

**ADVANCED GCE****HUMAN BIOLOGY**

Energy, Control and Reproduction

**2866**

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 minutesCandidate  
ForenameCandidate  
Surname

Centre Number

Candidate Number

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

Examiner's Use Only:

1			
2			
3			
4			
5			
6			
<b>Total</b>			

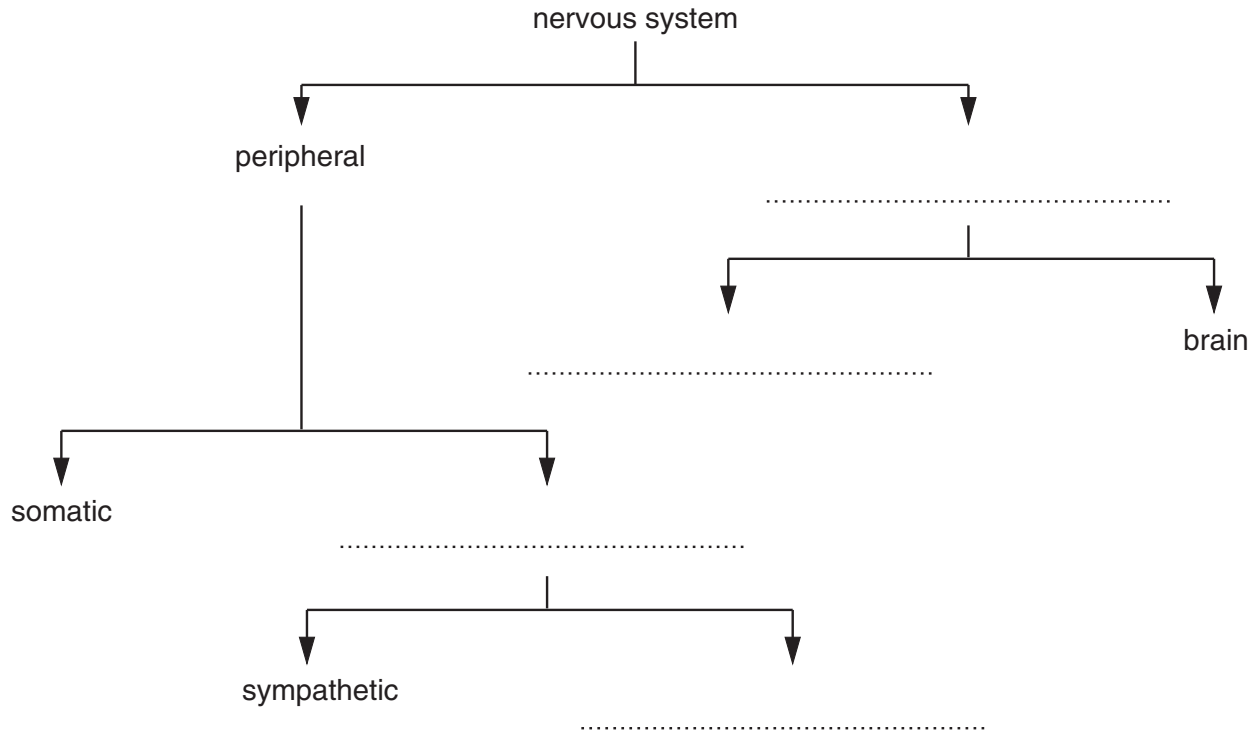


Answer **all** the questions.

- 1 An understanding of the structure of the nervous system is necessary for the effective treatment of traumatic brain injury.

(a) Fig. 1.1 shows the major components of the nervous system.

Complete Fig. 1.1 using the most appropriate terms.



**Fig. 1.1**

**[4]**

(b) Explain what is meant by the term *traumatic brain injury*.

.....

.....

.....

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

(c) Fig. 1.2 shows a section through the human brain.

