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Surname

Other names

Pearson Edexcel
International GCSE

Centre Number

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Candidate Number

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Human Biology

Unit: 4HB0

Paper: 02

Friday 8 May 2015 – Morning

Time: 1 hour

Paper Reference

4HB0/02

You must have:

Ruler

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.
- Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Information

- The total mark for this paper is 60.
- 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 ►

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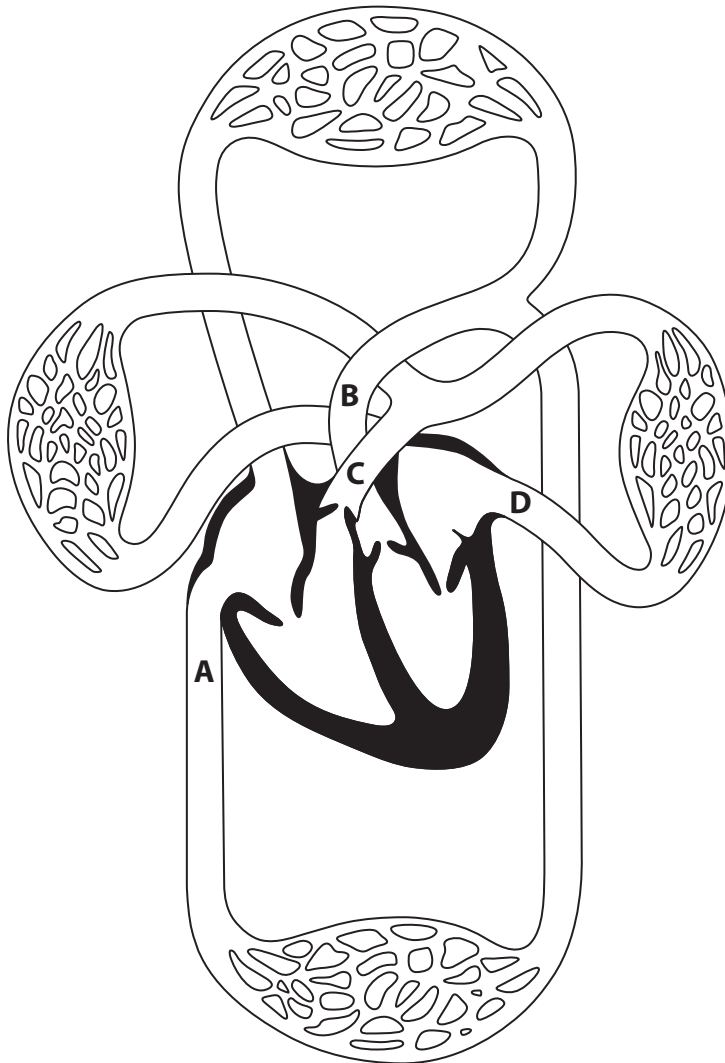
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Answer ALL questions.

1 (a) The diagram shows the human circulatory system.



(i) Draw an arrow in each of the blood vessels A, B, C and D to show the direction of blood flow.

(2)

(ii) Give the names of the blood vessels.

(4)

A

B

C

D



(iii) Describe two differences in the structure of blood vessels C and D.

(2)

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(b) Explain the possible consequences of a high fat diet on the circulatory system.

(2)

