Surname		Other Names	
Centre Number			Candidate Number	
Candidate Signature			

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General Certificate of Secondary Education
June 2005

ASSESSMENT and QUALIFICATIONS ALLIANCE

HUMAN PHYSIOLOGY AND HEALTH HIGHER TIER

3417/H

Friday 24 June 2005 9.00 am to 11.00 am

H

In addition to this paper you will require:
a ruler.
You may use a calculator.

Time allowed: 2 hours

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

Information
- The maximum mark for this paper is 120.
- Mark allocations are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
- In all calculations, show clearly how you work out your answer.

For Examiner's Use			
Number	Mark	Number	Mark
1		8	
2		9	
3		10	
4		11	
5		12	
6		13	
7			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

1 (a) The table shows information about some foods.

Food	Energy in kilojoules	Carbohydrate in portions	Fat
Hamburgers (large)	1696	3.5	**
Hamburgers (small)	1058	3	*
Cheeseburgers (large)	2083	4	***
Cheeseburgers (small)	1260	3	*
Fries	1209	3.5	**
Chicken nuggets	1134	1.5	*
Pancakes	1213	5	*
Apple pie	1050	3	**
Coke	403	2.5	–
Diet coke	4	–	–
Coffee (with milk)	168	–	–
Carbohydrate is shown as portions. Each portion = 10 g Fat is shown as *. Each * = 10 g			

(i) How many grams of carbohydrate are present in a large hamburger?

..... grams
(1 mark)

(ii) Which substance has been removed from diet coke?

.....
(1 mark)

(iii) Milk contains some fat. Suggest why coffee (with milk) in the table is shown as having no fat.

.....

.....
(1 mark)

(b) Which substance is the largest component of coke and coffee?

.....

(1 mark)

(c) Vitamins and minerals are needed in a balanced diet.
How does the body make use of:

(i) vitamin D; .....

.....

(1 mark)

(ii) iron? .....

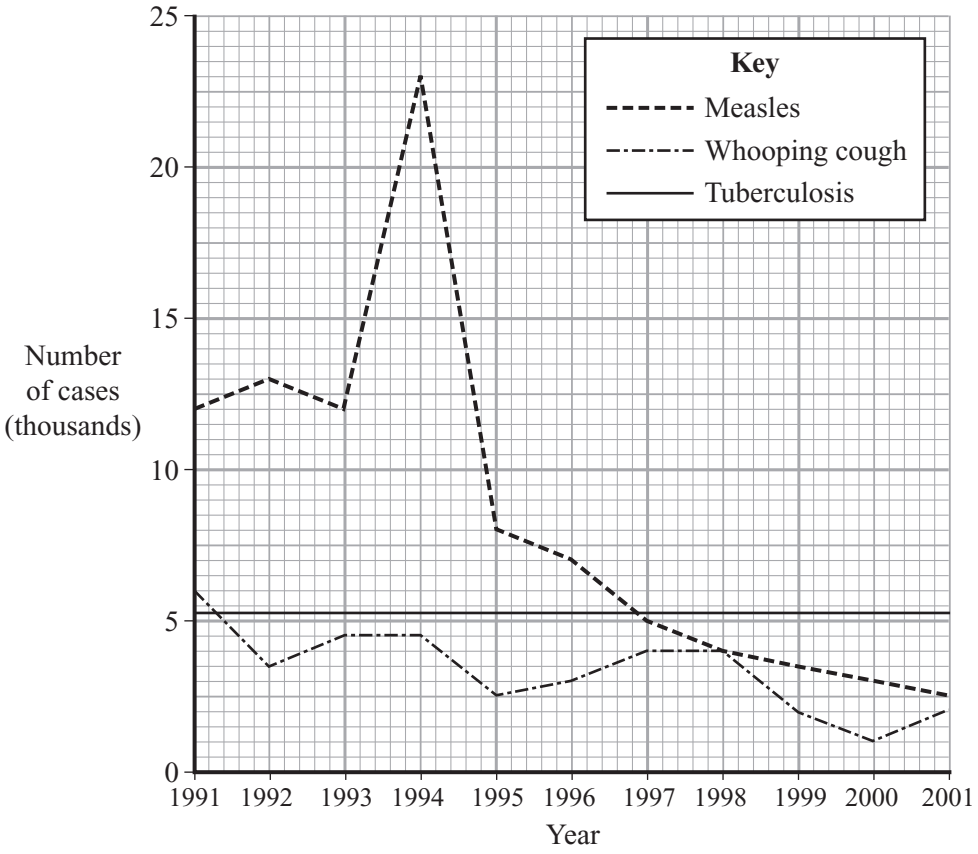
.....

