Write your name here

Surname	Other names

Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Human Biology

Unit: 4HB0
Paper: 01

Wednesday 9 January 2013 – Afternoon
Time: 2 hours

Paper Reference
4HB0/01

You must have:
Ruler
Candidates may use a calculator.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 120.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P41541A

1/1/1/1/

P 4 1 5 4 1 A 0 1 2 8

PEARSON

Answer ALL questions.

1 For each of the questions (a) to (j), choose an answer **A**, **B**, **C** or **D** and put a cross in the box ☒. Mark only one answer for each question. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

(a) The liver is an example of

(1)

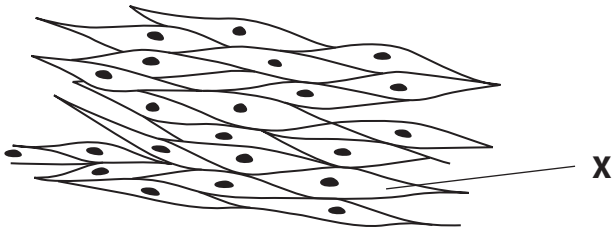
☒ **A** an organelle

☒ **B** a tissue

☒ **C** an organ

☒ **D** an organ system

(b) The picture shows some animal cells.



What part of the cell is shown by **X**?

(1)

☒ **A** cytoplasm

☒ **B** cell membrane

☒ **C** mitochondrion

☒ **D** nucleus

(c) Which two gases are associated with aerobic respiration?

(1)

☒ **A** nitrogen and oxygen

☒ **B** oxygen and carbon dioxide

☒ **C** carbon dioxide and nitrogen

☒ **D** argon and oxygen

(d) Which part of the blood carries most carbon dioxide?

(1)

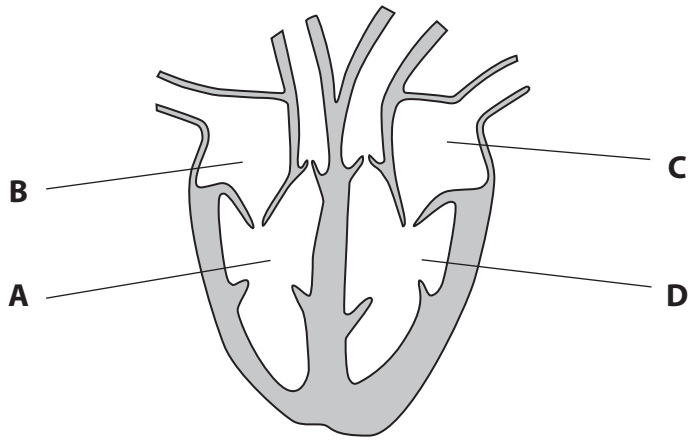
- ☒ **A** plasma
- ☒ **B** platelets
- ☒ **C** red blood cells
- ☒ **D** white blood cells

(e) The lungs, kidneys and skin are all organs involved in

(1)

- ☒ **A** digestion
- ☒ **B** excretion
- ☒ **C** reproduction
- ☒ **D** transport

(f) The diagram shows a human heart viewed from the front.



Which letter represents the part that pumps oxygenated blood out of the heart?

(1)

- ☒ **A**
- ☒ **B**
- ☒ **C**
- ☒ **D**

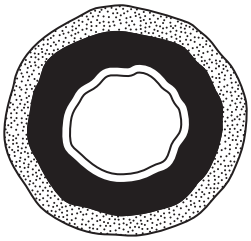
(g) A sewage treatment plant purifies 65 litres of sewage per minute. It runs continuously for 24 hours each day.

How many litres of sewage will be treated in one day?

(1)

- ☒ **A** 1 560
- ☒ **B** 3 900
- ☒ **C** 93 600
- ☒ **D** 561 600

(h) This is a section through a structure in the human body. It has very thick elastic walls and carries blood away from the heart.