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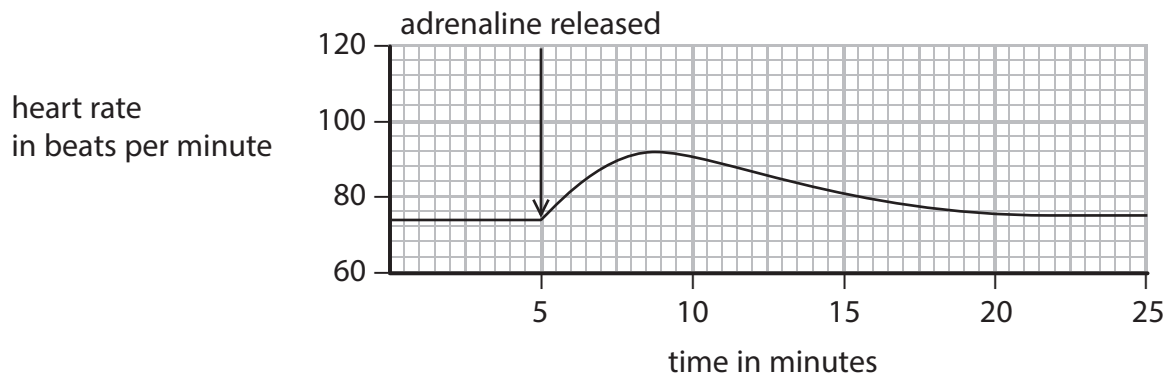
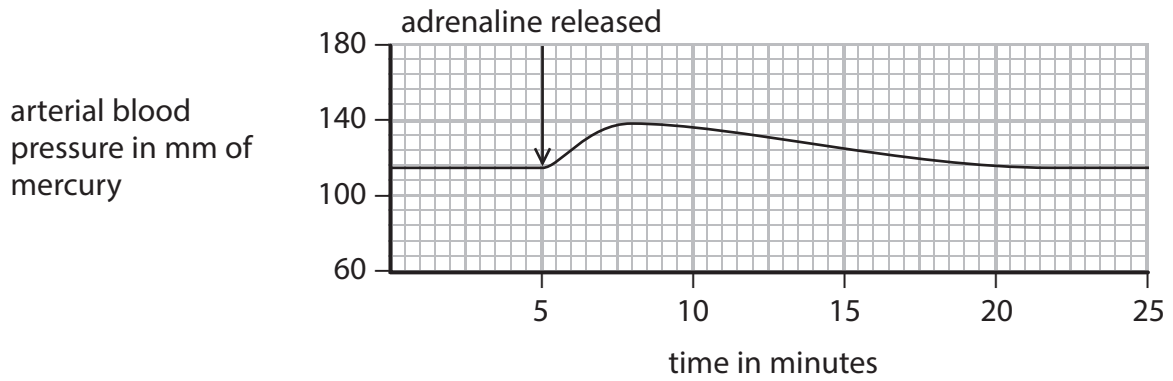
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(c) An investigation is carried out to show the effect of adrenaline on arterial blood pressure and heart rate.

The graphs show the results of the investigation.



2 (a) Milk contains fat which can be broken down by the enzyme lipase.

A student uses this method to investigate the effect of temperature on the action of lipase.

- add a solution containing lipase to equal volumes of milk in four different test tubes
- incubate each test tube at different temperatures for 20 minutes
- record the pH of each milk solution every two minutes

The table shows the change in the pH of the milk and lipase solution, at each temperature, over the 20-minute period.

Temperature in °C	Time in minutes									
	2	4	6	8	10	12	14	16	18	20
30	pH9	pH9	pH9	pH9	pH9	pH8	pH8	pH7	pH6	pH6
40	pH9	pH8	pH7	pH7	pH6	pH6	pH6	pH6	pH6	pH6
50	pH9	pH9	pH9	pH9	pH8	pH8	pH7	pH7	pH7	pH6
60	pH9	pH9	pH9	pH9	pH9	pH9	pH9	pH9	pH9	pH9

(i) Explain the results of the investigation at 40 °C.

(2)

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(ii) Explain why the results at 30 °C are different from the results at 40 °C.

(2)

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(iii) Explain why the results at 60 °C are different from the results at 40 °C.

(2)

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(iv) State one way that measurements of pH might have been taken during the investigation.

(1)

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(v) Explain why the results of the investigation would differ if bile was added to the lipase and milk solution at the beginning of the investigation.

(3)

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(b) Describe how the structure of the small intestine helps absorption of the products of fat digestion.

(3)

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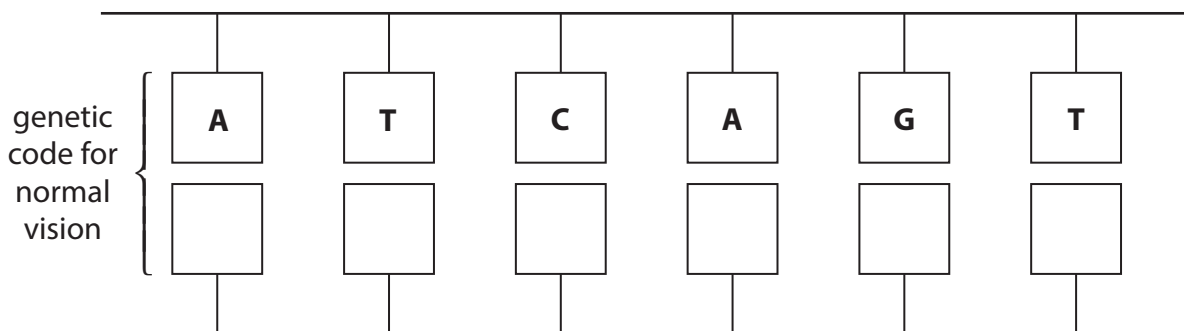
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(Total for Question 2 = 13 marks)



- 3 (a) The diagram shows the bases in one strand of a DNA molecule that represents part of a gene for normal vision.



