

**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)

Wednesday 16 June 2010
Morning

Duration: 1 hour 30 minutes

Candidate
Forename

Candidate
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 **24** pages. Any blank pages are indicated.

Examiner's Use Only:

1			
2			
3			
4			
5			
6			
Total			



Answer **all** the questions.

- 1** The efficiency of respiration has a direct effect on energy levels and health.

(a) Fig. 1.1 shows an electron micrograph of a mitochondrion.

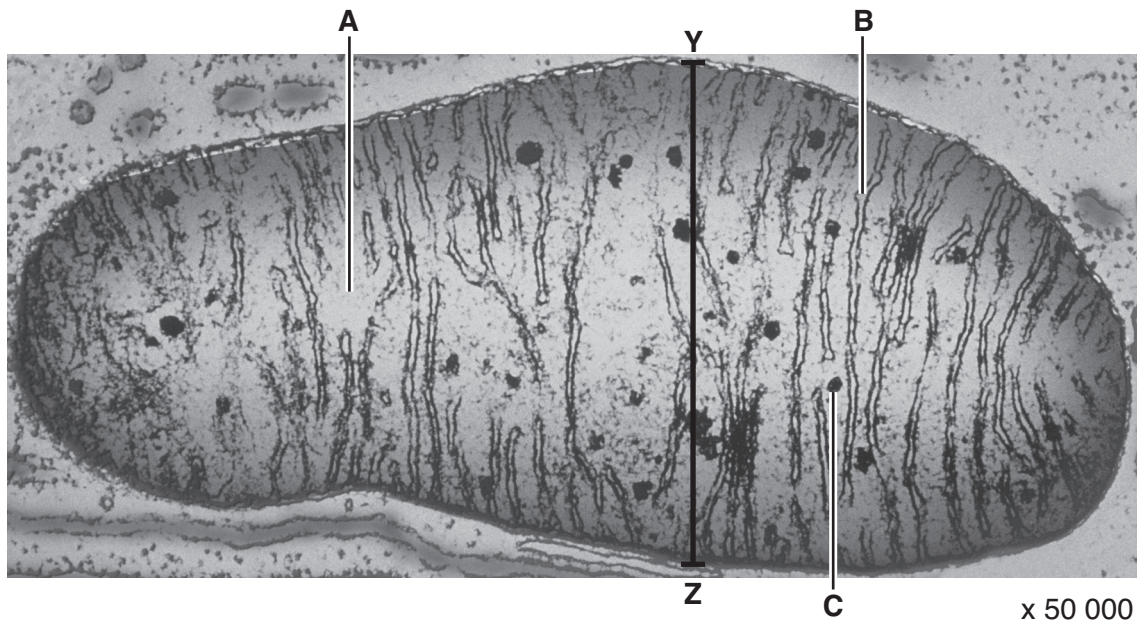


Fig. 1.1

- (i)** Name the parts labelled **A** to **C** on Fig. 1.1.

A

B

C **[3]**

- (ii)** Calculate the width of the mitochondrion between the points marked **Y** and **Z**.

Show your working.

Answer = μm **[2]**

(b) Fig. 1.2 is a diagram of certain pathways in mammalian respiration.

The different stages are labelled **D** to **H**.