(1 mark)

6

TURN OVER FOR THE NEXT QUESTION

2 The graph shows the number of cases of three diseases between 1991 and 2001.



(a) (i) What was the fall in the number of cases of whooping cough between 1997 and 2000?

..... thousand

(1 mark)

(ii) Describe the change in the number of cases of measles between 1993 and 1994.
Suggest a reason for this change.

Change: .....

.....

Reason: .....

.....

(2 marks)

(b) The vaccine for tuberculosis contains a dead form of the tuberculosis bacterium. How does the body respond to the vaccine?

.....

.....

.....

.....

.....

.....

(3 marks)

(c) (i) How is passive immunity brought about?

.....

.....

(1 mark)

(ii) When is passive immunity needed?

.....

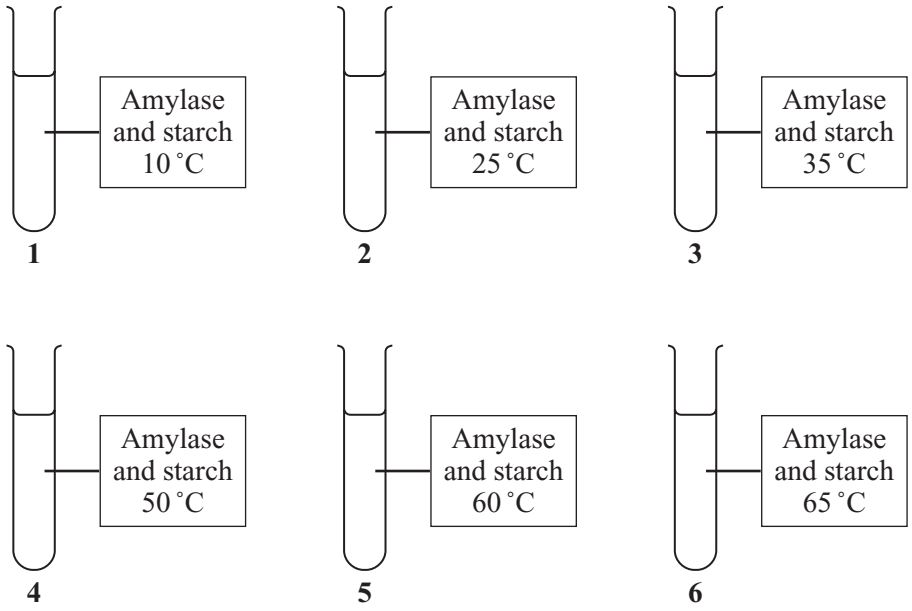
.....

(1 mark)

8

TURN OVER FOR THE NEXT QUESTION

3 A student set up the following investigation. Amylase and starch were kept in separate test tubes for two hours at the temperature shown in the diagram. The starch and amylase were then mixed and left for one hour. Each tube was then tested to see if digestion had taken place.



(a) In which tube would starch be digested the fastest?

.....

(1 mark)

(b) Explain why the starch would **not** be digested in tube **6**.

.....

.....

(1 mark)

(c) (i) What is the product of starch digestion?

.....

(1 mark)

(ii) How would you test for this product?

.....

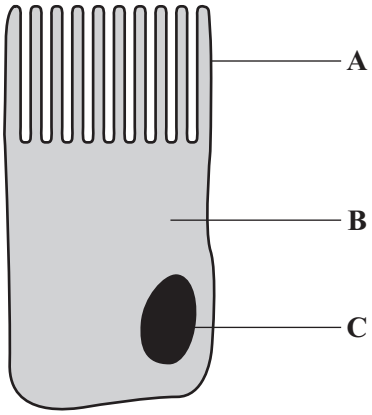
.....

.....

.....

(2 marks)

(d) The diagram shows a cell from the lining of the small intestine.



(i) State the functions of the structures labelled **B** and **C**.

B .....

.....

C .....

.....

(2 marks)

(ii) In the small intestine, digested food materials pass into the blood.
What is this process called?

.....

(1 mark)

(iii) How do the structures labelled **A** help this process?

.....

.....