The structure is

(1)

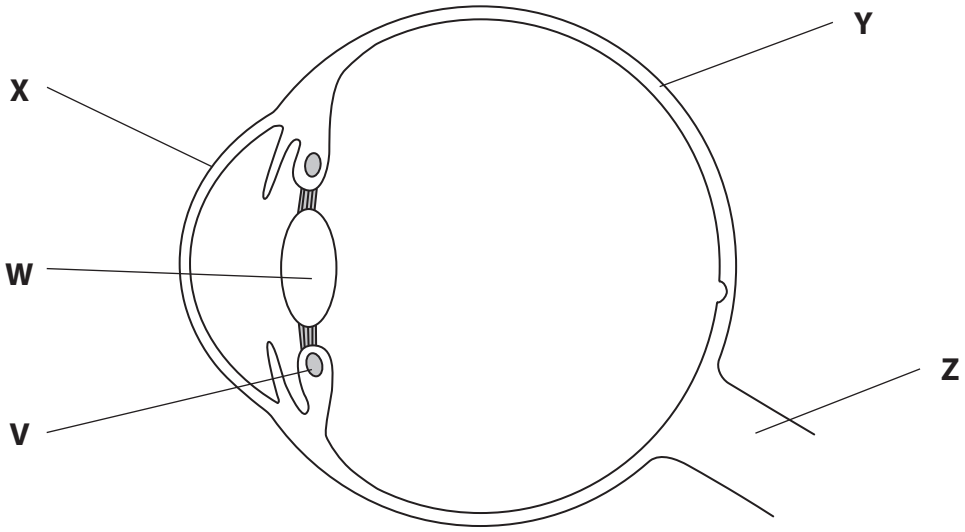
- ☒ **A** an artery
- ☒ **B** a bronchiole
- ☒ **C** the oesophagus
- ☒ **D** a vein

(i) Which of these descriptions **cannot** be used to describe an organism?

(1)

- ☒ **A** genotype heterozygous, phenotype dominant
- ☒ **B** genotype homozygous, phenotype dominant
- ☒ **C** genotype heterozygous, phenotype recessive
- ☒ **D** genotype homozygous, phenotype recessive

(j) Here is a section through the human eye.



Which letters represent the two parts that refract (bend) rays of light to focus them?

(1)

- ☒ **A** V and W
- ☒ **B** V and Y
- ☒ **C** W and X
- ☒ **D** X and Z

(Total for Question 1 = 10 marks)

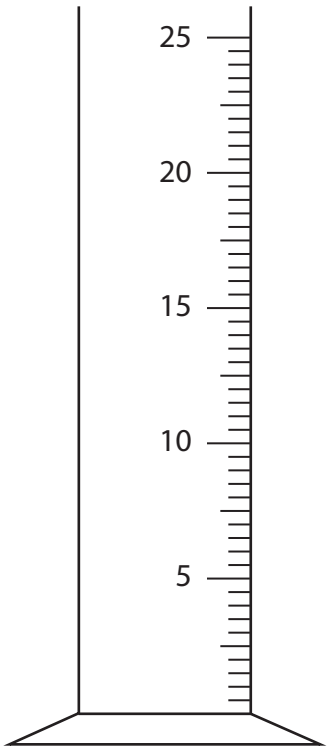
2 A student tests some food samples for glucose.

(a) Which reagent should the student use?

(1)

- ☒ **A** Benedict's
- ☒ **B** Biuret
- ☒ **C** Ethanol
- ☒ **D** Iodine

(b) The student measures out 5 cm^3 of reagent. She uses the piece of apparatus in the diagram.



(i) Name this piece of apparatus.

(1)

.....

(ii) On the diagram, draw where the surface of the reagent would be.

(1)

(c) The food test for glucose involves heating the reagent with some food.

Give **two** safety precautions that the student should carry out when doing this food test.

(2)

1 .....

.....

2 .....

.....

(d) The student tests two foods, Food X and Food Y.

She obtains the following results.

	Colour obtained when testing for glucose
Food X	Blue
Food Y	Orange

What conclusions may be made from the student's results?