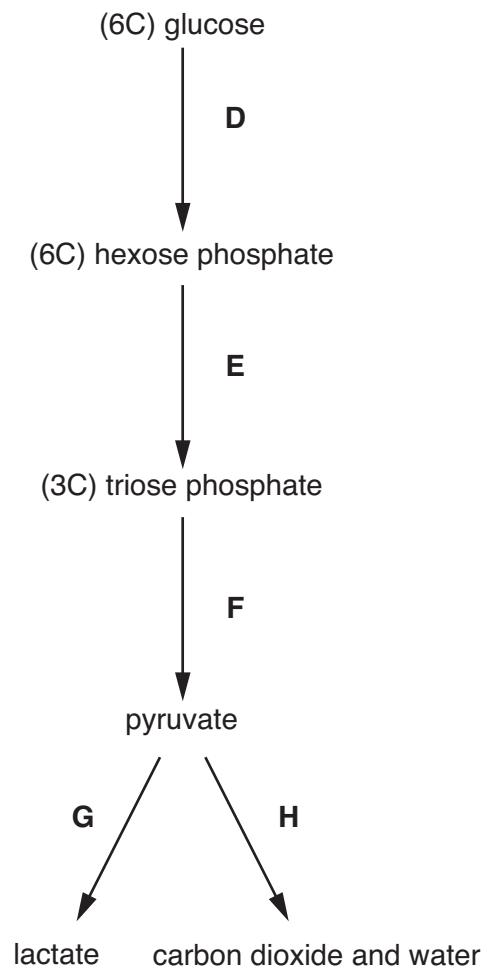


Fig. 1.2

Using the labels **D** to **H**, state at which stage or stages:

ATP is used;

reduced NAD is reoxidised without ATP formation;

ATP is produced outside the mitochondria;

oxygen is required.

[4]

- (c) Explain why the pathway to lactate is regarded as inefficient.

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..... [3]

- (d) The energy to maintain metabolism is carried in the cells as ATP.

Fig. 1.3 shows the diagrammatic structure of ATP.

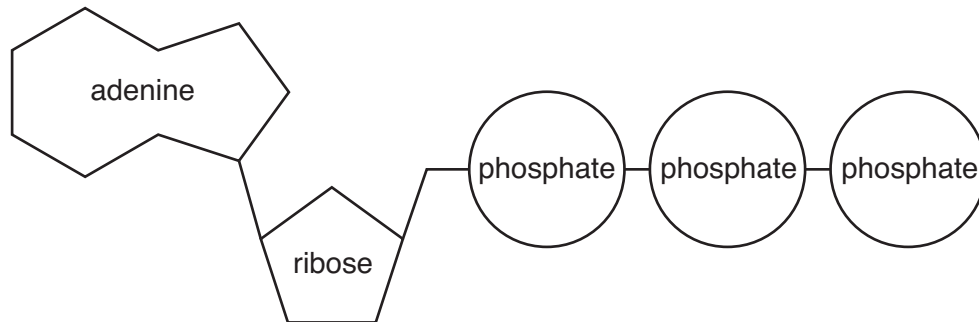


Fig. 1.3

- (i) **Draw a ring on Fig. 1.3** around the part of the ATP molecule that could be described as a nucleotide. [1]
- (ii) ATP is described as the main energy carrier in the cell.

State **two metabolic** processes in humans that require the use of ATP.

1

2 [2]

[Total: 15]