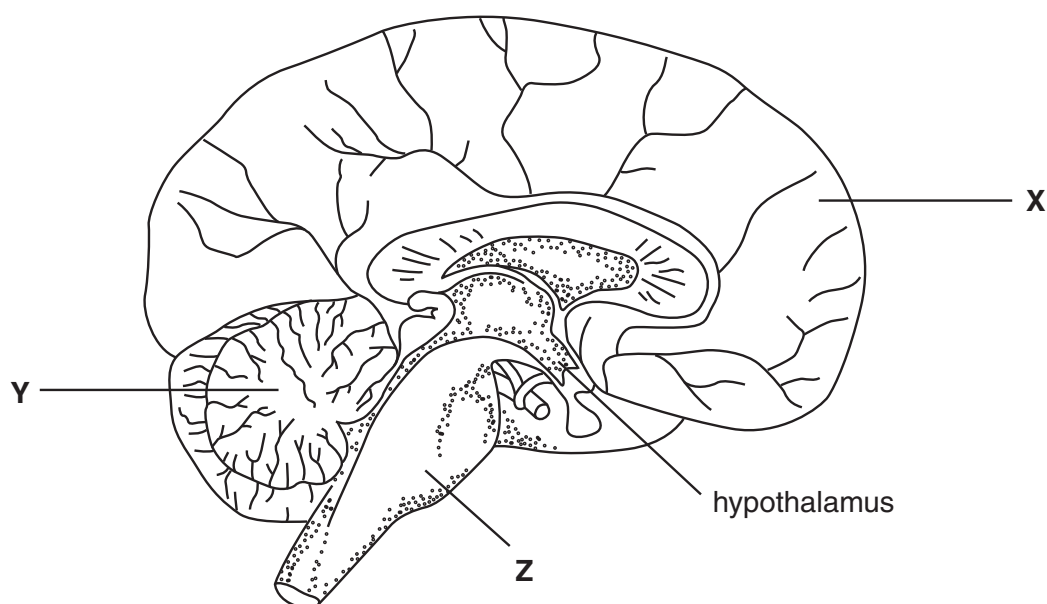


Fig. 1.2

(i) Table 1.1 lists five symptoms of brain injury.

Complete the table by filling in the appropriate letter, **X**, **Y** or **Z**, from Fig. 1.2. Each letter may be used once, more than once or not at all.

Table 1.1

symptom	region of brain injured
loss of short-term memory	
loss of balance	
personality change	
cardiac arrest	
inability to write	

[5]

(ii) State **one** function of the hypothalamus.

..... [1]

**(d)** Following a brain injury, an MRI scan may be used to assess the extent of damage.

Outline how an MRI scan works and how it can be used to assess brain damage.

..... [5]

**[Total: 17]**

- 2 In order to reduce the incidence of coronary heart disease (CHD), health promotion specialists aim to increase the number of people taking part in regular aerobic exercise.

(a) Explain the term *aerobic exercise*.

.....

.....

.....

.....

.....

.....

..... [3]

(b) Describe the effects on the cardiovascular system of a **short** period of strenuous exercise.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) Describe a programme that you could use to improve your aerobic fitness.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

- (d) Muscles contain both slow-twitch red and fast-twitch white fibres.

Explain why **slow-twitch** muscle fibres are important to an athlete during long periods of exercise.

.....

.....

.....

.....

.....

.....

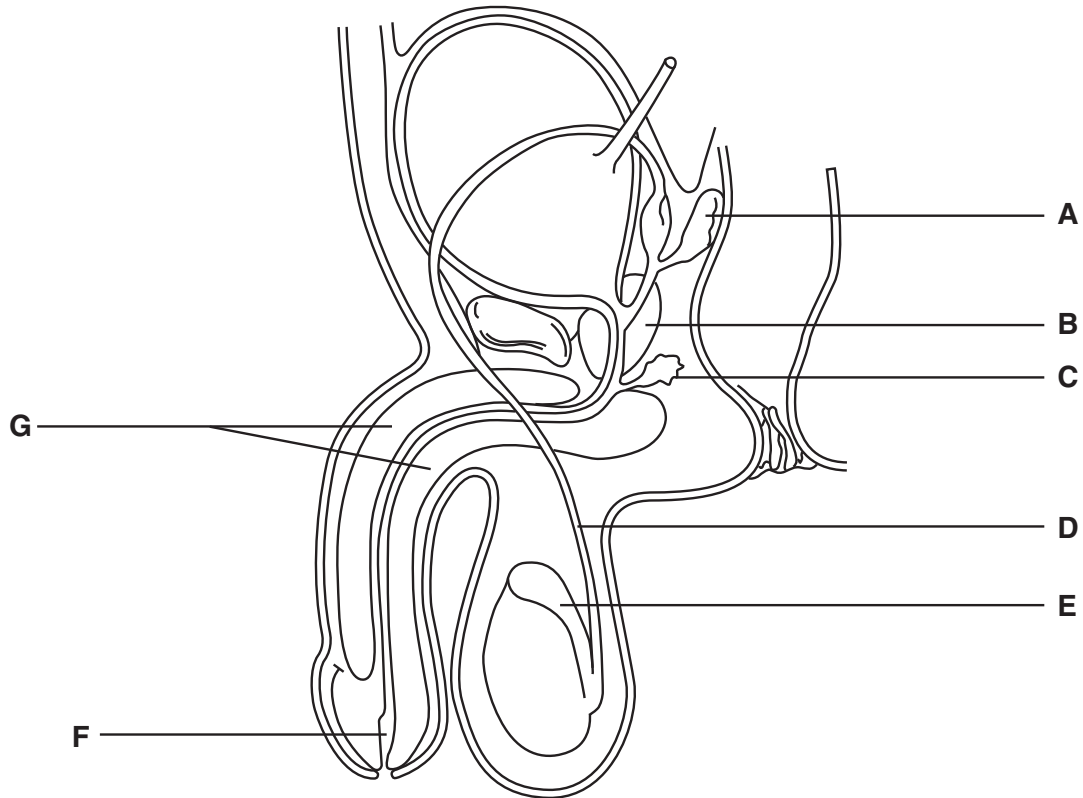
.....