(2)

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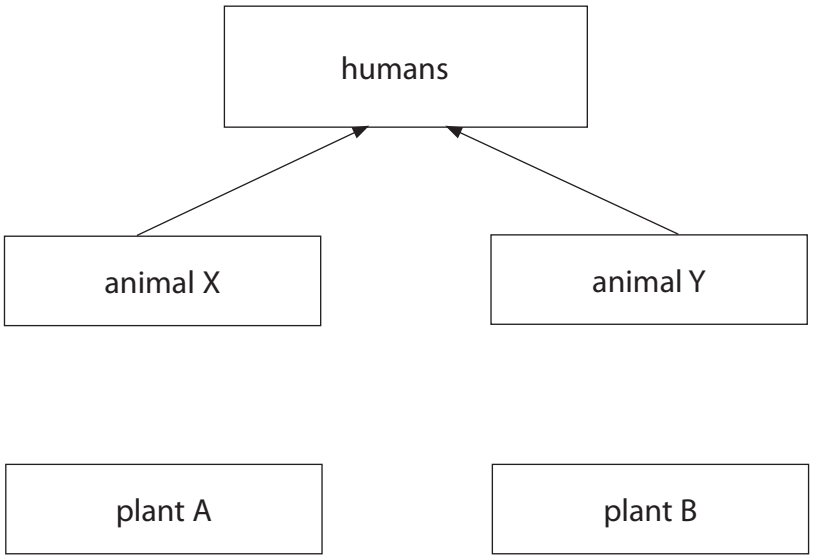
(Total for Question 2 = 7 marks)

3 Food chains often overlap with each other to form a food web. The diagram shows a food web.

Only some of the arrows have been drawn.



(a) Complete the arrows on the diagram to show that:

(2)

- animal X eats both plant A and plant B
- animal Y only eats plant B

(b) Name a primary consumer shown in the diagram.

(1)

.....

(c) Explain what is likely to happen to the numbers of animal Y if all members of animal X were killed by disease.

(2)

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(d) Energy is lost at each level of the food web.

Give **two** ways in which energy may be lost between the second and third trophic levels.

(2)

1 .....

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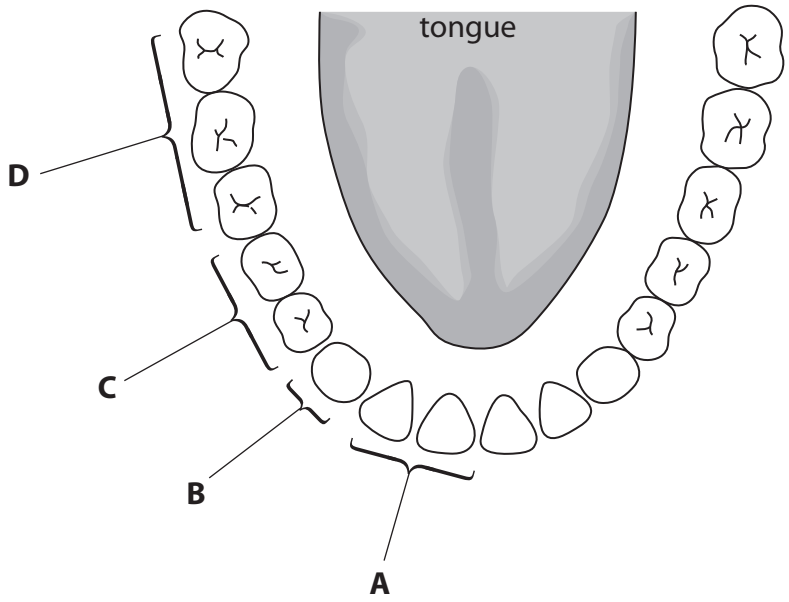
2 .....

.....

(Total for Question 3 = 7 marks)

4 The diagram shows the teeth and tongue in an adult human lower jaw.



(a) The labels on the diagram point to different types of teeth.

(i) Label **C** points to pre-molar teeth.

Calculate the total number of pre-molar teeth in the mouth of this adult.

(1)

..... teeth

(ii) Name the types of teeth labelled **A**, **B** and **D**.

(3)

A .....

B .....

D .....

(b) The different types of teeth have different functions.

Describe the functions of the teeth labelled **A** and **D**.

(2)

A .....

.....

D .....

.....

(c) It is very important that we brush our teeth regularly to keep them healthy.