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QUESTION 2 STARTS ON PAGE 6

2 Fig. 2.1 is an electron micrograph showing a longitudinal section of contracted striated muscle.

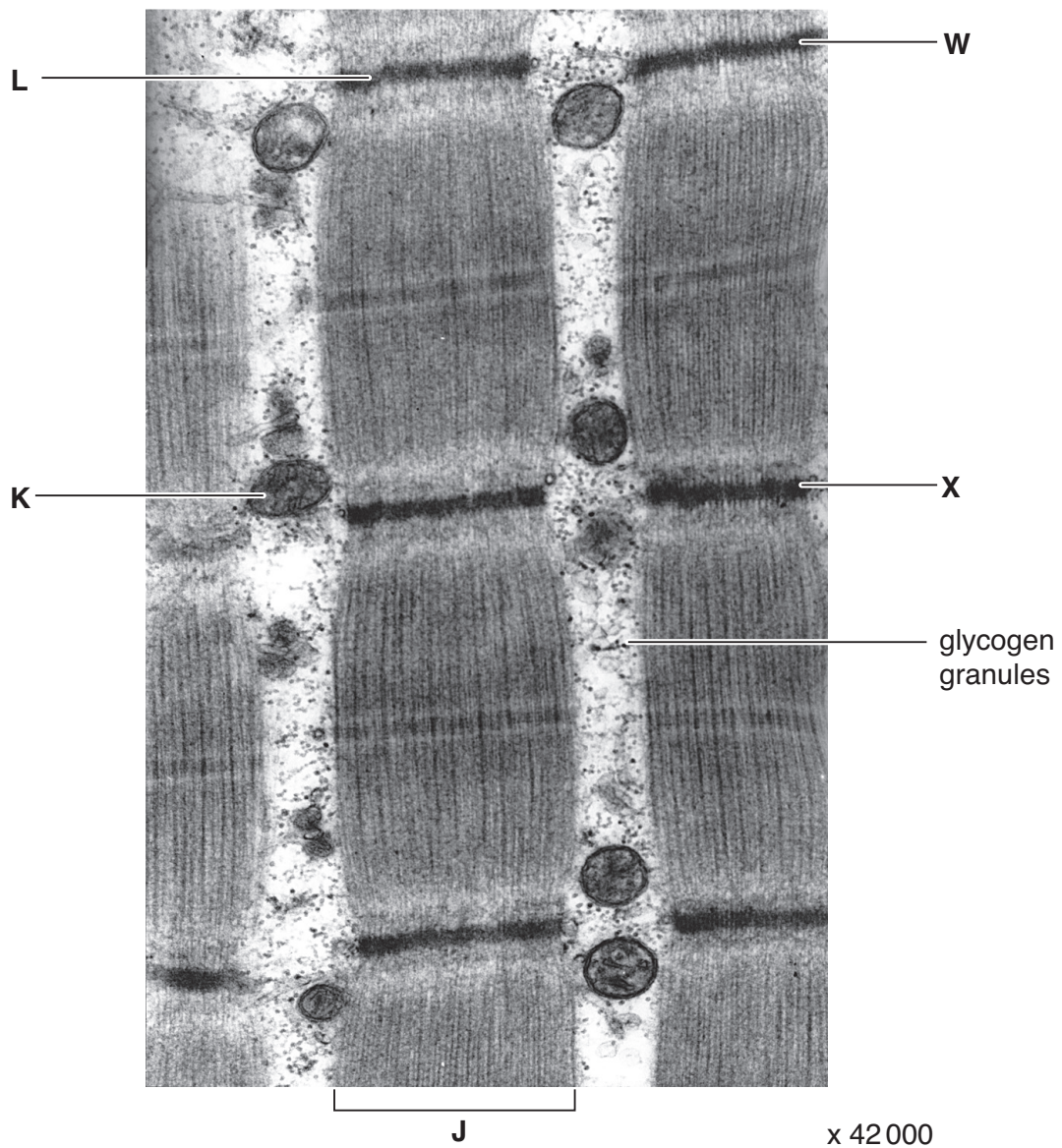


Fig. 2.1

- (a) (i) Name the parts labelled **J**, **K** and **L** on Fig. 2.1.

J

K

L [3]

- (ii) Name the structure between positions **W** and **X** on Fig. 2.1.

..... [1]

- (iii) Explain the presence of glycogen granules in striated muscle.

.....

.....

..... [1]

- (b) Fig. 2.2 shows the arrangement of thick and thin filaments in striated muscle.

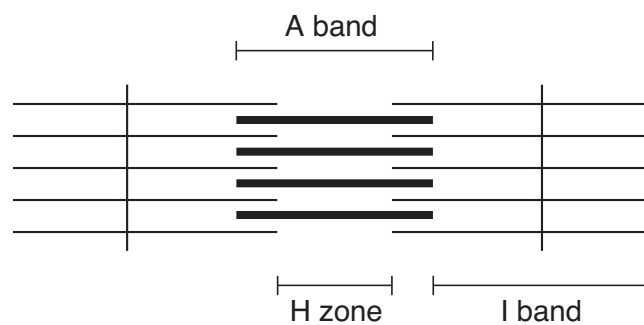


Fig. 2.2

State what happens to the lengths of the following when muscle contracts.