- (i) Complete the second strand of the DNA molecule by writing the complementary bases in the boxes.

(2)

- (ii) A mutation in the gene for normal vision can lead to colour blindness.

State how a gene mutation might affect the genetic code in this DNA strand.

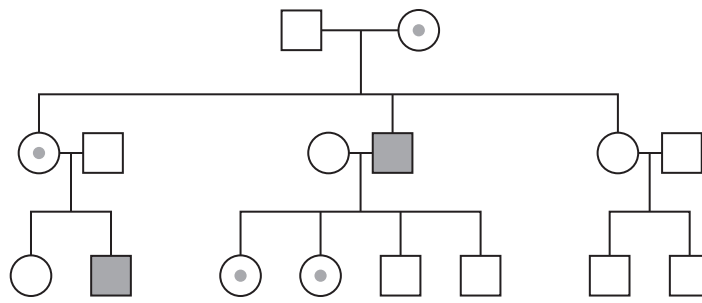
(1)

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(b) The diagram shows the inheritance of colour blindness in a family.



	Female	Male
unaffected	○	□
affected	●	■
unaffected but carrier	◉	

Explain the inheritance pattern for this type of colour blindness.

(3)

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(Total for Question 3 = 6 marks)



4 (a) This passage is about blood transfusions.

Approximately 41 000 blood transfusions take place every day in America. On average, each transfusion requires 0.50 dm^3 of blood.

When a donor gives blood, special equipment is used to separate the blood into its different components. One or more blood components can be given to a patient depending on their need.

(i) Calculate the volume of blood in dm^3 that is needed **each year** in America to meet the demand for blood transfusions.

(2)

volume = dm^3

(ii) One component of blood is platelets.

Suggest why some people may require platelet transfusions rather than whole blood transfusions.

(2)

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(b) Before a person is given a blood transfusion their blood group has to be checked.

The table shows the antigens that are present on a person's red blood cells and the antibodies that are found in their plasma for each blood group.

Blood group	ABO antigens present on red blood cells	ABO antibodies in the plasma
O	nil	anti-A and anti-B
A	A antigen	anti-B
B	B antigen	anti-A
AB	A and B antigens	nil

Use information from the table to explain why people with blood group O can donate blood to people of any blood group, but can only receive blood from group O.

(3)

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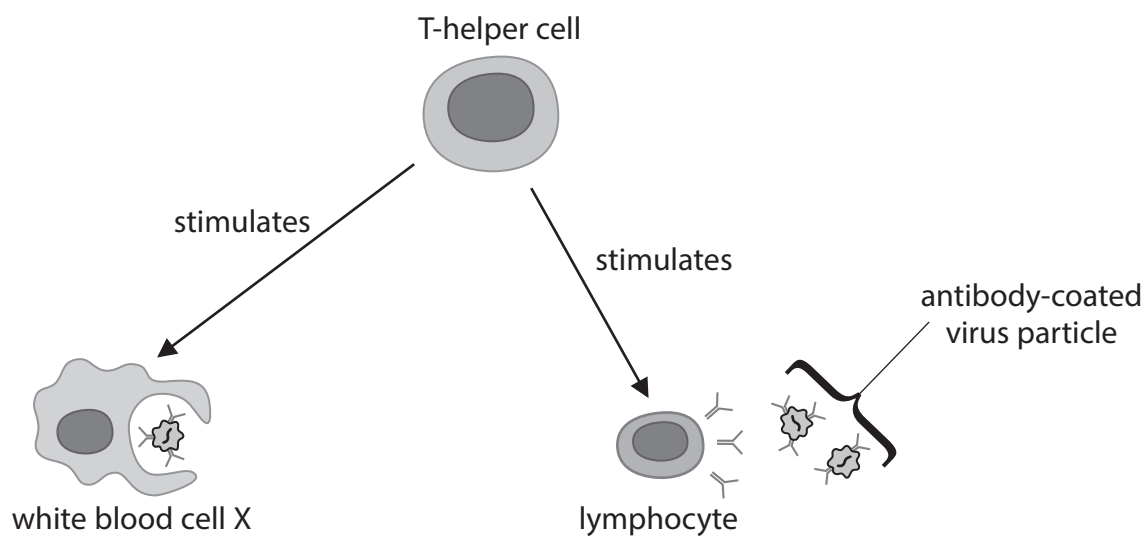
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(Total for Question 4 = 7 marks)



- 5 (a) T-helper cells are a type of white blood cell that have an important role in the immune response.

The diagram shows two functions of T-helper cells in the immune response.



- (i) Give the name of white blood cell X.