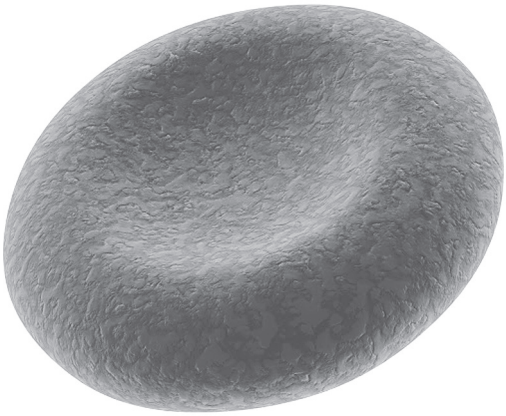
Complete the passage by writing a suitable word on each dotted line.

(4)

Small pieces of food can become trapped between teeth. If the food is not removed, ... break down the ..... present in food and turn it into ..... . This can dissolve the ..... of the tooth and cause cavities to form.

(Total for Question 4 = 10 marks)

5 (a) The diagram shows a red blood cell.



(i) What is the name of the pigment in the cell that helps it to absorb oxygen?

(1)

.....

(ii) Explain how the shape of a red blood cell helps it to absorb oxygen.

(2)

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(b) There are two types of white blood cells involved in destroying microorganisms.

These white blood cells are called lymphocytes and phagocytes.

(i) Describe how lymphocytes destroy microorganisms.

(2)

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(ii) In the space below, draw and label a phagocyte.

(3)

(iii) Describe how a phagocyte destroys a microorganism such as a bacterium.

(2)

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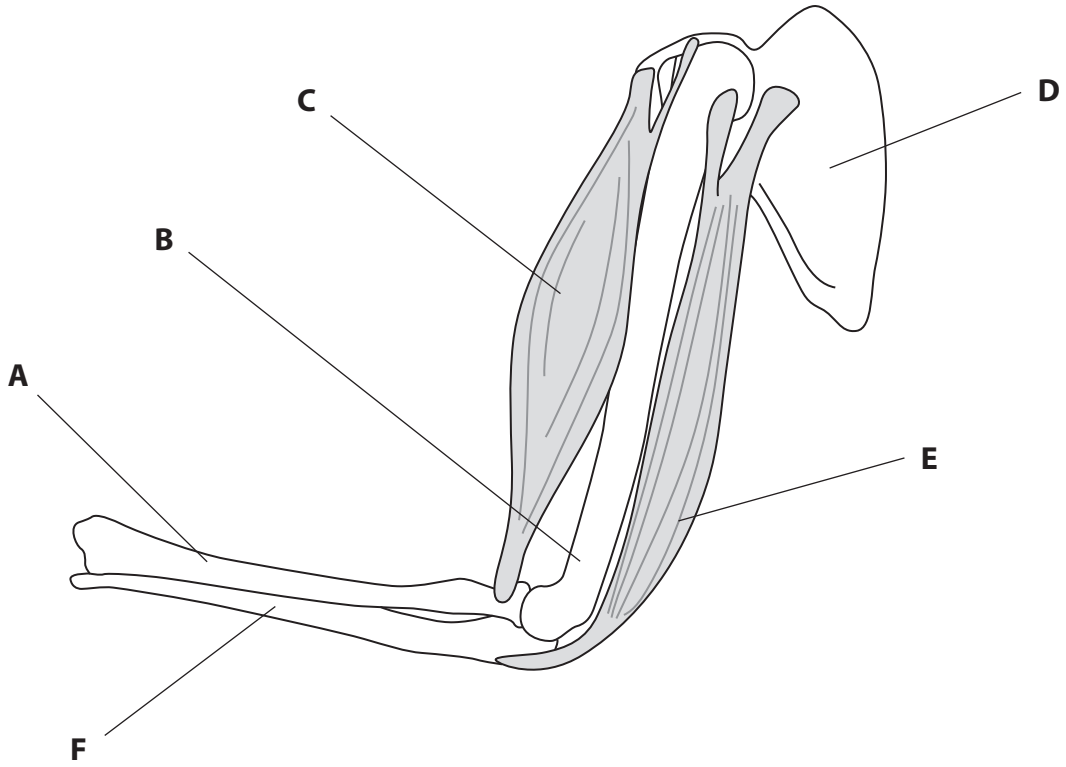
(Total for Question 5 = 10 marks)

6 The diagram shows a human arm.



(a) Name the bones labelled **A**, **B**, **D** and **F**.

(4)

Bone **A** .....

Bone **B** .....

Bone **D** .....

