

Centre Number	Candidate Number	Name
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CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**HUMAN AND SOCIAL BIOLOGY**

**5096/02**

Paper 2

May/June 2003

**2 hours**

Additional Materials: Answer Paper

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name in the spaces at the top of this page and on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

**Section A**

Answer **all** questions.

Write your answers in the spaces provided on the Question Paper.

**Section B**

Answer **three** questions.

Write your answers to Questions 8 and 9 on the separate Answer Paper provided.

Write your answer to Question 10 in the spaces provided on the Question Paper.

At the end of the examination,

1. fasten your work securely together;
2. write an E (for Either) or an O (for Or) next to the number 10 in the grid below to indicate which question you have answered.

The number of marks is given in brackets [ ] at the end of each question or part question.

You are advised to spend no longer than 1 hour on Section A.

For Examiner's Use	
<b>Section A</b>	
<b>Section B</b>	
<b>8</b>	
<b>9</b>	
<b>10</b>	
<b>TOTAL</b>	

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

This document consists of **16** printed pages.

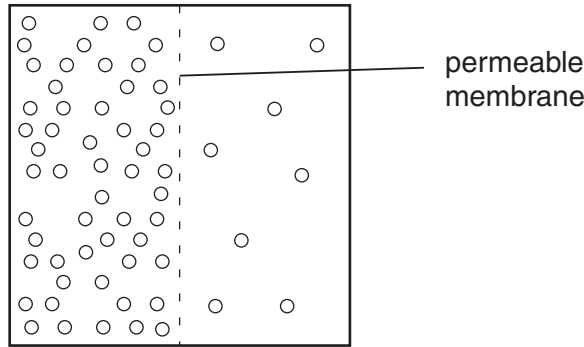


**Section A**

Answer **all** the questions.

Write your answers in the spaces provided.

- 1 Fig. 1.1 shows molecules of a gas in two areas, separated by a permeable membrane.



**Fig. 1.1**

- (a) (i) Draw an arrow on Fig. 1.1 to show the direction in which diffusion will occur. [1]

- (ii) State what will eventually happen to the concentrations of gas on both sides of the membrane.

.....[1]

- (b) Explain how the following help to maintain the diffusion of oxygen from the alveoli into the blood.

*breathing* .....

.....

*blood flow* .....

.....[2]

- (c) Gaseous exchange in the lungs occurs in alveoli, which have thin walls and a large surface area.

Explain how these features of the alveoli help gaseous exchange.

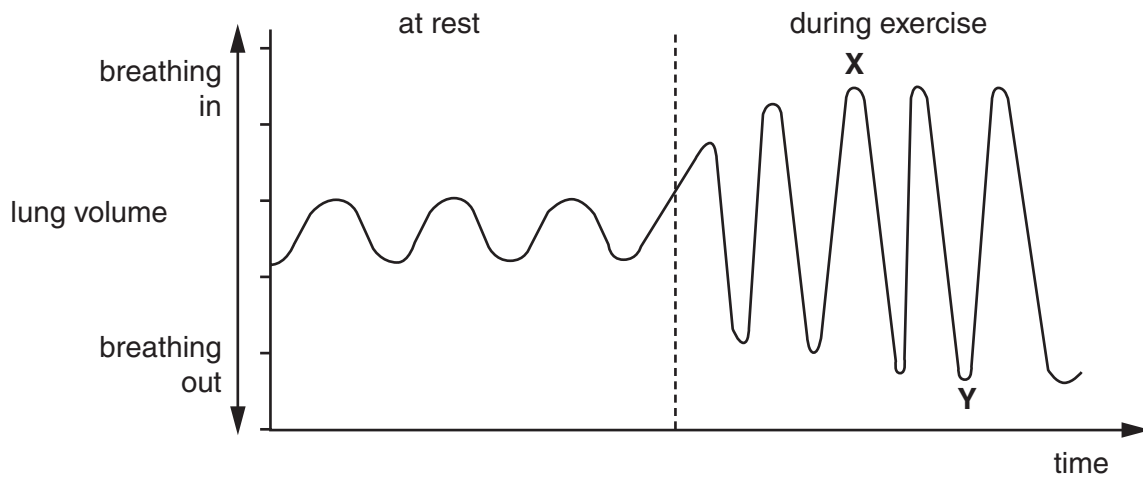
.....