..... [4]

[Total: 15]

- 3** The role of health professionals in the field of human reproduction includes giving advice on fertility. An understanding of the human male urinogenital system is essential when advising on male fertility problems.

Fig. 3.1 is a longitudinal section of the male urinogenital system.



**Fig. 3.1**

**(a)** State which of the labels **A** to **G** on Fig. 3.1 indicates the:

**(i)** vas deferens; .....

**(ii)** prostate gland. ....

**[2]**

**(b)** Describe the function of the tissue labelled **G** in Fig. 3.1.

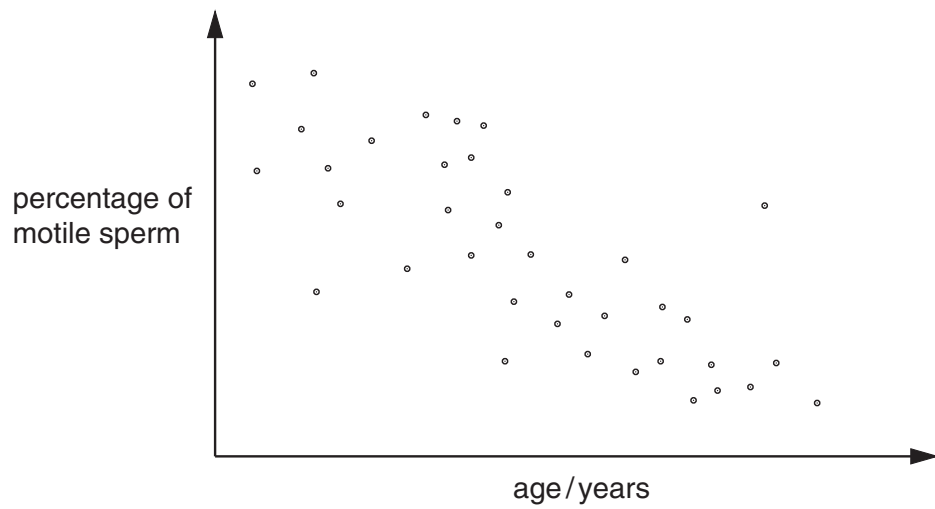
.....

.....

.....

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

- (c) Fig. 3.2 shows the results of an investigation into the motility of sperm produced by men of different ages.



**Fig. 3.2**

Describe the trend shown by the data in Fig. 3.2.

.....

.....

.....

.....

.....

..... [3]



Outline the possible causes of **male** infertility **and** describe the types of fertility treatment available for men.

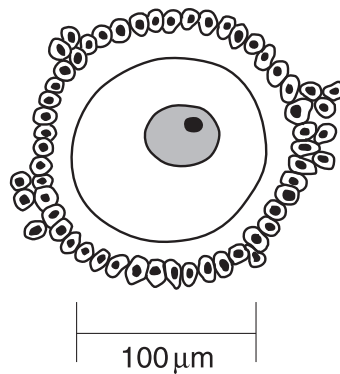
[7]

© OCR 2010

**Turn over**

- (e) Males may release as many as 40 million sperm cells in a single ejaculation. In contrast, a female may only release about 400 secondary oocytes in her lifetime.

Fig 3.3 shows a secondary oocyte following ovulation.



**Fig. 3.3**

Calculate the magnification of the drawing in Fig. 3.3.

Show your working and give your answer to the **nearest whole number**.

Magnification =  $\times$  ..... [2]

- (f) The **volume** of a secondary oocyte is significantly greater than the volume of an erythrocyte (red blood cell).

Explain how this difference is related to the functions of the two cells.

.....

.....

.....

.....

.....

.....

.....