(1 mark)

9

4 Read the passage.

> In 1928, a doctor named Alexander Fleming was working with a bacterium called *Staphylococcus*. He grew the bacteria on agar in glass dishes. Normally, the dishes were sealed with a glass lid. Some of the dishes were left without lids and became contaminated with a mould from the air. Fleming noticed that there were no bacteria growing near the mould.
>
> Fleming thought that the mould was producing a substance that either killed the bacteria or inhibited their growth. To test his idea, Fleming produced a pure culture of the mould. He grew the mould in a broth. He added the broth to various types of bacterial cultures. The broth killed the bacteria even when diluted thousands of times. Fleming named the active substance produced by the mould, penicillin.
>
> Penicillin was found to be effective against many human diseases.

(a) What was Fleming's first observation?

.....

.....

(1 mark)

(b) What was Fleming's theory to explain his observation?

.....

.....

.....

.....

(2 marks)

(c) How did he test his theory?

.....

.....

.....

.....

(2 marks)

(d) What was the result of his test?

.....

.....

(1 mark)

(e) Before penicillin was used as a treatment for human diseases, it was tested on animals. Explain why.

.....

.....

(1 mark)

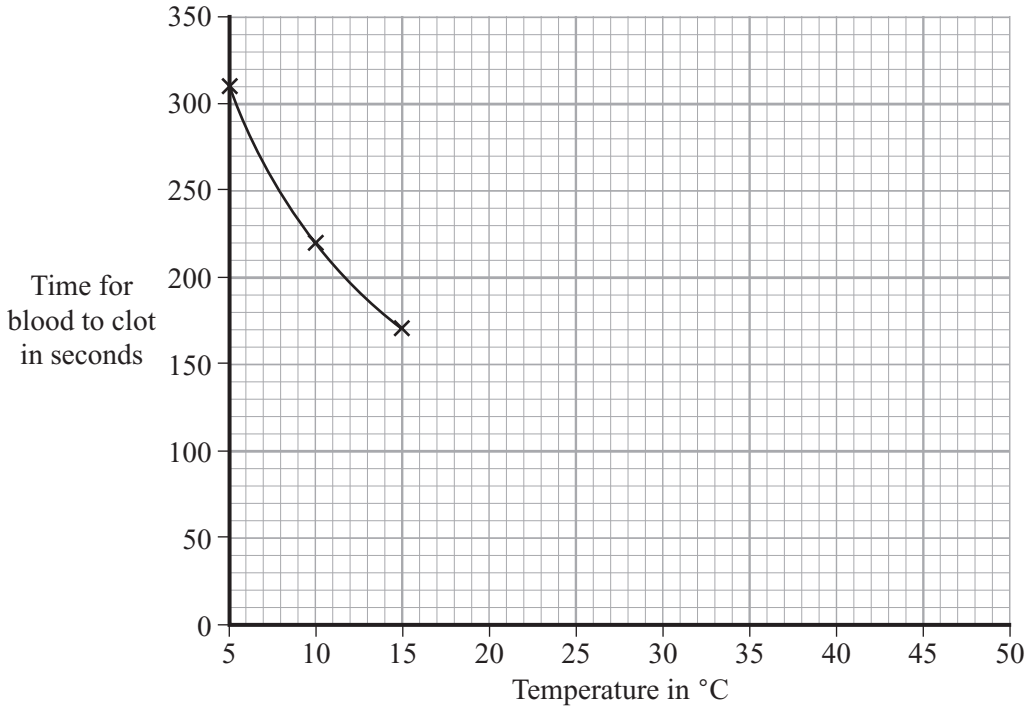
7

TURN OVER FOR THE NEXT QUESTION

5 The table shows the times taken for blood to clot at different temperatures.

Temperature in °C	Time for blood to clot in seconds
5	310
10	220
15	170
20	130
25	90
30	60
35	50
40	60
45	90
50	300

(a) (i) Complete the graph.



(4 marks)

(ii) At what temperature does the blood clot the quickest?

.....

(1 mark)

(iii) Suggest a reason for this.

.....

.....

(1 mark)

(iv) What are the relationships between blood clotting and temperature as shown on the graph?

.....

.....

.....

.....

(2 marks)

(b) How does blood clotting help to prevent disease?

.....

.....

(1 mark)

9

TURN OVER FOR THE NEXT QUESTION

6 (a) Give **two** functions of the skeleton.

1 .....

.....

2 .....

.....

(2 marks)

(b) Name the structures in a joint which:

(i) cover the ends of the bones and prevent friction;

.....