.....

.....

.....[3]

Fig. 1.2 shows changes in the breathing pattern of a person at rest and then while exercising.



**Fig. 1.2**

**(d) (i)** Using Fig. 1.2, state **two** ways in which the breathing pattern changes during exercise.

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

**(ii)** During heavy exercise, which muscles involved in breathing would be fully contracted at the points labelled **X** and **Y** on Fig. 1.2?

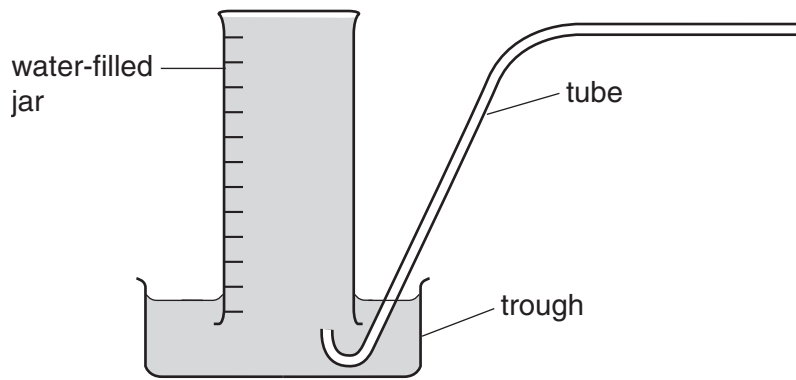
- X** .....
- Y** .....[3]

**(e)** Define the term *vital capacity*.

.....

.....[2]

(f) Fig. 1.3 shows some apparatus that can be used to measure vital capacity.



**Fig. 1.3**

(i) Describe how you would use this apparatus.

.....  
.....  
.....  
.....  
.....[4]

(ii) State the effect that each of the following would have on a person's vital capacity.

*smoking* .....

*regular exercise* .....[2]

[Total : 20]

2 Fig. 2.1 shows some of the processes and organs involved in the regulation of blood sugar.

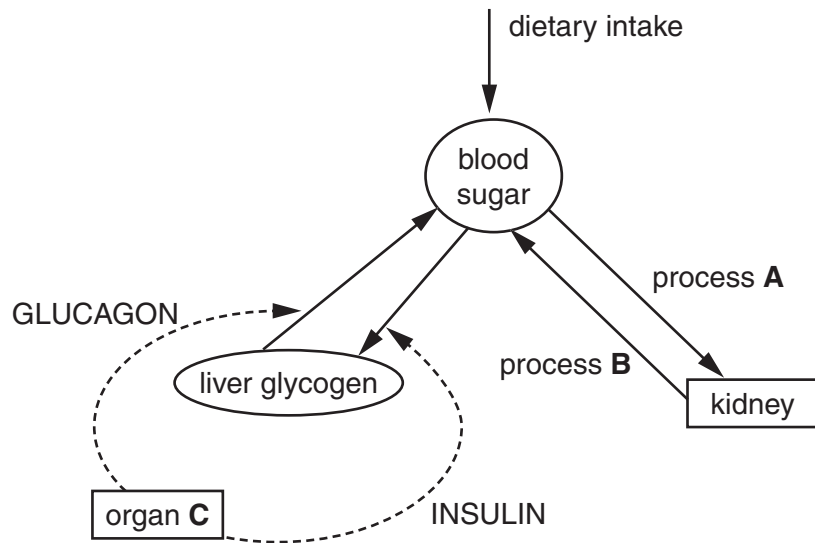


Fig. 2.1

(a) Name organ **C** which detects changes in blood sugar levels.

..... [1]

(b) What effects do glucagon and insulin have on the **amount** of sugar in the blood?

*glucagon* .....

*insulin* ..... [2]

(c) Processes **A** and **B** occur in the kidney.

Name

(i) process **A**, in which sugar leaves the blood; ..... [1]

(ii) process **B**, in which sugar re-enters the blood. .... [1]

(d) Diabetics lack insulin and are treated by having regular injections of insulin.

Explain why this hormone cannot be taken as a pill.

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

[Total : 7]

- 3 Table 3.1 shows various methods of birth control and their failure rates measured as pregnancies per 100 women per year. The figure for no contraception is given for comparison.