..... [3]

**[Total: 20]**

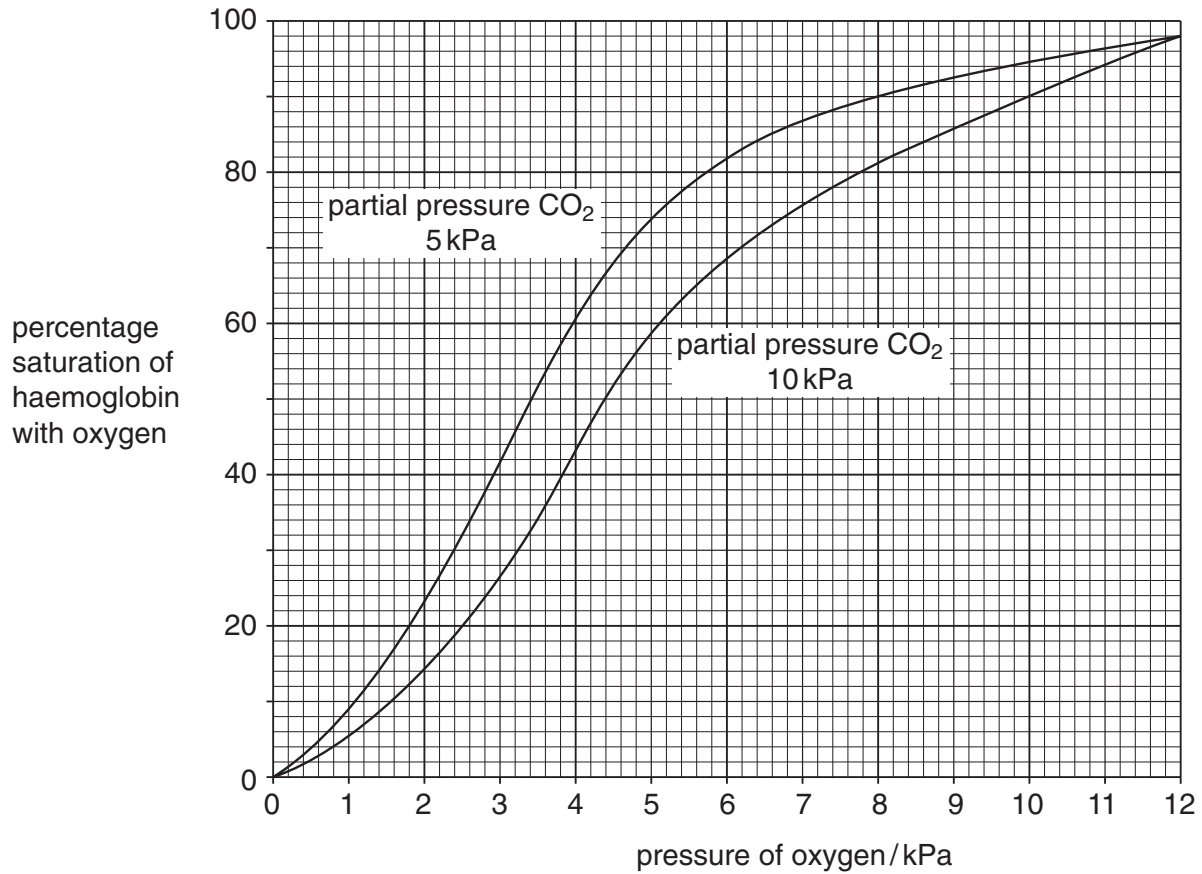
**11**  
**BLANK PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**

**QUESTION 4 STARTS ON PAGE 12**

- 4 Understanding the biochemistry of oxygen transport enables athletes to improve their performance.

Fig. 4.1 shows the oxygen dissociation curve for adult haemoglobin at different partial pressures of carbon dioxide ( $p\text{CO}_2$  / kPa).



**Fig. 4.1**

- (a) (i) Name the effect illustrated by the curves.

..... [1]

- (ii) Explain how the structure and properties of the haemoglobin molecule give rise to the sigmoid (S-shaped) curves shown in Fig. 4.1.

.....

.....

.....

.....

.....

.....

.....

..... [3]

**(b)** In this question, one mark is available for the quality of spelling, punctuation and grammar.

Explain how these methods lead to improved performance.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [7]

Quality of Written Communication [1]

**[Total: 15]**

**5** As world population rises, the efficiency of food production becomes more important.

(a) An investigation into the use of a particular area of land showed that in one year:

- one hectare of the land produced a yield of 4342kg of maize;
- another hectare of the land produced a yield of 143kg of beef when it was used for grazing cattle.

Explain why the yield of beef is lower than the yield of maize.

..... [4]

**(b)** Maize is used in agriculture because its rate of photosynthesis is significantly higher than its rate of respiration.

