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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE (9–1)

Centre Number | Candidate Number

Tuesday 5 May 2020

Morning (Time: 1 hour 45 minutes) | Paper Reference **4HB1/01R**

Human Biology

Unit: 4HB1

Paper: 01R

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 90.
- 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.
- 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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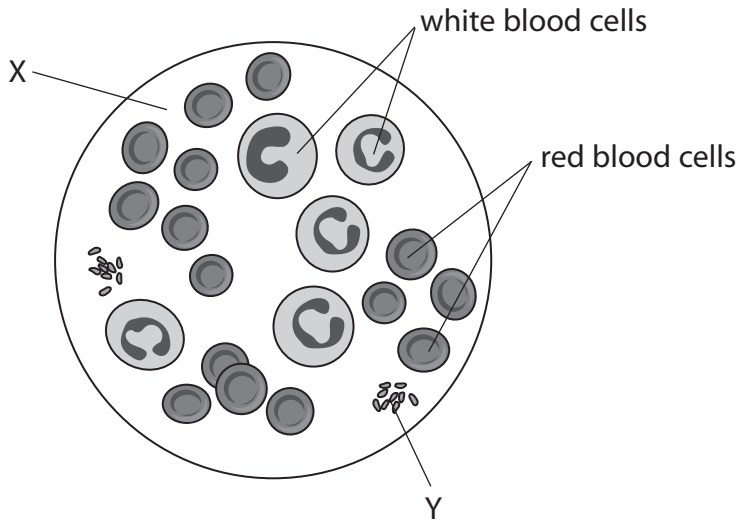
Answer ALL questions.

1 The diagram shows a sample of human blood.



(a) State the function of red blood cells.

(1)

.....

.....

(b) Give the name of X and Y.

(2)

X .....

Y .....

(c) (i) Calculate the ratio of red blood cells to white blood cells.

Write the ratio in its simplest form.

(2)

ratio = ...

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(ii) Suggest why this ratio will change if a person has a bacterial infection.

(2)

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(Total for Question 1 = 7 marks)

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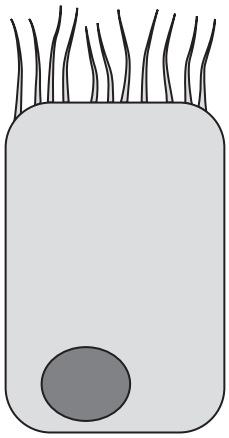
2 The diagram shows a cell from the human breathing system.



(a) (i) Add these labels to the diagram.

- cilia
- cell membrane
- nucleus

(3)

(ii) Each of the cell structures has a particular function.

The boxes give a list of structures and functions.

Draw one straight line from each structure to its function.

(3)

Structure	**Function**
	holds the genetic code
cilia	site where most chemical reactions occur
cell membrane	controls the entry and exit of substances
nucleus	makes proteins
	moves mucus through the trachea

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(b) (i) Cigarette smoking affects the function of the cell shown in the diagram.

Name a substance in cigarette smoke that causes damage to this cell.

(1)

.....

(ii) Describe how cigarette smoking affects the cell shown in the diagram.

(2)

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(Total for Question 2 = 9 marks)

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3 (a) A student uses a light microscope to observe some cells taken from the inside of her cheek.

The table lists steps in the student's method.

The steps are not in the correct order.

(i) Place a number in each box to show the correct order of steps that the student should follow.

The first and last steps have been done for you.

(2)

	Steps
	select a suitable objective lens
5	adjust focusing wheel to obtain a clear image
1	remove cells from the inside of the cheek
	place microscope slide onto the microscope stage
	smear the cell sample onto a microscope slide

(ii) The objective lens magnifies cells on the slide making them look bigger.

State an advantage of magnifying the cells.

(1)

.....

.....

(iii) Suggest why the student was unable to see the cell sample even though the microscope was at the correct magnification and focused.

(1)

.....

.....

(iv) Give two ways that the student could avoid health hazards when working with living cells.

(2)

1 .....

.....

2 .....

.....

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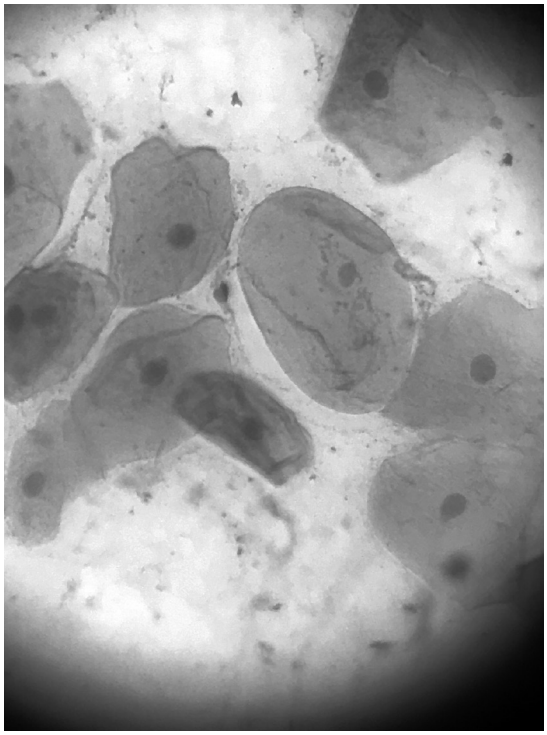
(b) The photograph shows an image of a cheek cell seen under a light microscope using a 10× eyepiece lens and a 40× objective lens.