(1 mark)

(ii) hold the bones together;

.....

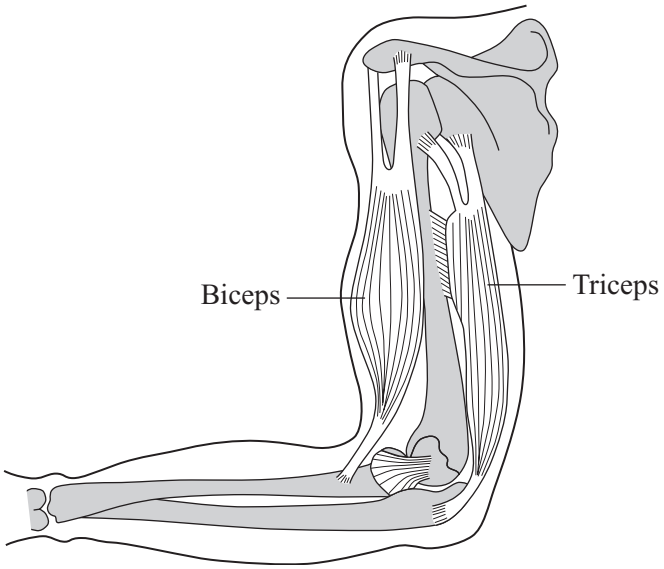
(1 mark)

(iii) attach a muscle to a bone.

.....

(1 mark)

(c) The diagram shows some of the muscles in the arm.



Explain how the biceps and triceps move the arm at the elbow.

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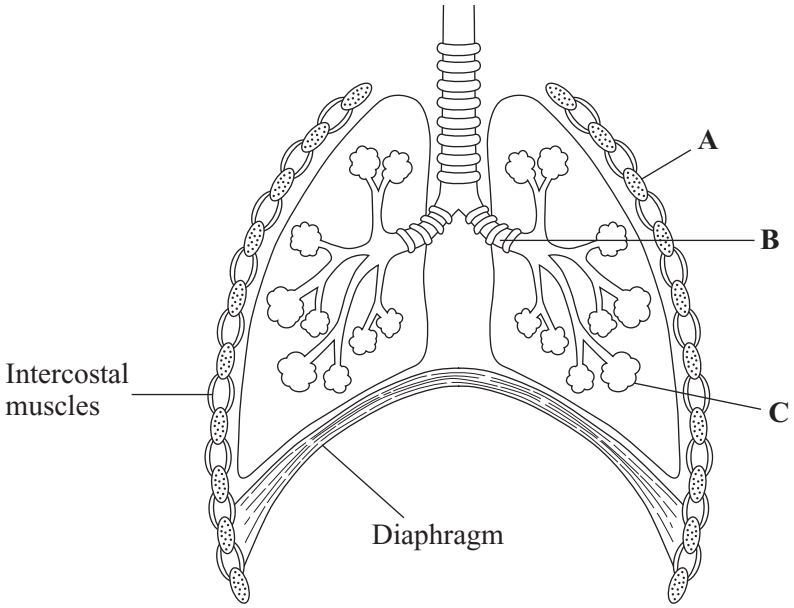
(5 marks)

10

7 The diagram shows the breathing system.



(a) Name the parts labelled **A**, **B** and **C**.

A .....

B .....

C .....

(3 marks)

(b) Explain how the diaphragm and the intercostal muscles cause air to enter the lungs.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

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(5 marks)

(c) The lining of the trachea has cells that make mucus and cells that have cilia. How do the mucus and cilia help to stop dust and microorganisms entering the lungs?

.....

.....

.....

.....

.....

.....

(2 marks)

(d) During an asthma attack people have difficulty in breathing. A chemical can be inhaled to widen the air passages. Suggest how this helps the person to breathe more easily.

.....