A band

H zone

I band [3]

Describe the events that occur when muscle contracts. In your answer, explain the roles of calcium ions, tropomyosin, troponin, actin and myosin.

You will gain credit for using the information in Fig. 2.1 and Fig. 2.2 in your answer.

[8]

Quality of Written Communication [1]

[Total: 17]

3 Fig. 3.1 represents a section through the complete wall of the back of a mammalian eye.

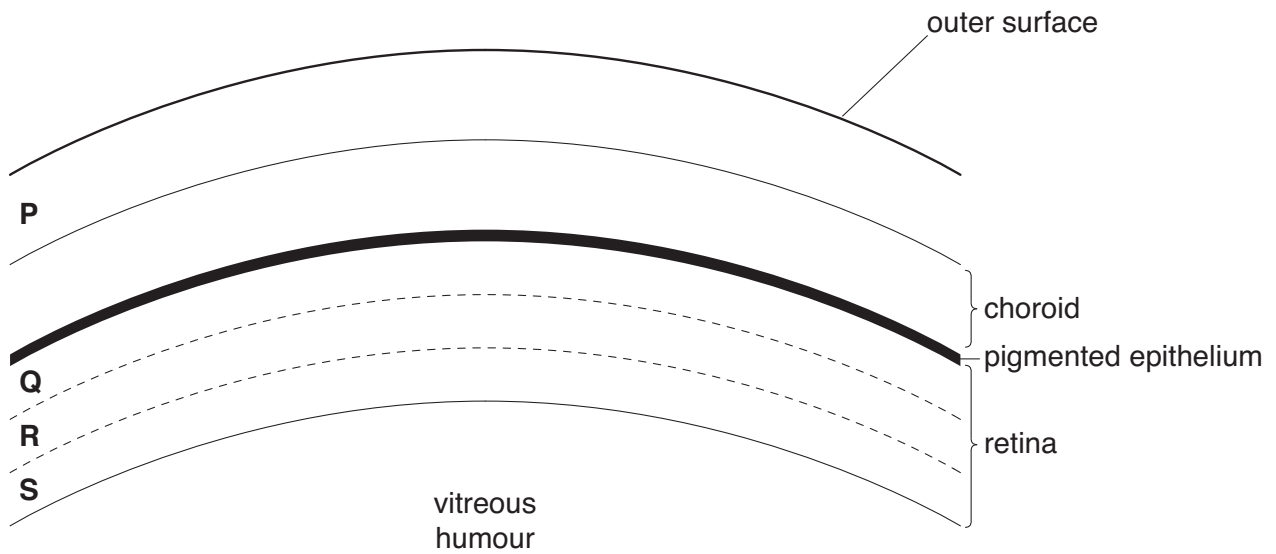


Fig. 3.1

(a) Using letters from Fig. 3.1, indicate which layer contains:

ganglion cells;

many collagen fibres;

bipolar neurones.

[3]

Colour vision in humans is based on the trichromatic (3-colour) principle. The responses of the three types of photoreceptor cell, c_1 , c_2 and c_3 , to different wavelengths of light are shown in Fig. 3.2. The colours corresponding to the wavelengths of the visible spectrum are shown in Table 3.1.