Bone **F** .....

(b) The shoulder and elbow are both examples of a particular type of joint.

Name this type of joint.

(1)

.....

(c) Muscles **C** and **E** move the lower arm.

(i) Name these muscles.

(2)

Muscle **C** .....

Muscle **E** .....

(ii) Explain how muscle **C** and muscle **E** work together to straighten the lower arm.

(2)

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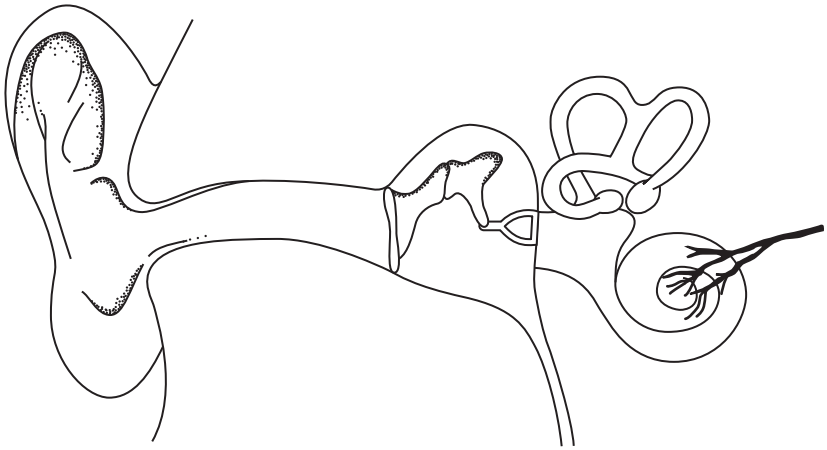
(Total for Question 6 = 9 marks)

7 A man hears a lion roar and then sees it coming towards him.

(a) The diagram shows a cross-section of the man's ear.



Complete the passage by writing a suitable word or words on each dotted line.

(5)

The sound of the lion's roar is directed through the outer ear by the

..... down to the .....

which begins to vibrate. The bones of the middle ear, the malleus, incus and

..... transmit the sound to the snail-like structure

of the inner ear called the ..... . Tiny hairs inside

this structure move and the sound of the lion's roar reaches the brain via the

..... .

(b) As the lion gets closer, the lens inside the man's eye gets shorter and fatter, so that he can continue to see it clearly.

Explain how this change to the lens occurs.

(2)

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(c) The man runs away when he hears and sees the lion.

Describe how the man's brain causes his legs to move and enables him to run away.

(3)

(d) The man's hormonal system helps him to run away quickly. He produces adrenaline on hearing and seeing the lion.

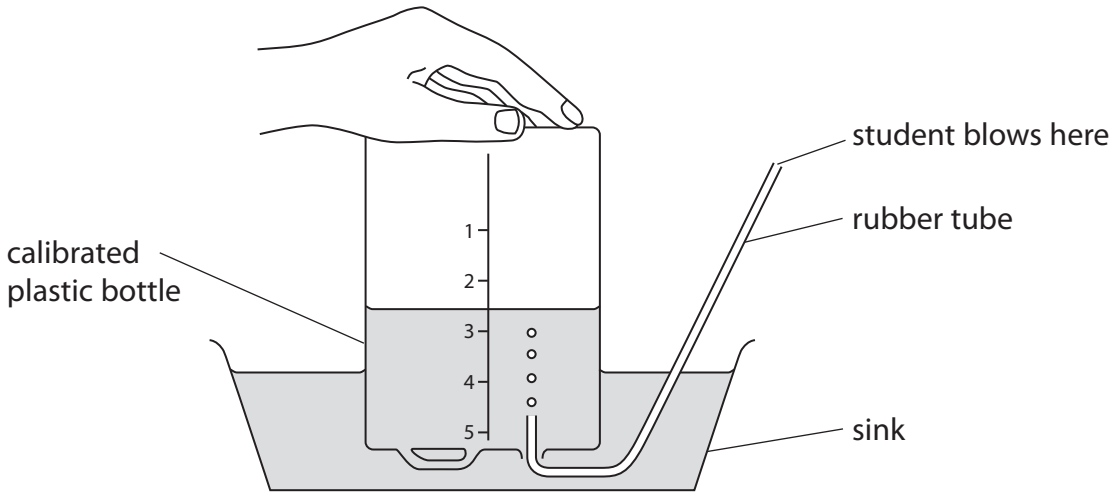
Explain how adrenaline can help the man to run away quickly.