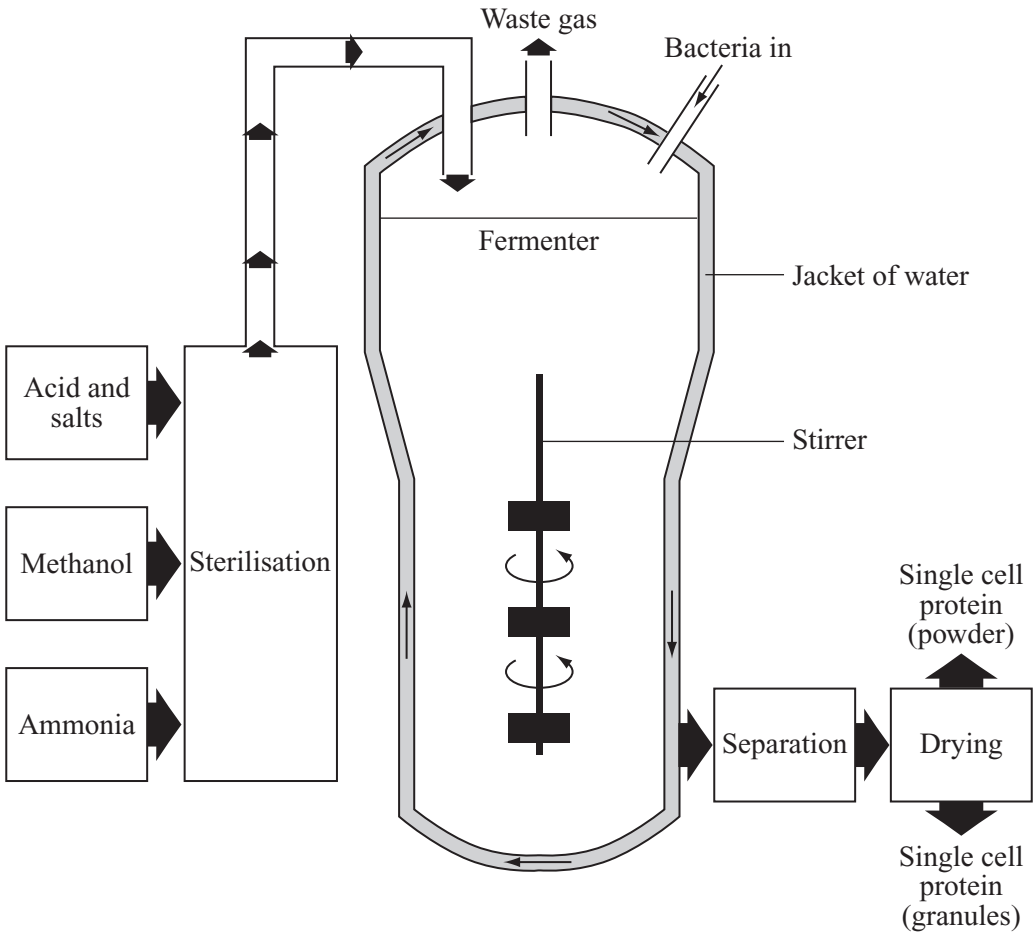
.....

(1 mark)

11

TURN OVER FOR THE NEXT QUESTION

8 Single cell protein (SCP) can be produced by growing microbial cells in a fermenter. The diagram shows a section through a fermenter.



(a) (i) Name **one** raw material used in the process.

.....

(1 mark)

(ii) Explain why there is a jacket of water around the fermenter.

.....

.....

.....

(2 marks)

(iii) The contents of the fermenter are continuously stirred to mix the contents. Suggest a reason why.

.....

.....

(1 mark)

(iv) Suggest why the raw materials are sterilised.

.....

.....

(1 mark)

(b) Each of the microbial cells in the fermenter can divide every few hours to form clones. What is a clone?

.....

.....

(1 mark)

(c) (i) SCP contains 42 % protein. A single fermenter yields 90 600 kg of SCP per day. How much of this is protein?

..... kg

(1 mark)

(ii) The traditional method of producing protein is through the rearing of cattle, sheep and pigs.

Suggest **one** advantage and **one** disadvantage of SCP production compared with the traditional method of producing protein.

Advantage .....

.....

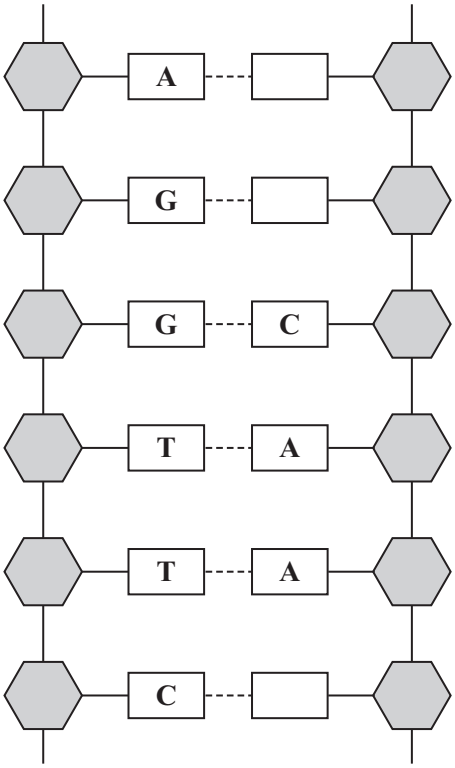
Disadvantage .....