**Table 3.1**

method	failure rate / pregnancies per 100 women per year
contraceptive pill	0–3
IUD (coil)	0.5–6
condom	3–20
cap	3–25
rhythm method	15–35
no contraception	85

- (a) State which method of contraception is

most effective; .....

least effective. ....

[2]

- (b) Complete the table below by naming the method of contraception described in each case.

description of method	name of method
prevents implantation	
prevents ovulation	
prevents semen reaching vagina	
prevents semen in vagina entering cervix	

[4]

[Total : 6]

4 Fig. 4.1 shows how bone density changes with age in men and women.

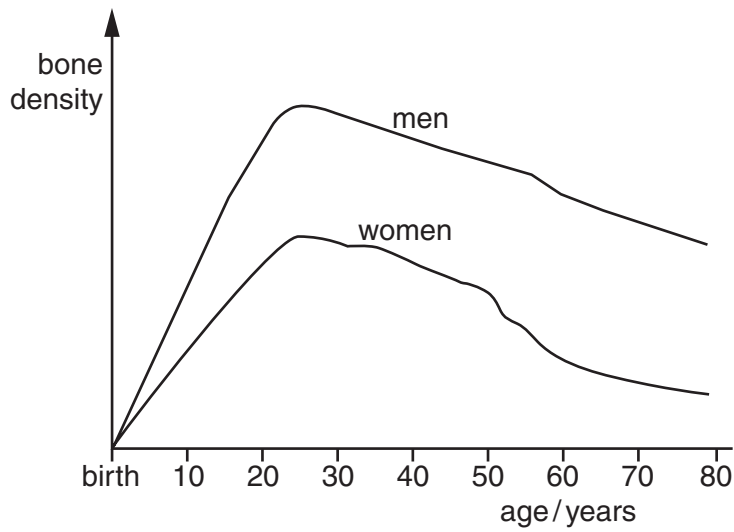


Fig. 4.1

(a) Name a mineral that is found in bone. ....[1]

(b) At which age does bone density begin to decrease sharply in women?

..... [1]

(c) Describe what is happening in women of this age that could account for the decrease.

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

[Total : 4]

5 Complete the table below identifying the type of pathogen (causative organism) or the mode of transmission for each disease.

disease	mode of transmission	type of pathogen
HIV / AIDS	sexual	
ringworm	contact	
tuberculosis		bacterium
cholera	water	
malaria	insect bite	

[Total : 5]

6 Fig. 6.1 shows the stomach and associated organs.

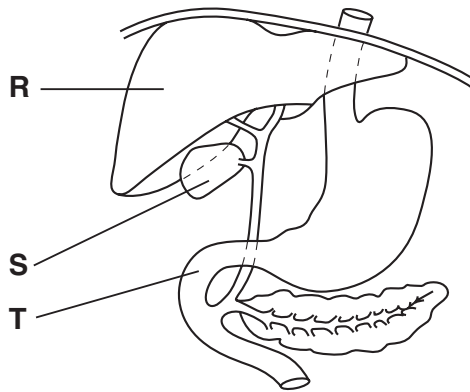


Fig. 6.1

(a) Name **R**, **S** and **T**.

**R** .....

**S** .....

**T** .....

[3]

(b) Name the fluid that is stored in **S**. .....[1]

(c) **T** receives fluids from several organs.

Name the fluids that are described below.

strongly acidic .....

contains breakdown products of haemoglobin .....

hydrolyses fats .....[3]

[Total : 7]



- 7 Albinism is a rare condition in humans in which normal colouration is absent. It is due to the inheritance of a pair of recessive alleles, **aa**. Fig. 7.1 shows the inheritance of colouration in a family tree of eight individuals, **J** to **Q**.

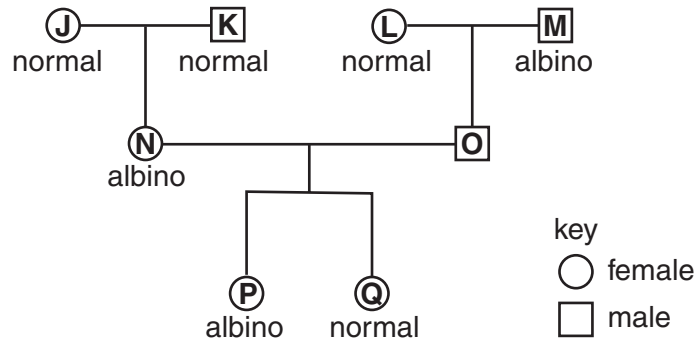


Fig. 7.1

- (a) Using **A** to represent the allele for normal colouration and **a** to represent the allele for absence of colouration, state the genotypes of individuals **J** and **K**.

