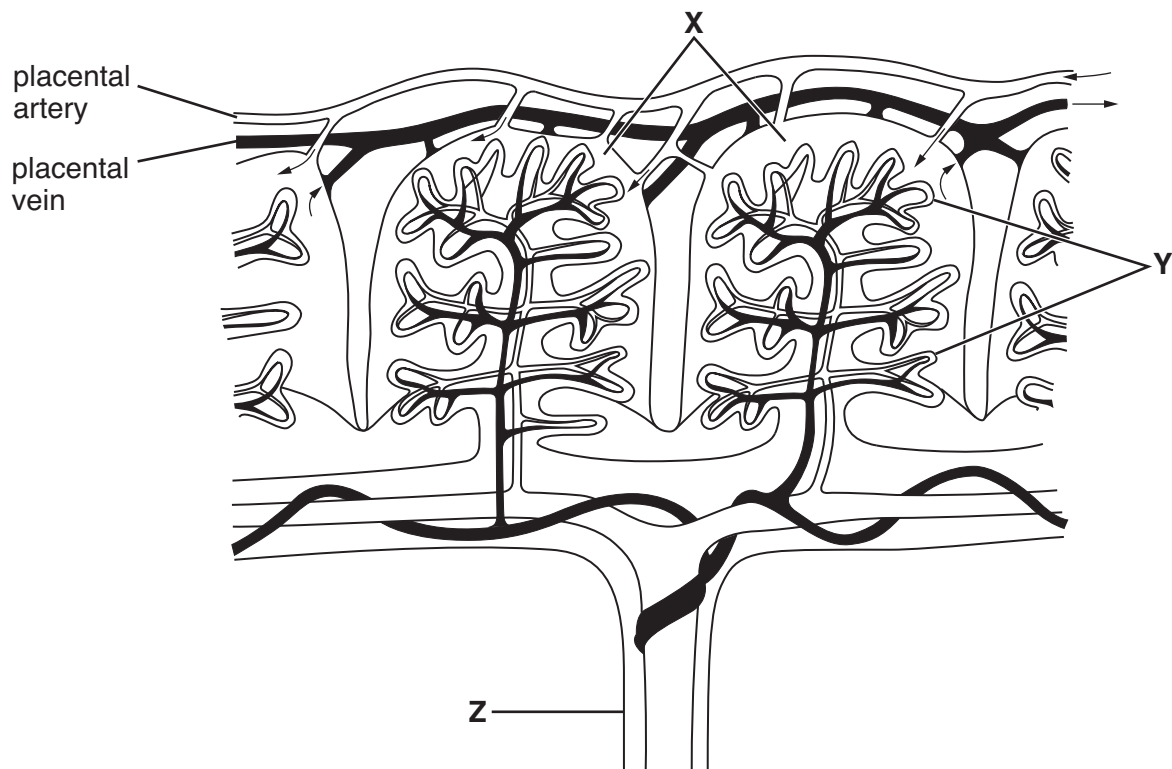


Fig. 1.1

- (a) (i) Name structures **X**, **Y** and **Z**.

X

Y

Z [3]

- (ii) Using an arrow, **indicate on Fig. 1.1** the direction of the blood flow in the **umbilical vein**. [1]

- (iii) State whether the blood in the umbilical vein contains more or less oxygen than the blood in the umbilical artery.

..... [1]

(b) The placenta is formed from tissue from both the mother and the embryo.

(i) Explain what is meant by the term *tissue*.

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

(ii) Name **one** tissue in the placenta that is formed from the mother and **one** that is formed from the embryo.

tissue from the mother
tissue from the embryo [2]

(c) The placenta forms a protective barrier between the mother and the fetus.

Give **two** reasons why the fetus needs this protective barrier.

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

- (d) The fetus is supplied with oxygen carried by the haemoglobin in the mother's red blood cells (erythrocytes).
- (i) Table 1.1 shows the rate of oxygen transfer across the placenta and across the alveoli in the mother's lungs in the last two weeks of gestation.