(4)

(Total for Question 7 = 14 marks)

8 Five female physical education students wanted to find out about their aerobic fitness. They carried out an experiment to measure the vital capacity of their lungs.

They made the simple spirometer shown in the diagram.



(a) (i) What is meant by the **vital capacity** of the lungs?

(1)

(ii) Explain why a large vital capacity is important to a physical education student.

(2)

(b) Describe how the equipment shown in the diagram could be used to measure vital capacity.

(2)

(c) Each student measured her vital capacity three times and then calculated her average vital capacity in dm^3. The results are shown in the table.

	vital capacity in dm^3			
student	**result 1**	**result 2**	**result 3**	**average**
A	3.7	3.4	3.4	
B	4.6	3.1	4.3	**4.0**
C	4.5		4.5	**4.4**
D	2.6	2.5	2.1	**2.4**
E	3.1	2.6	2.7	**2.8**

(i) Calculate the missing average for student **A**.

(1)

..... dm^3

(ii) Calculate the missing result for student **C**.

(1)

..... dm^3

(iii) Circle the anomalous result in the table.

(1)

(d) Explain why student **C** might be considered to be the fittest.

(2)

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(Total for Question 8 = 10 marks)

9 (a) A balanced diet contains the correct proportions of carbohydrates, proteins, lipids, water, vitamins and two other food types.

Name the **two** other food types in a balanced diet.

(2)

1 .....

2 .....

(b) Explain how the diet of a woman should change if she becomes pregnant.

(2)

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(c) Design an experiment to show that carbohydrates contain more energy per gram than proteins.

(5)

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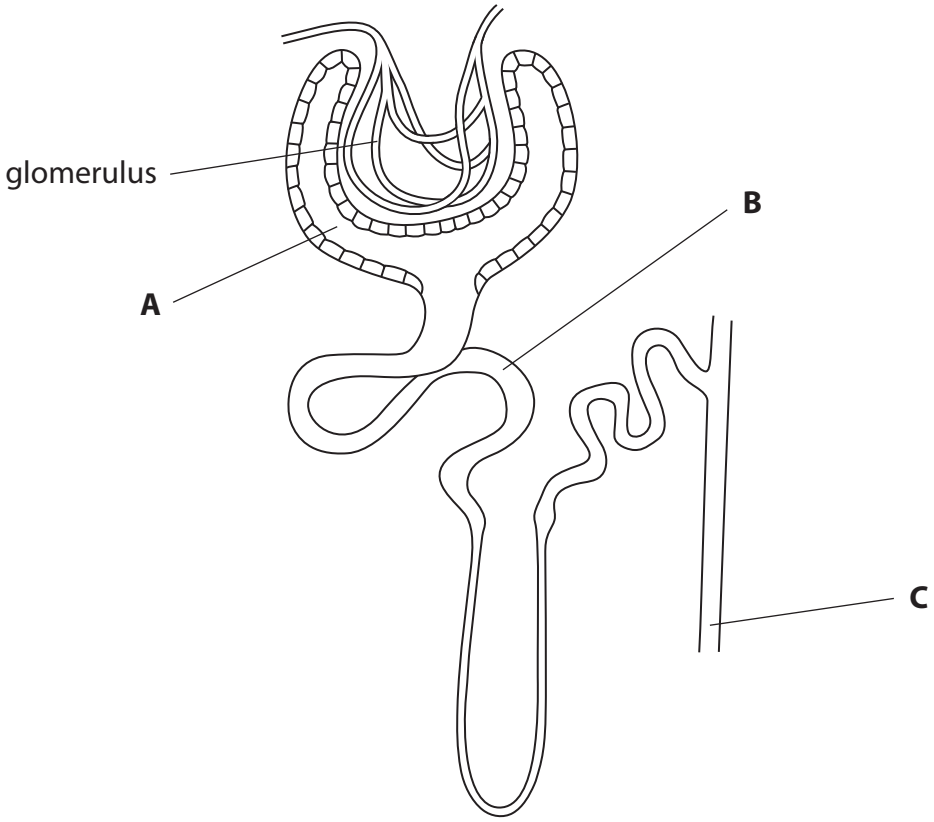
(Total for Question 9 = 9 marks)

10 (a) The diagram shows a nephron from a human kidney.