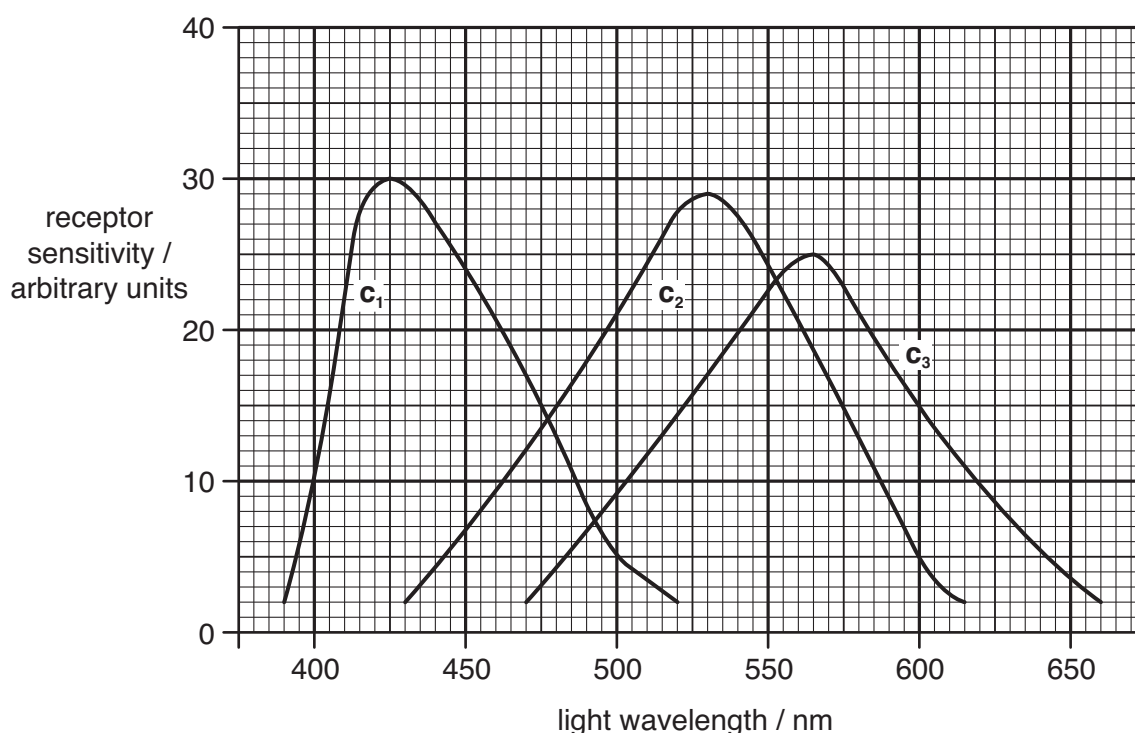


Fig. 3.2

Table 3.1

light wavelength / nm	below 440	440–499	500–569	570–589	590–620	above 620
colour	violet	blue	green	yellow	orange	red

- (b) With reference to Fig. 3.2, determine the wavelengths of light to which cells c_1 and c_2 are most sensitive.

c_1

c_2

[2]

Cells of type c_3 have a maximum sensitivity to light of 565nm and are often referred to as 'red sensitive cones'.

(c) Suggest what is anomalous about this common name.

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

(d) There are no specific photoreceptor cells for detecting violet light.

With reference to the information given, suggest a mechanism whereby the brain could distinguish between 'blue' light and 'violet' light.

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

[Total: 8]

- 4 (a) The process of oogenesis begins before birth when cells of the germinal epithelium in the ovary start to divide by mitosis. The cells that are produced grow and then begin to divide by meiosis.

The later stages of meiosis occur after puberty and at fertilisation.

Complete the table by naming the cells produced at each stage of **oogenesis**.

stage of oogenesis	cells produced
mitosis	oogonia
growth
meiosis I
meiosis II

[3]

- (b) Mitosis and meiosis also occur in **spermatogenesis**.

Explain the importance of mitosis **and** meiosis in the production of sperm.

mitosis

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meiosis

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[4]

- (c) During investigations into infertility in women, measurements of progesterone levels in blood or saliva may be taken. The progesterone levels indicate the activity of the ovarian follicle and the corpus luteum during the menstrual cycle.

Measuring levels of progesterone in non-pregnant women is therefore used to confirm that ovulation has occurred and that the corpus luteum is functioning normally.

- (i) Explain why an active corpus luteum is necessary in order for pregnancy to occur.