.....

(2 marks)

9

9 The diagram shows a representation of part of a DNA molecule. The boxes represent the bases which hold the two strands of DNA together.



Symbol	Name of Base
A	Adenine
C	Cytosine
G	Guanine
T	Thymine

(a) Complete the diagram to show the missing bases. *(2 marks)*

(b) Where in a cell is DNA found?

.....

.....

(1 mark)

(c) What is the relationship between chromosomes, genes and DNA?

.....

.....

.....

.....

(2 marks)

(d) Describe what happens to the DNA in a cell when the cell divides.

.....

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.....

(3 marks)

8

TURN OVER FOR THE NEXT QUESTION

10 (a) Waste material may be removed from the body through the anus by egestion or through organs such as the kidneys by excretion. How is excretion different from egestion?

.....

.....

(1 mark)

(b) Complete the table to show if each of the substances is excreted or egested from the body.

Substance	Excreted or egested
Bile	
Faeces	
Urea	

(2 marks)

(c) Describe how urea is formed.

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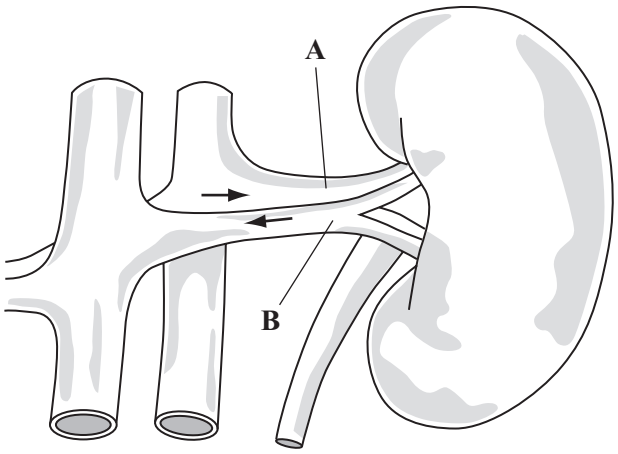
(4 marks)

(d) The diagram shows a kidney and its associated blood vessels.



(i) Name the blood vessels labelled:

A; .....

B. .....

(2 marks)

(ii) Explain how the kidneys produce urine.

.....

.....

.....

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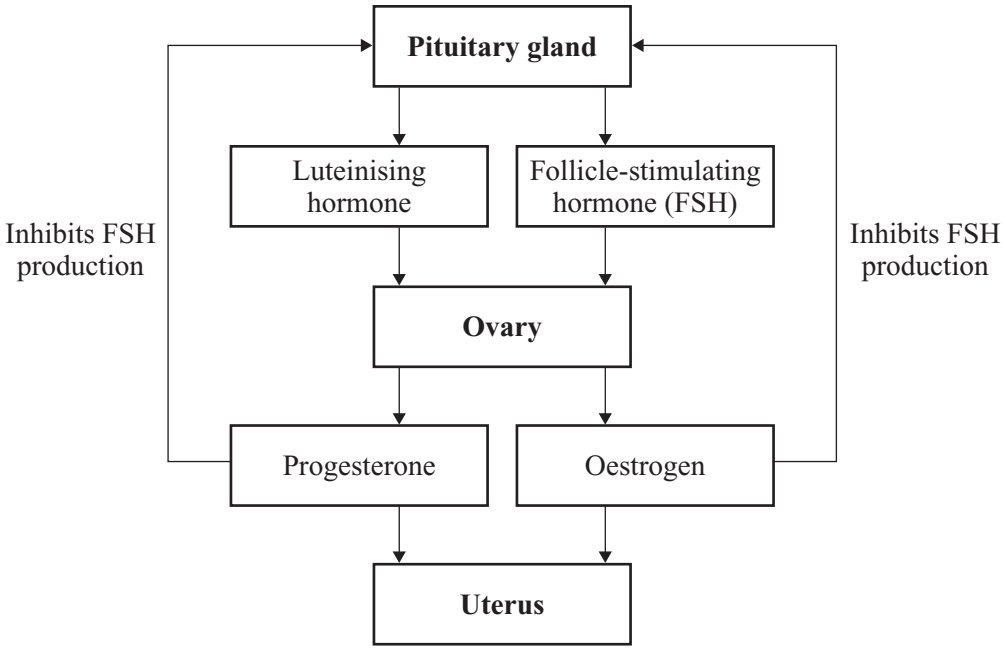
(5 marks)

14

11 (a) The diagram shows the role of some of the hormones involved in the menstrual cycle.