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

(3)

A .....

B .....

C .....

(ii) Describe the process that occurs in the glomerulus.

(3)

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(b) The table shows the amounts of substances filtered, reabsorbed and excreted by the kidney in one day.

Substance	Units	Filtered	Reabsorbed	Excreted
Water	dm^3	180	178.5	1.5
Na^+	mEq	25 200	25 050	150
K^+	mEq	720	620	100
HCO_3^-	mEq	4 320	4 318	2
Cl^-	mEq	18 000	17 850	150
Glucose	mEq	800	799.5	0.5
Urea	g	56	28	28

Source: adapted from Robert Berne and Matthew Levy, *Principles of Physiology, Wolfe,* 1990

(i) Calculate the percentage of urea reabsorbed.

(2)

..... %

(ii) Suggest why the percentage of urea reabsorbed is much less than the percentage of glucose reabsorbed.

(2)

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(iii) Use information from the table and your own knowledge to explain the mechanism by which glucose and Na^+ are reabsorbed.

(2)

(c) A diuretic is a substance which increases the production of urine.

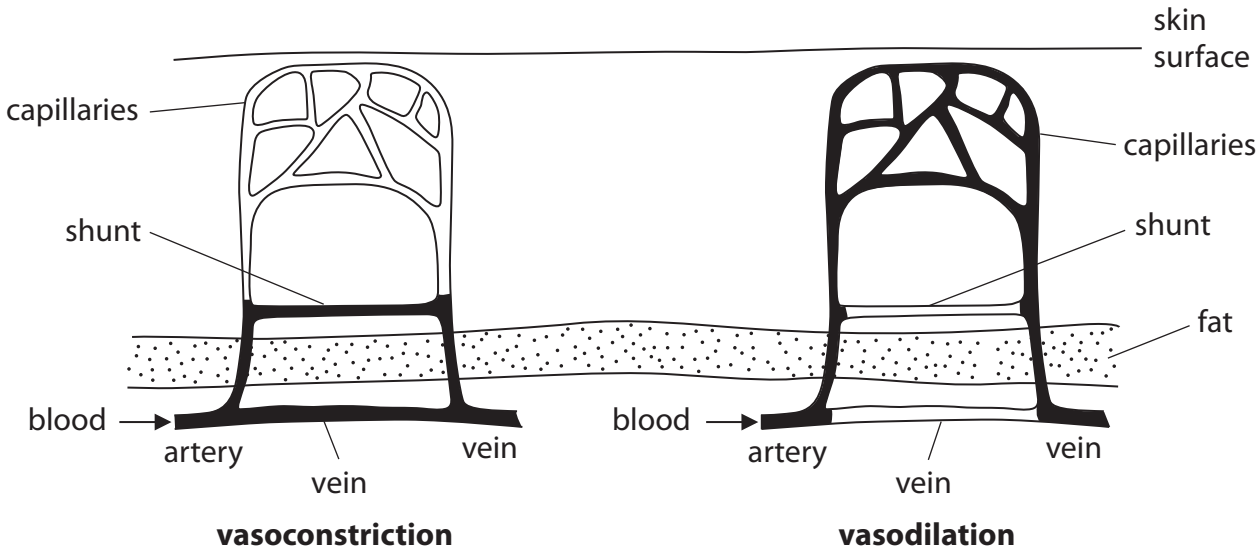
Some other substances such as caffeine are thought to stop ADH from being secreted.

Explain how caffeine acts as a diuretic.

(3)

(Total for Question 10 = 15 marks)

11 The diagram shows the mechanism of vasoconstriction and vasodilation.



(a) Explain the role of vasodilation in the regulation of body temperature.

(2)

(b) Describe a mechanism for regulating body temperature other than vasodilation or vasoconstriction.

(2)

(c) Temperature regulation is an example of homeostasis.

(i) State what is meant by the term **homeostasis**.

(2)

(ii) Homeostasis involves negative feedback.