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..... [3]

- (ii) A couple are hoping to conceive a child, so they are not using any form of contraception. Despite having a normal menstrual cycle, the otherwise healthy woman fails to become pregnant.

Suggest **two** possible reasons for this.

1

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2

..... [2]

(d) One of the most common causes of infertility in women is infection with genital chlamydia, caused by the bacterium *Chlamydia trachomatis*.

- Chlamydia is the most common sexually transmitted disease in the United Kingdom.
- Chlamydia may cause pelvic inflammatory disease (PID).
- One in five women who develop PID become infertile.
- A large proportion of infections with *Chlamydia trachomatis* remain undiagnosed.

Fig. 4.1 shows the number of cases of genital chlamydia diagnosed at clinics in the United Kingdom from 1995 to 2001.

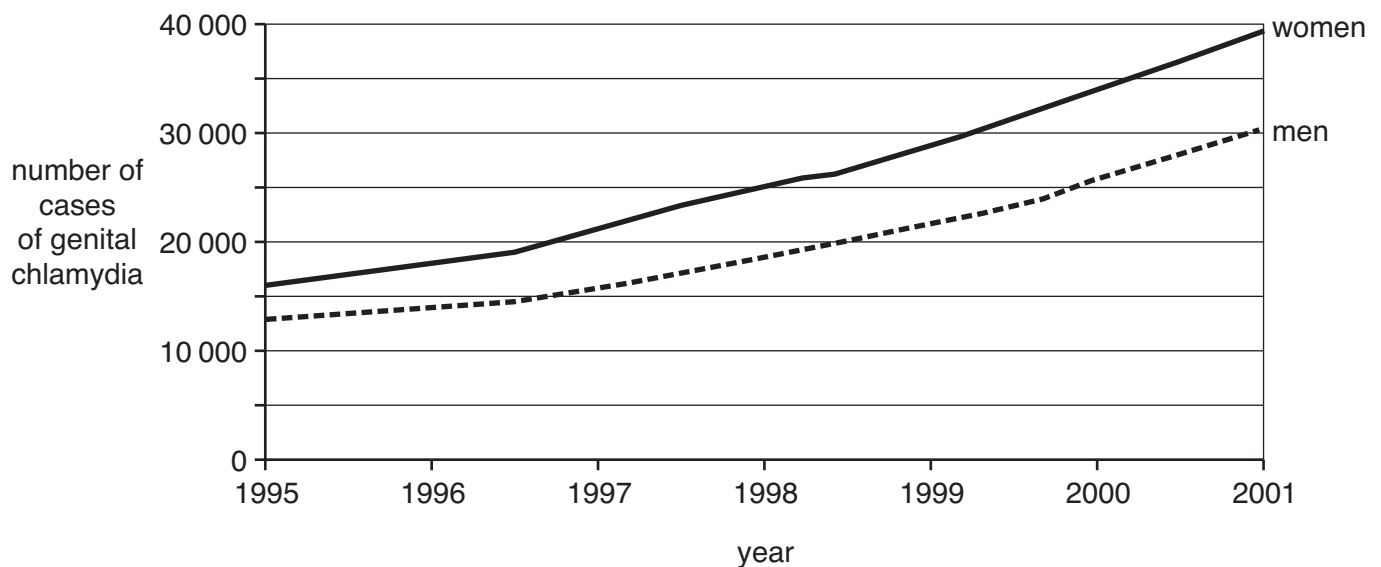


Fig. 4.1

(i) Suggest a suitable treatment for infection with *C. trachomatis*. Give a reason for your answer.

.....

 [2]

(ii) Suggest why data have been collected for the number of diagnoses of genital chlamydia in **men**.

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 [1]

- (iii) Describe **and** suggest an explanation for the trend shown by the data in Fig. 4.1.

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..... [4]

- (iv) Suggest what the trend in Fig. 4.1 might indicate about the spread of other sexually transmitted infections, such as HIV.