(i) What effect does FSH have on the ovaries?

.....

.....

(1 mark)

(ii) What effect does luteinising hormone have on the ovaries?

.....

.....

(1 mark)

(iii) Which part of the ovary produces progesterone?

.....

(1 mark)

(iv) Give **one** effect of progesterone during the menstrual cycle and **one** effect of progesterone during pregnancy.

Effect during the menstrual cycle: .....

.....

Effect during pregnancy: .....

.....

(2 marks)

(v) During pregnancy, the placenta produces gonadotrophin. What is the function of this hormone?

.....

.....

(1 mark)

(vi) One type of contraceptive pill contains only oestrogen. Explain how this type of pill prevents conception.

.....

.....

.....

.....

(2 marks)

(b) Other hormones are involved in homeostasis.

(i) Which organ monitors the water content of the blood?

.....

(1 mark)

(ii) Which organ secretes the hormone ADH?

.....

(1 mark)

(iii) How is the water content of the blood kept constant?

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

14

12 The core body temperature varies only within narrow limits, even when the air temperature changes considerably.

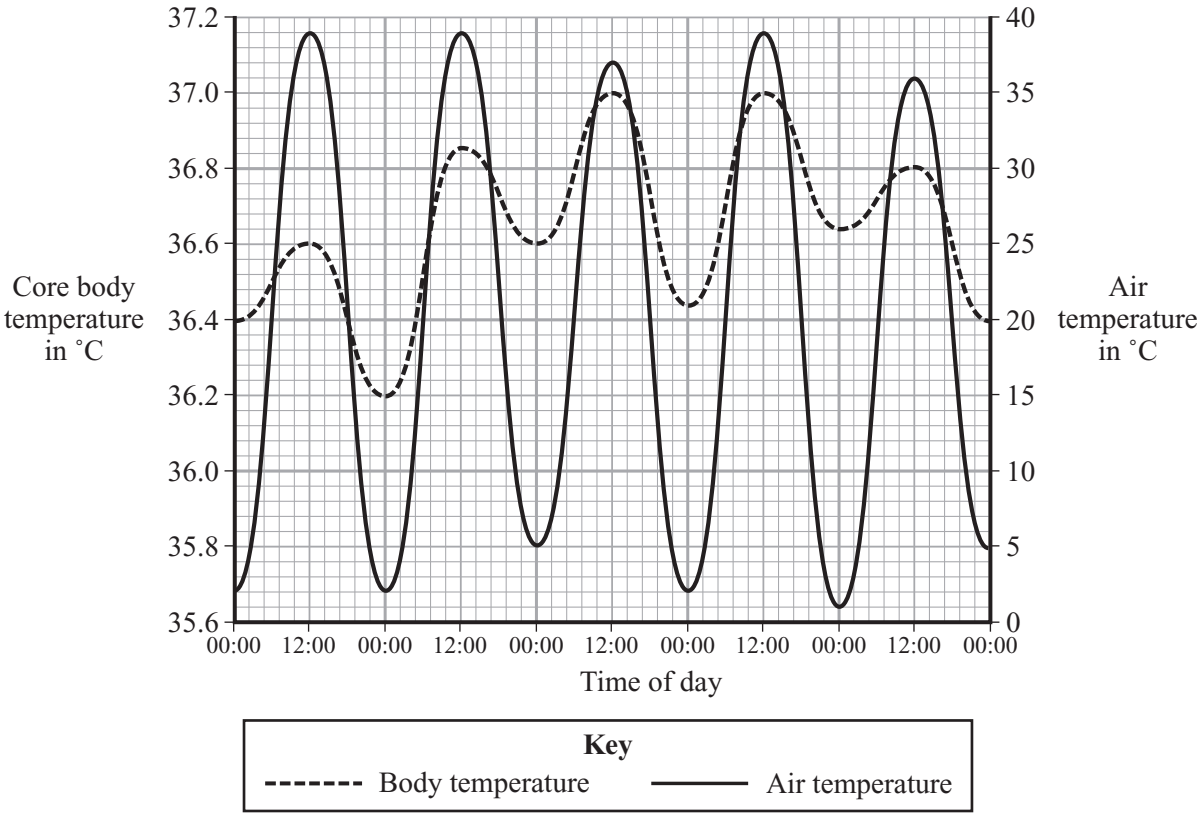
(a) Which part of the brain monitors core body temperature?