Table 1.1

	rate of oxygen transfer/cm ³ min ⁻¹
placenta	16
alveoli in mother's lungs	240

Suggest reasons for this difference.

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..... [3]

- (ii) Explain how the fetal haemoglobin is able to combine with the oxygen from the mother's haemoglobin.

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.....

..... [3]

[Total: 17]

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

Fig. 2.1 is a diagram of the drooping saxifrage, *Saxifraga cernua*.

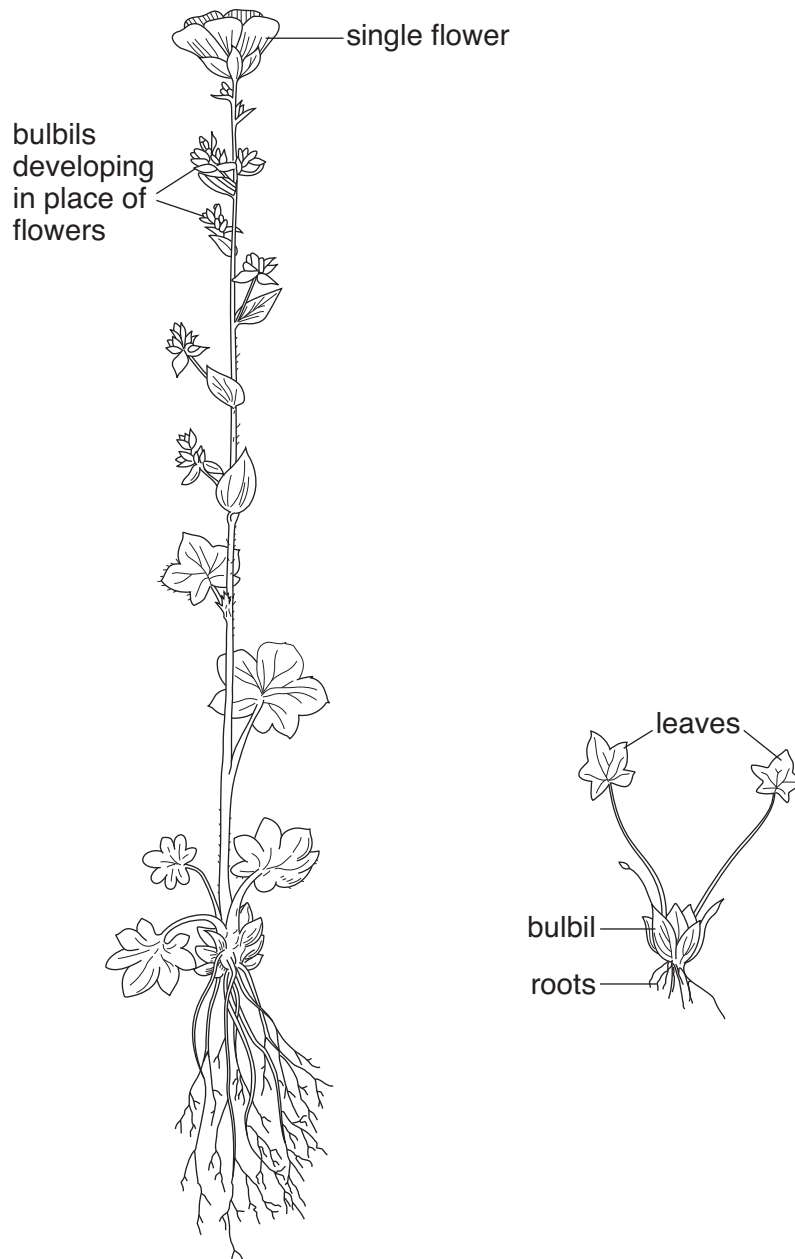


Fig. 2.1

- *S. cernua* has a low population density.
- Bulbils are produced all along the flower stalk instead of flowers.
- The bulbils eventually produce roots and leaves, and fall off.
- *S. cernua* rarely produces seeds from the single flower.