**J** .....

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

- (b) (i) Although **O**'s phenotype is not given in Fig. 7.1, what would you expect it to be, normal or albino?

..... [1]

- (ii) Explain your choice in (i).

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

- (c) If **N** and **O** have another child, what is the chance that they will have a son with normal colouration?

..... [1]

[Total : 6]

## Section B

Answer **three** questions.

Write your answers to Questions **8** and **9** on the separate answer paper provided.

Question **10** is in the form of an **Either/Or** question. Only one part should be answered.

Write your answer to Question **10** in the spaces provided.

- 8** (a) (i) Describe the early signs and symptoms of gonorrhoea in a man. [3]  
(ii) State how it is treated at this early stage. [1]
- (b) Describe and explain the possible effects on the male and the female if the disease is not treated at this early stage. [4]
- (c) Gonorrhoea is caused by a bacterium. Give **three** ways in which a virus differs from a bacterium in structure. [3]
- (d) HIV/AIDS is spread sexually and by other means. Describe **three** other ways in which it is spread. [3]
- (e) People with AIDS may die from a variety of diseases they are unable to combat. Name the defensive cells in their bodies that have been destroyed by the virus. [1]

[Total : 15]

- 9** (a) Drug taking may lead to dependence. Two common drugs are nicotine and alcohol. What is meant by the term *drug dependence*? [1]
- (b) Name the parts of the body where these drugs enter the bloodstream. [2]
- (c) Alcohol is described as a depressant. How does it produce this effect? [1]
- (d) Explain why a person should not drive a car after drinking alcohol. [4]
- (e) Cigarette smoke contains several substances, including nicotine and carbon monoxide. Explain how nicotine and carbon monoxide may cause women who smoke to have smaller babies than those of non-smokers. [7]

[Total : 15]

10 Either

Fig. 10.1 shows a model gut made from Visking tubing, which is permeable to small molecules but not to large ones. Amylase is an enzyme that hydrolyses starch to sugar.

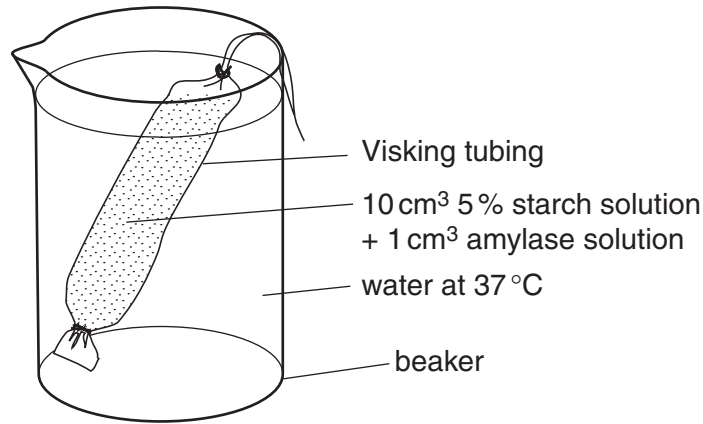


Fig. 10.1

- (a) Name the part of the apparatus that represents the  
 blood supply of the gut; .....  
 gut wall; .....  
 gut contents. .... [3]

At the start of the experiment and after five minutes, the water in the beaker and the contents of the tubing were tested for starch and for sugar.

The results are shown in Table 10.1.

Table 10.1

material tested	result at start	result after five minutes
water in beaker	no starch no sugar	no starch sugar present
contents of tubing	starch present no sugar	no starch sugar present

- (b) Describe how you would test a small amount of solution for sugar.  
 .....  
 .....  
 .....  
 ..... [3]

**(c) (i)** Explain why there is no starch

in the water in the beaker at the start of the experiment;

.....  
.....

in the contents of the tubing after five minutes.

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

**(ii)** Explain why sugar is found after five minutes

in the contents of the tubing;

.....  
.....

in the water in the beaker.