.....

.....

(1 mark)

(b) The graph shows the variation in the body temperature of a person and the air temperature over a period of five days in the desert.



(i) What is the largest variation in air temperature during one twelve-hour period?

.....

(1 mark)

(ii) What is the range of body temperature?

..... to .....

(2 marks)

(c) Explain how core body temperature is kept relatively constant when air temperature rises from 5 °C to 37 °C.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

.....

.....

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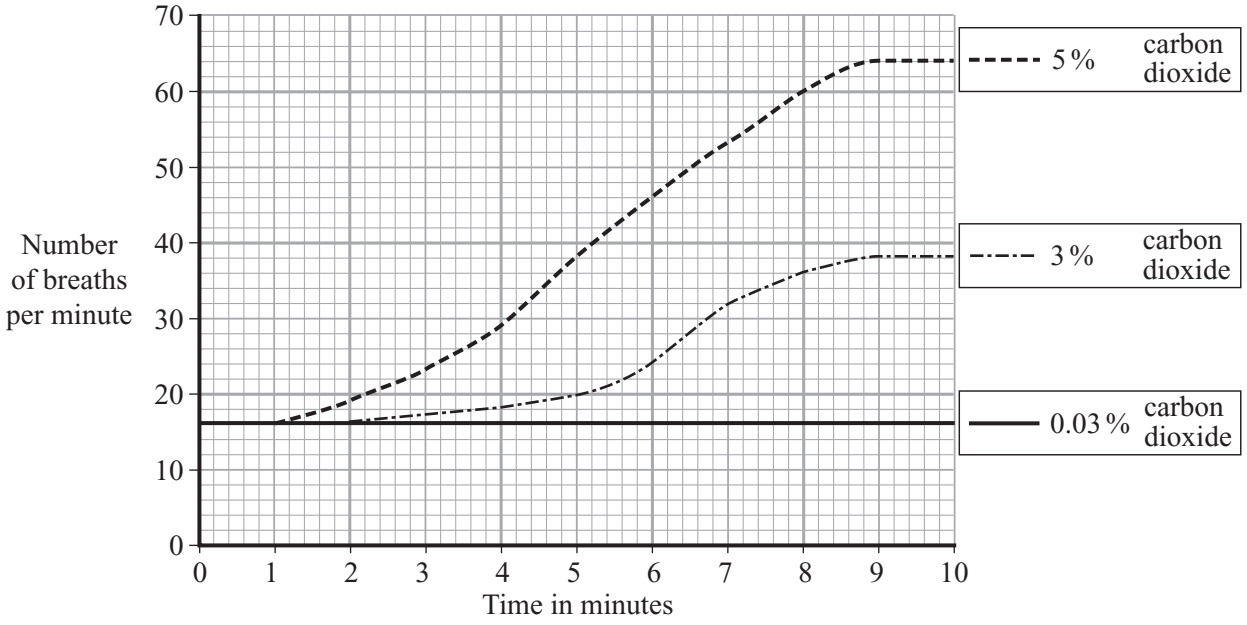
.....

(6 marks)

10

TURN OVER FOR THE NEXT QUESTION

13 The graph shows the effect on a person's breathing rate of different concentrations of carbon dioxide in the atmosphere.



(a) Where in the body is the breathing rate co-ordinated?

.....

(1 mark)

(b) (i) When a person breathes in air containing 3 % carbon dioxide, how long does it take from the start for their breathing rate to double?

.....

(1 mark)

(ii) When a person breathes in air containing 5 % carbon dioxide, how many times faster is their breathing rate after nine minutes?

.....

(1 mark)

(c) 'Mouth to mouth' resuscitation can be used to restart the breathing of a person who has stopped breathing. Use the information in the graph to explain how 'mouth to mouth' resuscitation causes breathing to restart.

.....

.....

.....

.....

(2 marks)

5

END OF QUESTIONS

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