Table 5.1 contains statements relating to three biochemical processes in a leaf cell of maize.

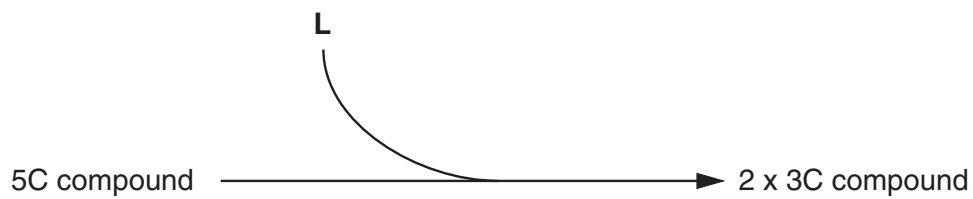
Complete the table with a tick (✓) if the statement is true or a cross (X) if the statement is not true for each biochemical process.

### Table 5.1

	light-dependent stage of photosynthesis	glycolysis	Krebs cycle
ATP is produced			
ATP is required			
NAD is reduced			
NADP is reduced			

[4]

- (c) Fig. 5.1 shows an outline of one stage of the Calvin cycle in photosynthesis.



**Fig. 5.1**

Name compound **L** in Fig. 5.1.

..... [1]

- (d) The world's population increases annually by approximately 80 million people. This creates a greater demand for food each year.

Some of this demand is being met by increasing deforestation in order to provide more land for arable farming.

Suggest why some people do **not** consider this to be an acceptable solution.

.....

.....

.....

.....

.....

.....

.....

.....

.....

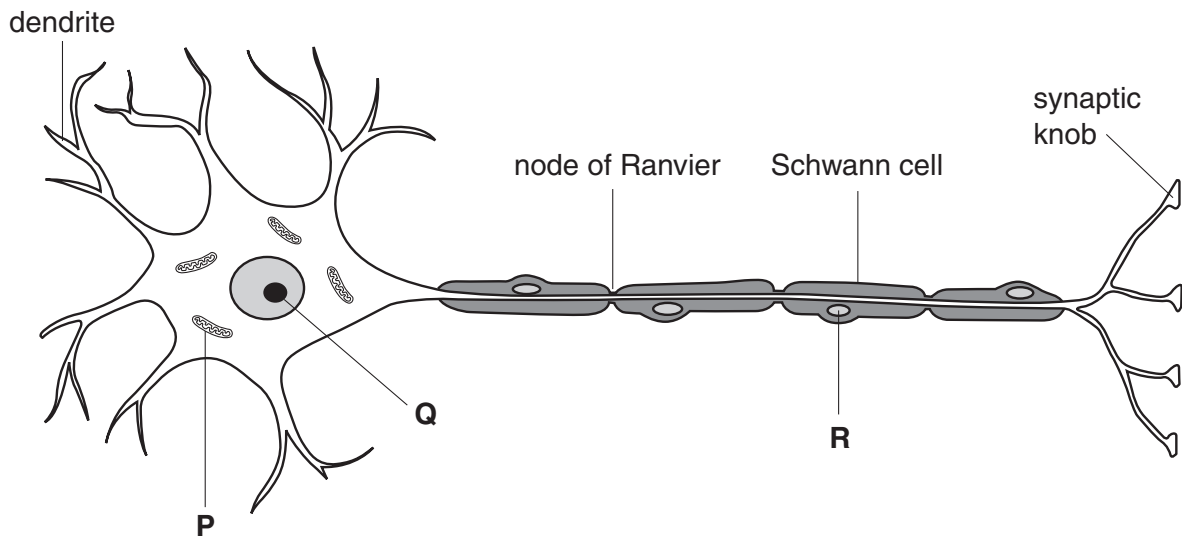
.....

..... [4]

**[Total: 13]**



6 Fig. 6.1 is a diagram of a neurone.



**Fig. 6.1**

(a) Name the structures labelled **P**, **Q** and **R** in Fig. 6.1.

**P** .....

**Q** .....

**R** ..... [3]

(b) (i) Explain how neurotransmitter released from the synaptic knob crosses the synaptic cleft.

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

(ii) Suggest why neurotransmitter molecules are able to bind to receptors on post-synaptic membranes.

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

- (iii) Neurotransmitter molecules are normally broken down by enzymes.

Some chemicals inhibit the action of the nervous system by preventing the breakdown of neurotransmitter molecules after they have bound to the receptors on the post-synaptic membrane.

Describe ways in which some chemicals may prevent the breakdown of neurotransmitter molecules.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 10]

**END OF QUESTION PAPER**

**19**  
**BLANK PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.