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

**(d)** In order to confirm that this result is due to the action of amylase, a control experiment should be carried out. Describe how you would carry out such a control.

.....  
.....  
.....  
.....  
.....[5]

[Total : 15]

Or

Fig. 10.2 shows a simple apparatus that can be used to estimate the energy content of a food. The temperature of the water in the boiling tube is taken, the food is burned under the tube and the highest temperature reached by the water is recorded.

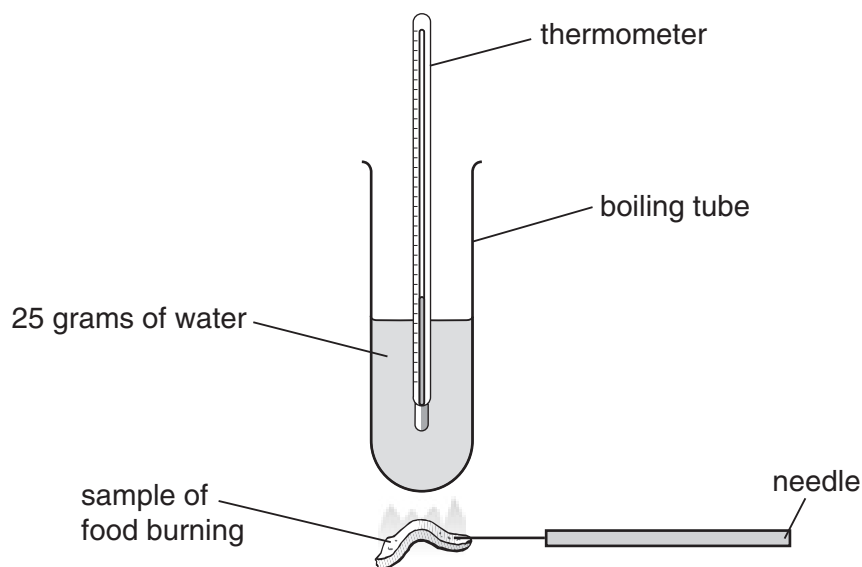


Fig. 10.2

It takes 4.2 joules to raise the temperature of 1 gram of water by 1 °C.

Using the formula below, the energy content of a food sample can be calculated.

$$\text{mass of water} \times \text{temperature difference} \times 4.2 = \text{energy content in joules}$$

The results from two different food samples, **A** and **B**, are shown in Table 10.2.

Table 10.2

sample	temperature of water at start / °C	temperature of water after burning food / °C	temperature difference / °C
<b>A</b>	20	32	
<b>B</b>	22	57	

- (a) (i) Calculate the temperature difference for samples **A** and **B** and insert the figures in Table 10.2. [2]
- (ii) Using the formula above and your results from (i), calculate the energy content of samples **A** and **B**. Show your working and include the correct units.

**A** .....

**B** .....

[4]

(b) All the students in a class test the same type of food, as shown in Fig. 10.2. The results vary a lot.

Suggest three reasons for this variation.

1. ....  
.....
  2. ....  
.....
  3. ....  
.....
- [3]

(c) A textbook gives the following results for the energy content of carbohydrate and fat.

substance	energy content / kilojoules per gram
carbohydrate	17
fat	37

Which of the following 100 gram food samples, **X**, **Y** or **Z**, would give the most energy if eaten?

food sample	carbohydrate / gram	fat / gram
<b>X</b>	50	5
<b>Y</b>	5	30
<b>Z</b>	52	2

most energy is in food sample .....

[1]

(d) Table 10.3 shows the daily energy requirements for different people.

**Table 10.3**

age range or occupation	daily energy requirement / megajoules
child 0–1	3.3
child 2–4	5.9
child 4–7	7.5
boy 9–12	10.5
boy 12–15	11.7
boy 15–18	12.6
girl 9–12	9.6
girl 12–15	9.6
girl 15–18	9.6
adult male office worker	10.9
adult male labourer	15.1
adult female office worker	10.0
adult female labourer	14.0
pregnant female	12.0
breast-feeding female	13.0

From the information in Table 10.3, list five factors that affect the energy requirement of a person.

1. ....
2. ....
3. ....
4. ....
5. ....[5]

[Total : 15]

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*Copyright Acknowledgements:*

Question 5. Boyle, Indge Senior, *Human Biology*. © Collins, 1999.

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