

**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)

Friday 12 June 2009**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.
- You are advised to show all the steps in any calculations.
- This document consists of **16** pages. Any blank pages are indicated.

FOR EXAMINER'S USE

Qu.	Max.	Mark
1	10	
2	14	
3	10	
4	16	
5	20	
6	20	
TOTAL	90	

Answer **all** the questions.

- 1 Table 1.1 shows the total number of pregnancies and the number of multiple pregnancies in the UK between the years 2000 and 2005.

Table 1.1

	year					
	2000	2001	2002	2003	2004	2005
total number of pregnancies	672 459	662 608	661 603	689 131	709 316	715 556
twins	9 578	9 590	9 740	10 115	10 455	10 533
triplets	285	235	194	140	163	159
quadruplets	5	5	4	3	5	2
quintuplets	0	1	1	0	0	0
sextuplets	0	1	0	0	0	0

- (a) (i) Define the term *multiple pregnancy*.

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 [1]

- (ii) Suggest why not every multiple pregnancy will result in a multiple birth.

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 [2]

- (iii) The strain on the mother is greater in a multiple pregnancy and this may lead to complications such as pre-eclampsia.

Describe how pre-eclampsia could be detected as part of a routine antenatal care programme.

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..... [2]

- (iv) A multiple pregnancy is more likely to lead to babies with low birth weight. Before the babies are born their growth will have been monitored using ultrasound scans.

Describe **one** measurement of growth that will have been taken during these ultrasound scans.

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..... [1]

(b) With reference to Table 1.1:

- (i) comment on the data for **twin pregnancies** between the years 2000 and 2005;

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..... [2]

- (ii) suggest **one** reason for the overall decrease in the number of **triplet pregnancies** between the years 2000 and 2005.

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..... [2]

[Total: 10]

- 2 Many of the hedges in Britain were planted by medieval farmers as boundaries and to keep in livestock. In the second half of the twentieth century, many modern farmers removed these hedges.

(a) (i) Explain the advantages to farmers of removing hedges.

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..... [2]

(ii) Describe the environmental problems caused by removing hedges.

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(b) Fig. 2.1 is a diagram of the changes in an abandoned ploughed field over time.

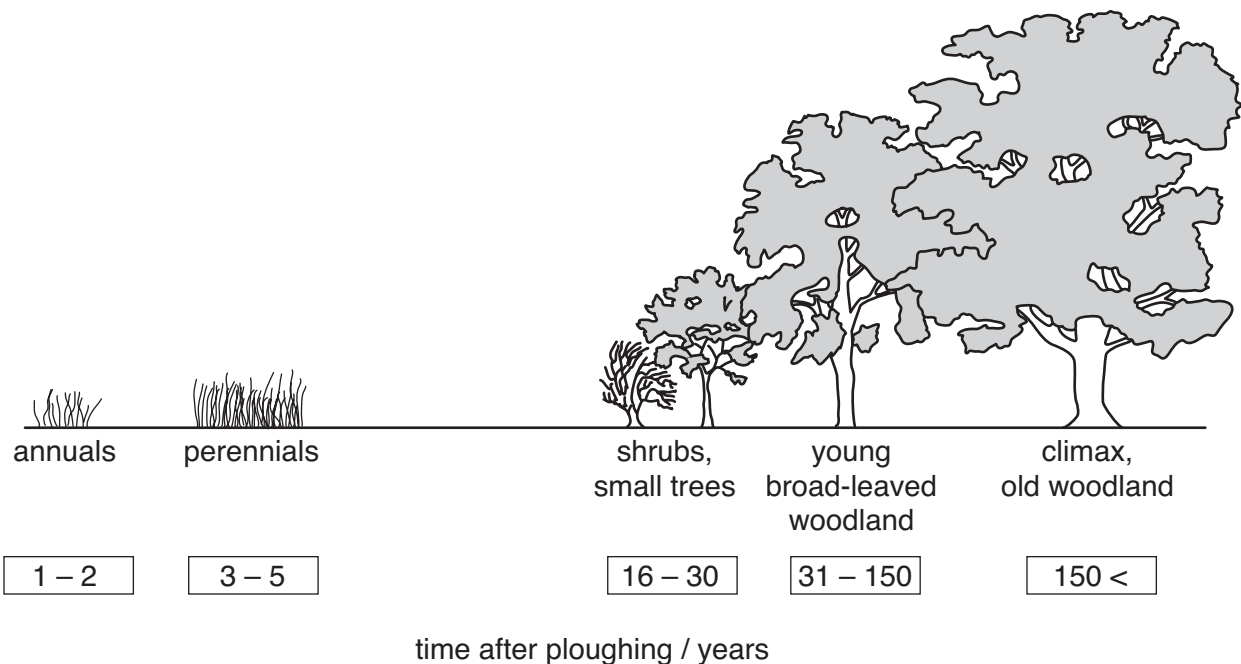


Fig. 2.1

- (i) State the name for the changes seen in Fig. 2.1.