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..... [2]

[Total: 21]

- 5 A computerised axial tomography (CT) scan can help with the diagnosis and treatment of brain injuries.

Fig. 5.1 shows a CT scan of the human brain.

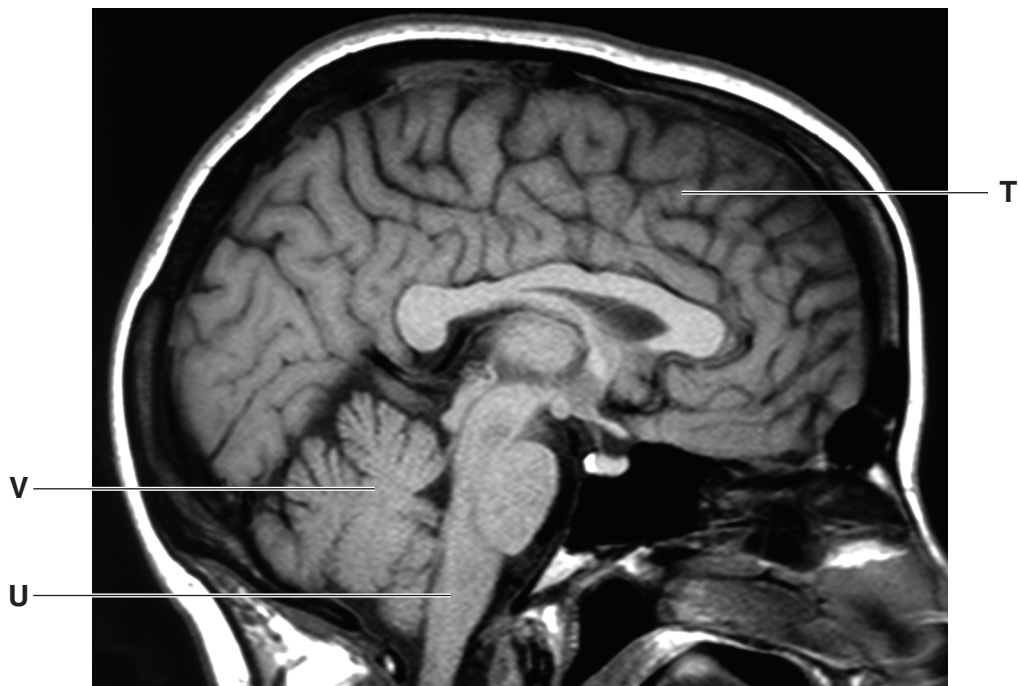


Fig. 5.1

- (a) (i) Name the structures labelled **T** to **V** on Fig. 5.1.

T

U

V [3]

- (ii) Outline how a CT scan works **and** explain how it could be used in the assessment of brain damage.

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..... [5]

- (b) Describe how brain activity may be modified by diamorphine (heroin), in order to relieve severe pain in cancer patients.

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..... [3]

QUESTION 5(c) STARTS ON PAGE 18

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

Explain, with reference to heroin and alcohol, the difference between **psychological** and **physical** dependency.

..... [7]

Quality of Written Communication [1]

[Total: 19]

19
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QUESTION 6 STARTS ON PAGE 20

- 6 There is an increasing awareness of the importance of monitoring the effect of human activities on ecosystems. To do this, it is necessary to understand the environmental processes that may be affected.

Fig. 6.1, opposite, shows the carbon cycle.

- (a) Name the processes occurring at **M** and **N** on Fig. 6.1.

M

N [2]

- (b) Human demand for timber and other wood products has led to an increase in deforestation.

Explain how deforestation can result in an increase in the carbon dioxide concentration of the atmosphere.

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..... [2]

- (c) The forest floor is normally a mixture of leaf litter and soil.

Explain how leaf litter and soil contribute to the carbon dioxide in the atmosphere.

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..... [3]

- (d) Describe **two** possible ways in which a rise in atmospheric carbon dioxide concentration could affect the human ecosystem.