..... [7]

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Turn over

- (b) *S. cernua* does not usually produce seeds.

Describe the **evolutionary disadvantages** of not producing seeds.

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.....

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..... [5]

- (c) The bulbils in *S. cernua* develop from meristematic cells on the main stem.

- (i) State **two** characteristics of meristematic cells.

1

.....

2

..... [2]

- (ii) Describe how a **root** in the bulbil of *S. cernua* develops from meristematic cells.

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..... [3]

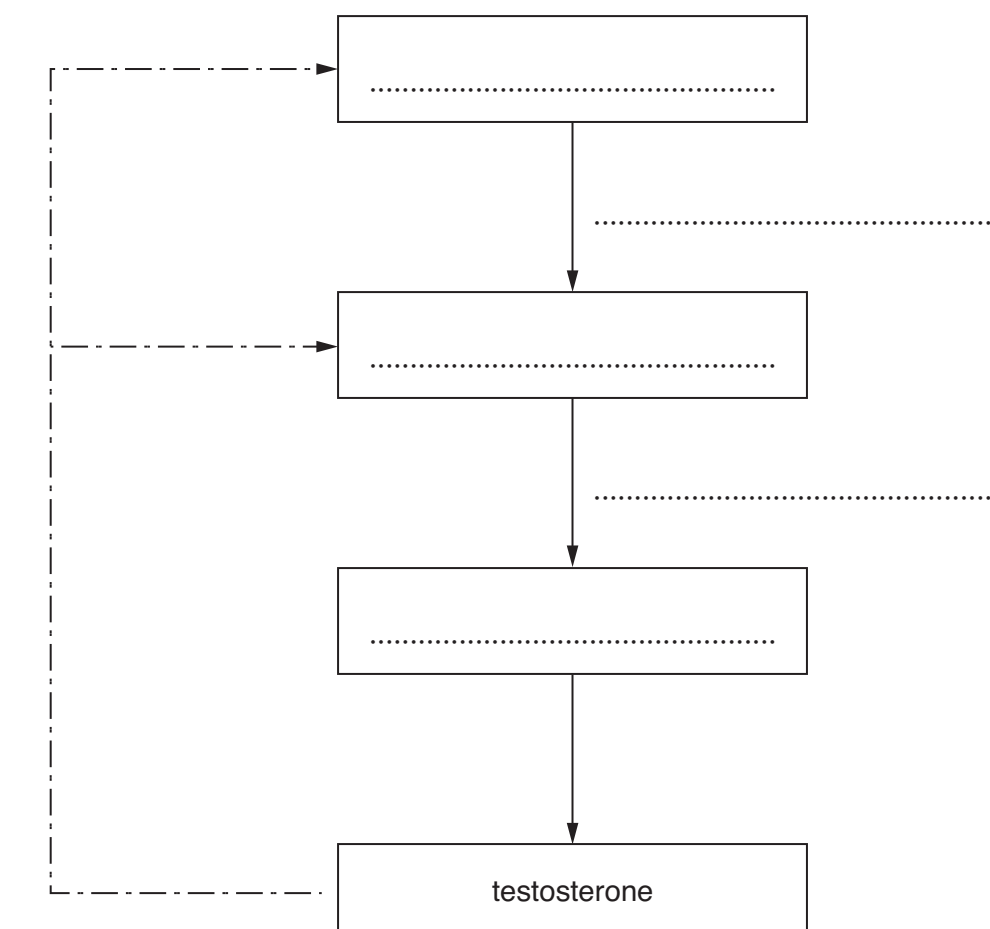
[Total: 18]

- 3** The hormone testosterone is involved in the development of the secondary sexual characteristics in the human male and controls spermatogenesis.

(a) (i) Give an example of a secondary sexual characteristic controlled by testosterone.

..... [1]

- (ii)** Complete the flow diagram and key in Fig. 3.1 to show the control of testosterone production in the human male.