..... [1]

- (ii) In autumn, the woodland community shown in Fig. 2.1 would shed a great many dead leaves.

Describe how the carbon atoms in these dead leaves could eventually be recycled back into new plant growth in future years.

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..... [4]

- (iii) **With reference to Fig. 2.1**, suggest what would have happened if the farmer had introduced sheep onto the field two years after it had been abandoned.

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..... [3]

[Total: 14]

- 3 Carbohydrate loading is a strategy employed by some athletes to maximize the amount of glycogen stored in their bodies.

(a) Describe how the **structure** of glycogen is adapted to its function as an energy store.

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..... [3]

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

Discuss the use of carbohydrate loading diets to improve athletic performance.

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[Total: 10]

- (a) (i) Table 4.1 shows the stages of cell division involved in spermatogenesis. For each stage, state the name of the structure or structures formed.

Table 4.1

stage of cell division	structure(s) formed
mitosis	
meiosis I	
meiosis II	

[3]

- (ii)** Explain how the male gamete is adapted to its function.

[5]

[5]

- (iii) Describe the functions of Sertoli cells.

[3]

[3]

- (b) Although both oogenesis and spermatogenesis involve meiosis, there are differences in some of the stages.

Outline how the stages of meiosis during oogenesis differ from the stages of meiosis during spermatogenesis.

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..... [2]

- (c) Interstitial cell stimulating hormone (ICSH), also known as luteinising hormone (LH), is a glycoprotein.

Testosterone is a steroid that is soluble in lipids.

Explain why testosterone is able to pass through the cell membrane of its target cells whereas ICSH/LH cannot pass through the cell membrane of its target cells.

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..... [3]

[Total: 16]

- 5 A knowledge of how the brain functions is helpful in the development of drugs to treat illnesses such as Parkinson's disease.

(a) Fig. 5.1 is a diagram of the human brain.

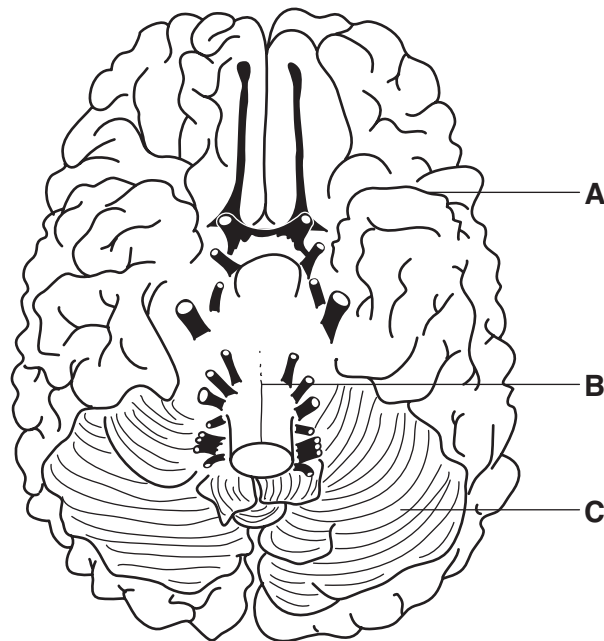


Fig. 5.1

- (i) State the view of the brain shown in Fig. 5.1. Select your answer from one of the following possibilities:

anterior dorsal lateral posterior ventral

.....

[1]

- (ii) Fill in the table below by naming the structures of the brain labelled **A** to **C** and give **one** function of each structure.

	name of structure	function of structure
A		
B		
C		

[6]

- (b) Parkinson's disease is a disease in which the coordination of voluntary movements is lost. Symptoms may include uncontrollable shaking or an inability to move.

It is caused by a progressive degeneration of the neurones deep inside the brain that normally make dopamine.

Dopamine controls the activity of acetylcholine at synapses in the brain.

- (i) Name the type of substance to which dopamine and acetylcholine belong.

..... [1]

- (ii) Suggest how the reduction in the concentration of dopamine at synapses in the brain can cause the symptoms of Parkinson's disease.

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..... [2]

- (iii) Describe what drug treatments can be used to relieve the symptoms of Parkinson's disease.

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..... [2]

[7]

[Total: 20]

6 Skeletal muscle fibres have a high metabolic rate even when they are in a relaxed state.

- (a) Describe how skeletal muscle fibres are adapted to meet the demands of a high metabolic rate.

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..... [4]

- (b) The energy requirement of skeletal muscles increases rapidly when they exercise.

When skeletal muscles first start to exercise they respire anaerobically for a few seconds before respiring aerobically.

- (i) State why **anaerobic** respiration is necessary in this situation.

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..... [1]

- (ii) Name the product of **anaerobic** respiration in muscle fibres.