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..... [3]

[Total: 10]

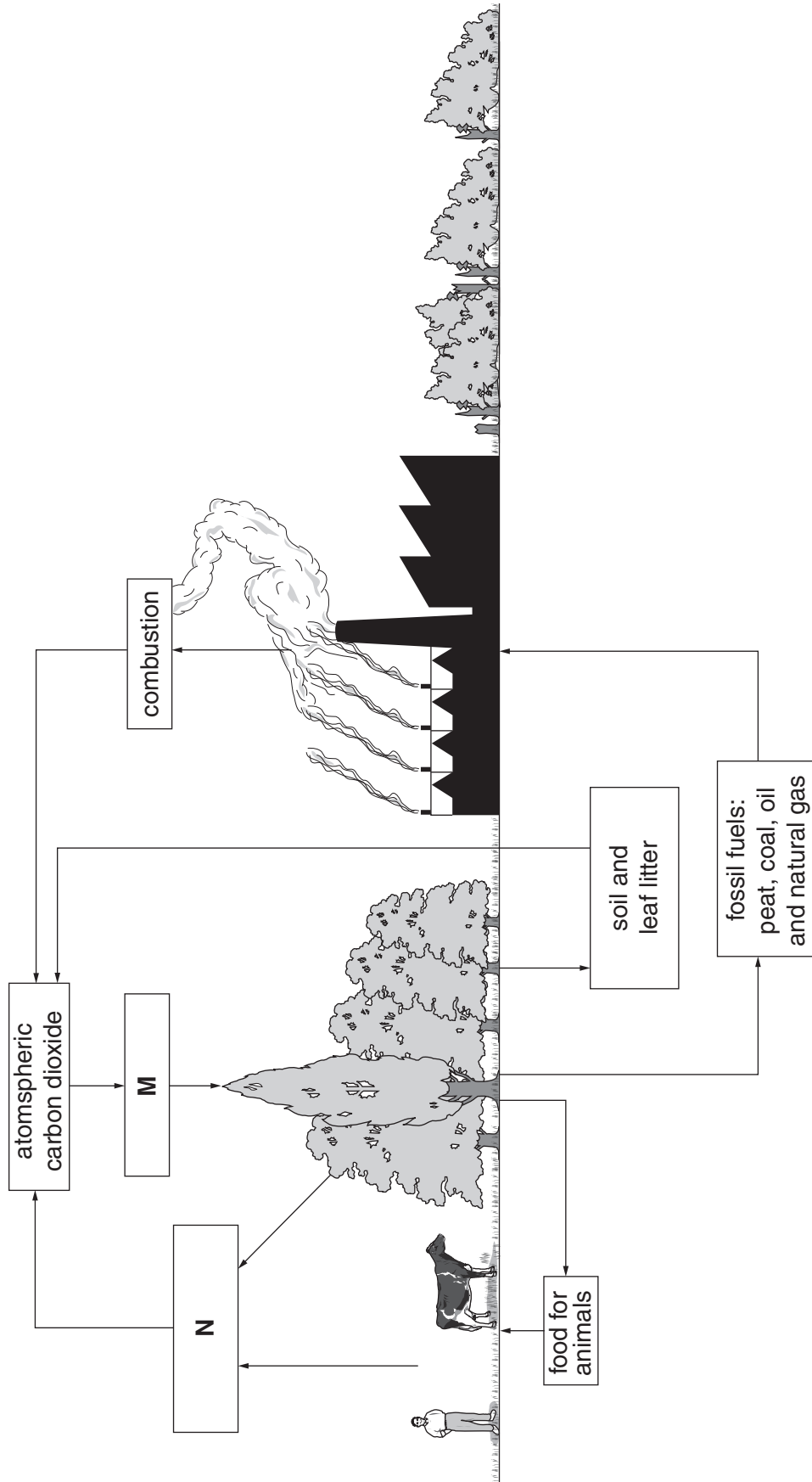


Fig. 6.1

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