Key:

.....

Fig. 3.1

[5]

- (iii) Testosterone is a steroid hormone.

Explain why testosterone can pass through cell membranes.

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..... [2]

- (b) Testosterone is thought to have a beneficial effect on the body by widening the lumen of arterioles due to relaxation of smooth muscle in the arteriole wall (vasodilation). This reduces the risk of cardiovascular disease.

- (i) Suggest how vasodilation reduces the risk of cardiovascular disease.

.....

.....

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..... [2]

- (ii) It is not fully understood how testosterone causes vasodilation.

However, studies have shown that testosterone may close some calcium ion channels in the cell membranes of nerve fibres. This would stop calcium ions passing through the membranes.

Explain how closing the calcium ion channels in the cell membrane of the nerve fibres may cause vasodilation.

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..... [3]

- (iii) Treating cardiovascular disease in men by injecting large quantities of testosterone may produce unacceptable side effects.

Suggest why side effects may occur.

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..... [2]

[Total: 15]

- 4 (a) Fig. 4.1 shows the flowers of two forms of the primrose, *Primula vulgaris*, in vertical section.

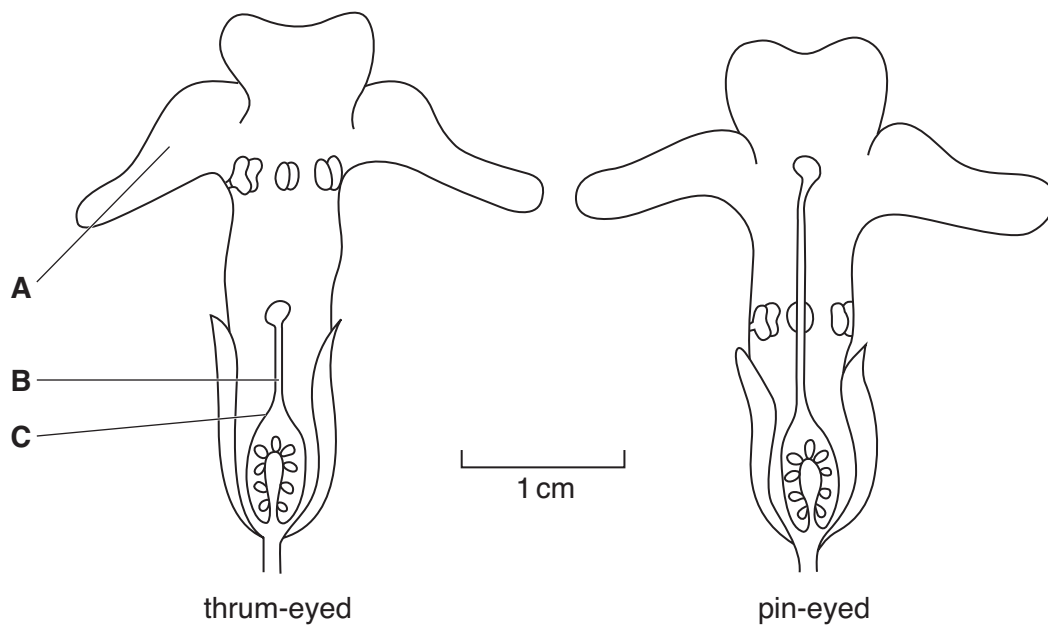


Fig. 4.1

- (i) Name the structures labelled **A** to **C**.

A

B

C [3]

- (ii) Explain the advantage of the arrangement of flower parts in the primroses shown in Fig. 4.1.