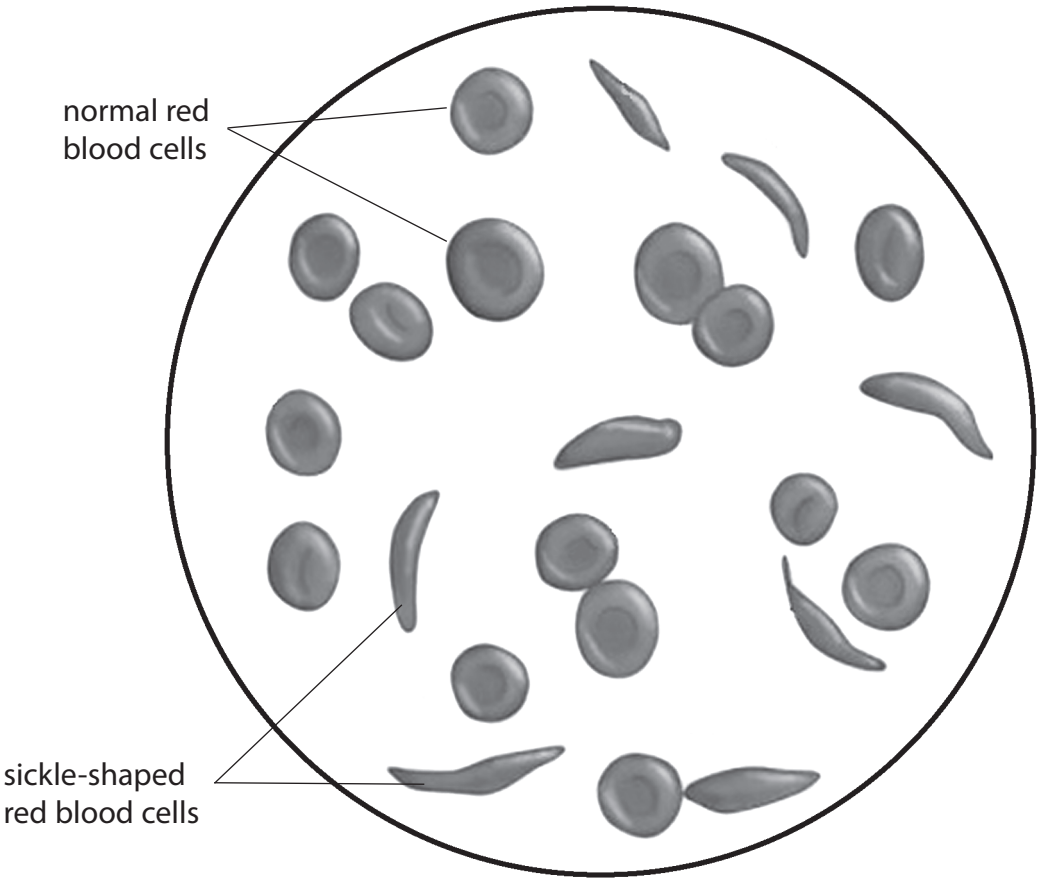
Explain what is meant by the term **negative feedback**, using the control of blood glucose as your example.

(3)

(Total for Question 11 = 9 marks)

12 Sickle cell disease is an inherited blood disease. People with sickle cell disease must have two copies of the faulty allele. This means that their red blood cells are sickle-shaped and rigid.

The diagram shows normal red blood cells and sickle-shaped red blood cells.



(a) Define the term **allele**.

(1)

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(b) Explain how the information in the question tells us that the sickle cell allele is recessive, rather than dominant.

(2)

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(c) A man and a woman know that they are both carriers of the disease.

What are their chances of having a child with sickle cell disease?

Draw a genetic diagram to help explain your answer. Use **H** to represent a normal allele and **h** to represent a sickle cell allele.

(4)

QUESTION 12 CONTINUES ON THE NEXT PAGE

(d) Malaria is an endemic disease in some countries.

People who carry one allele for sickle cell disease are naturally protected from malaria. Such people are said to have the sickle trait.

Explain, in terms of inheritance of alleles, why people who have the sickle trait can produce offspring who may have sickle cell disease or be susceptible to malaria.

(3)

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(Total for Question 12 = 10 marks)

TOTAL FOR PAPER = 120 MARKS