(1)

- (ii) State the function of white blood cell X in defending the body from disease.

(1)

- (iii) HIV reproduces inside T-helper cells.

Explain how viruses use living cells to reproduce.

(3)



(iv) Use the diagram to help you explain why people suffering from AIDs are more at risk of becoming ill with common infections such as influenza.

(2)

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(v) HIV attaches to a specific cell membrane protein, known as CD4, found on the surface of T-helper cells.

Name the part of the T-helper cells that contains the gene for the CD4 protein.

(1)

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(vi) Suggest why a genetic mutation in the gene that codes for CD4 could reduce the risk of infection by HIV.

(2)

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(b) Explain how vaccination can reduce the incidence of influenza.

(3)

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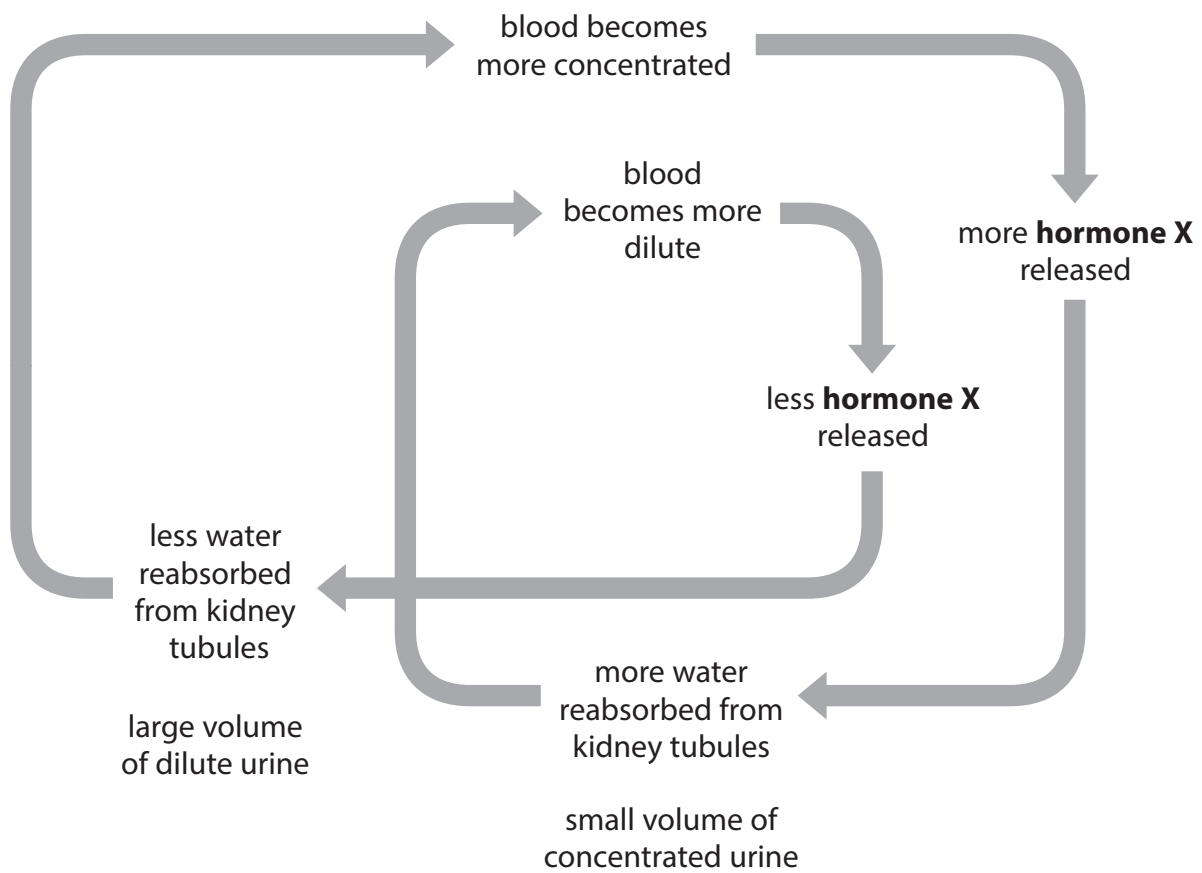
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(Total for Question 5 = 13 marks)



6 The diagram shows a negative feedback system that controls the volume of water in the blood.



(a) Identify hormone X.

(1)

- A insulin
- B ADH
- C FSH
- D thyroxine

(b) Name the gland that releases hormone X.

(1)



(c) Describe how the negative feedback system shown in the diagram helps to regulate the concentration of the blood.

(4)

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(Total Question 6 = 6 marks)

TOTAL FOR PAPER = 60 MARKS



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