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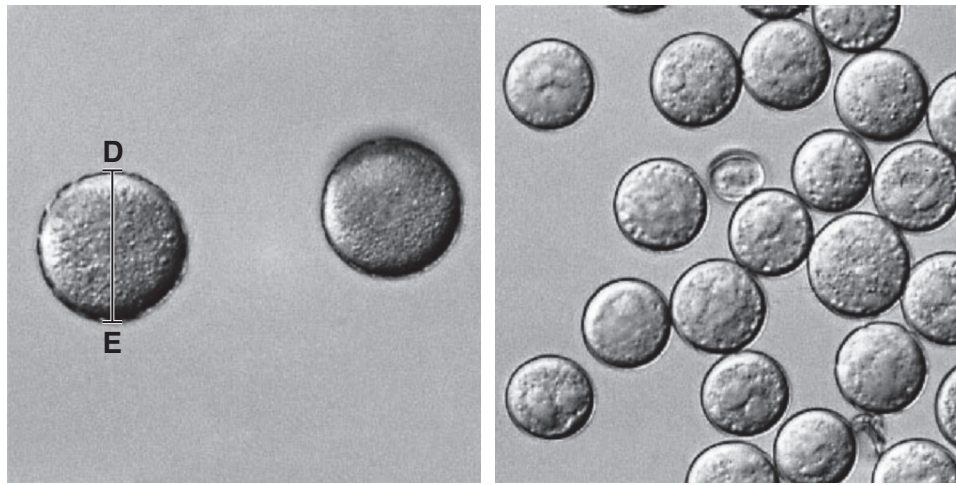
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..... [2]

- (b) The pollen of the primrose is self-incompatible. The thrum-eyed and pin-eyed pollen cannot pollinate their own type of flower.

Fig. 4.2 shows the pollen grains of the thrum-eyed and pin-eyed flowers of the primrose.



thrum-eyed pollen

pin-eyed pollen

Fig. 4.2

- (i) The labelled thrum-eyed pollen grain has an actual diameter of $35\mu\text{m}$ along the line **D** to **E**.

Calculate the magnification of the pollen grain.

Show your working and give your answer to **two** decimal places.

Answer = [2]

- (ii) Explain how the structural features of pollen grains ensure self-incompatibility.

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.....

..... [2]

- (c) The occurrence of thrum-eyed and pin-eyed flowers in the primrose is controlled by three gene loci on the same chromosome.

The characteristics controlled by the three gene loci are shown in Table 4.1.

Table 4.1

characteristic	alleles	
	dominant	recessive
style length	G short thrum-eyed style	g long pin-eyed style
anther position	A high thrum-eyed anthers	a low pin-eyed anthers
pollen size	P large thrum-eyed pollen	p small pin-eyed pollen

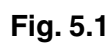
Using the information in this question, state the genotypes of:

thrum-eyed primroses

pin-eyed primroses

[2]

[Total: 11]



Describe the data shown in Fig. 5.1.

..... [3]

- (b) Explain why these data would have been better presented as a graph of **relative growth rates**.

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..... [2]

QUESTION 5 CONTINUES ON PAGE 17

..... [7]

[Total: 13]

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6 (a) Gibberellins are involved in the control of seed dormancy.

(i) Explain in detail, the function of gibberellins in breaking seed dormancy.

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..... [5]

(ii) Describe the advantages of seed dormancy to a flowering plant.

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..... [3]

(b) Gibberellins also stimulate cell elongation.

An investigation measured the effect of a range of concentrations of gibberellin on stem elongation in dwarf pea seedlings.

- 40 seeds of pure bred dwarf pea plants were germinated under identical conditions for two weeks.
- The seedlings were then divided into eight batches.
- Batches 1 to 7 were sprayed with a known concentration of gibberellin dissolved in water, each week for five weeks.
- Batch 8 was not sprayed.

Two weeks after the final spraying, the stem lengths of all eight batches were measured and the mean length calculated.

(i) Discuss whether this investigation is adequately controlled.

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..... [3]

(ii) Describe what is meant by *pure bred peas* **and** explain why they are used in this investigation.

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..... [3]

TURN OVER FOR QUESTION 6 (b)(iii)

- (iii) Suggest a likely cause of dwarfism in pure bred pea seedlings.

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..... [2]

[Total: 16]

END OF QUESTION PAPER

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