..... [1]

- (iii) Explain how muscle fibres can produce ATP when **aerobic** respiration first starts.

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..... [2]

(c) Lack of exercise increases the risk of coronary heart disease (CHD).

- Endostatin is a complex three-dimensional protein produced by the body.
- One of the functions of endostatin is to inhibit the development of the atheromatous plaques that cause CHD.

(i) The table below shows some statements that may be applied to biological molecules.

For each statement use a tick (✓) or a cross (✗) to indicate whether the statement is true or false for endostatin.

statement	true (✓) or false (✗)
contains glycosidic bonds	
has a tertiary structure	
has a double helix	

[3]

(ii) It is thought that exercise raises the blood concentration of endostatin.

Suggest how the effect of endostatin on atheromatous plaques could prevent the development of CHD.

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..... [3]

- (d) An investigation was carried out to discover if exercise could increase the blood concentration of endostatin in healthy volunteers.

Healthy male volunteers were exercised on a treadmill which increased their heart rate by at least 87%.

The concentration of endostatin in their blood was measured before exercise, and measured again at intervals for 6 hours after exercise.

Fig. 6.1 shows the results of this investigation.

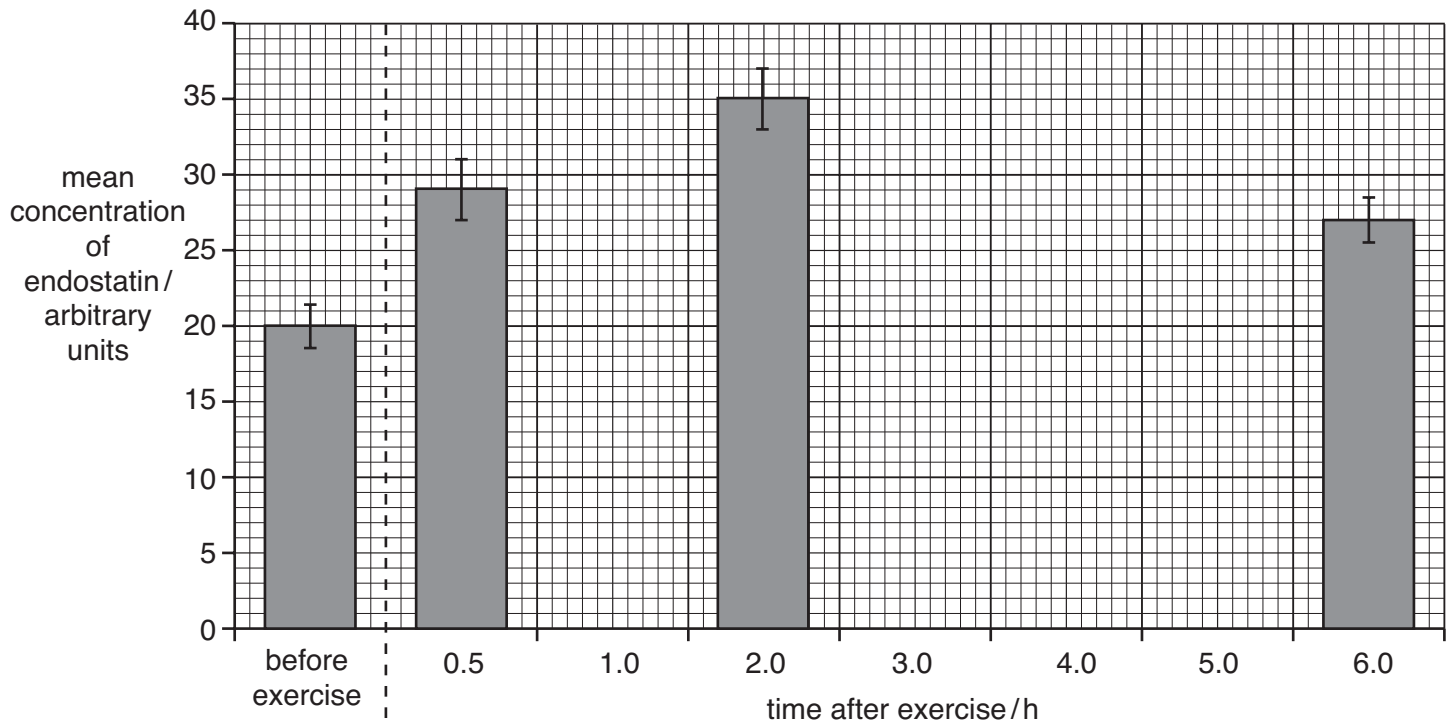


Fig. 6.1

- (i) Describe the results of this investigation.

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[3]

QUESTION 6 CONTINUES ON PAGE 16

- (ii) Suggest **how** the ability to increase endostatin concentration in the blood after exercise could have **evolved**.

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..... [3]

[Total: 20]

END OF QUESTION PAPER

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