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(i) Calculate the total magnification used to view the cheek cell.

(1)

total magnification = ...

(ii) The actual diameter of the cheek cell shown in the photograph is 0.018 mm.

Convert the diameter of the cheek cell into micrometre (μm).
[1 μm = 10^{-6} m]

(2)

diameter = ... μm

(Total for Question 3 = 9 marks)

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4 (a) Kwashiorkor is a deficiency disease that results from the lack of a certain nutrient in the diet.

Use words from the box to complete the passage about kwashiorkor.

(2)

fingers	carbohydrate	bread	ankles	protein	fat

Kwashiorkor is a disease that is more common in children.

One symptom of kwashiorkor is swelling in the ..... .

The symptoms of kwashiorkor are corrected by adding more ..... to the diet.

(b) The table gives information about the number of cases of kwashiorkor recorded in a hospital over four years.

Year	Number of cases of kwashiorkor
2010	32
2011	21
2012	23
2013	19

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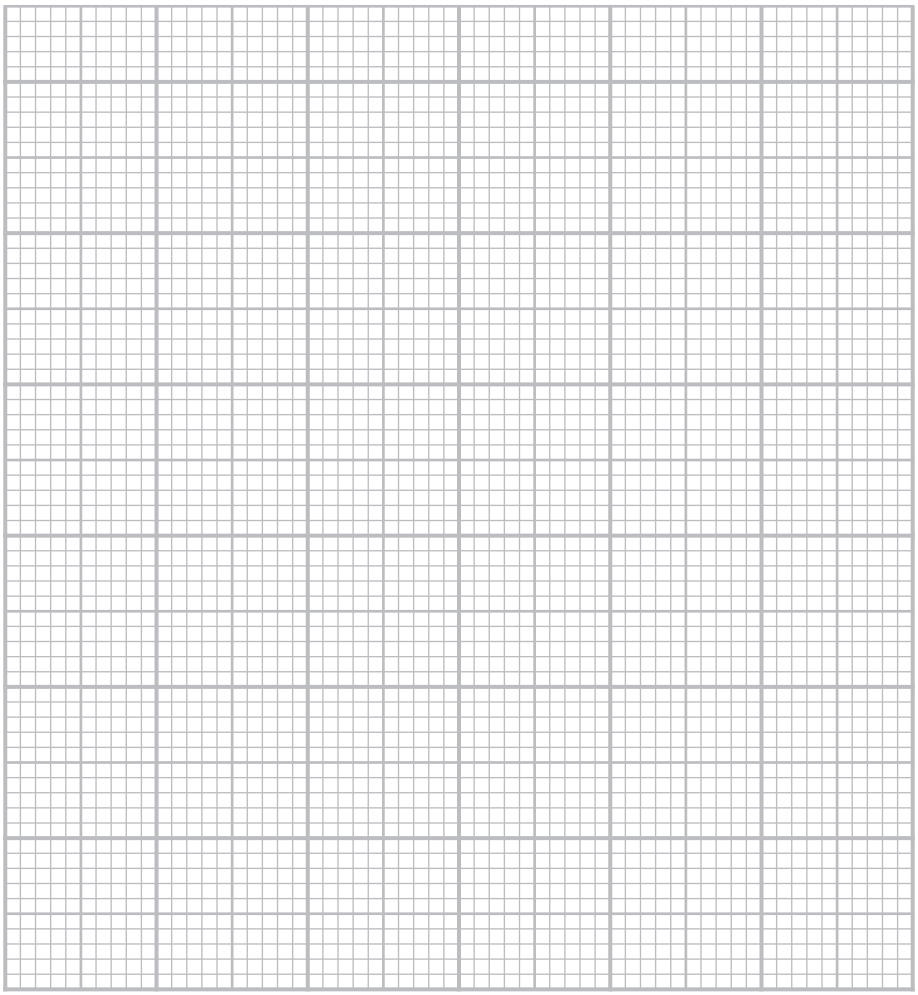
(i) Plot a bar chart of the data on the grid.

(3)



(ii) Suggest a reason for the difference in the number of recorded cases of kwashiorkor in 2010 compared with 2013.

(1)

.....

.....

(iii) In a hospital, 95 out of a total of 1978 children with malnutrition were found to have kwashiorkor.

Calculate the percentage of children with kwashiorkor.

(2)

percentage of children = ... %

(Total for Question 4 = 8 marks)

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5 (a) The type and amount of different nutrients needed for a balanced diet varies depending on several factors.

(i) Pregnant women are often advised by their doctor to take extra iron in their diet.

Which two foods are the best sources of iron?

(1)

- ☒ **A** fruit and green vegetables
- ☒ **B** dairy products and red meat
- ☒ **C** green vegetables and red meat
- ☒ **D** fruit and dairy products

(ii) Explain why a woman should have more iron in her diet when she becomes pregnant.

(4)

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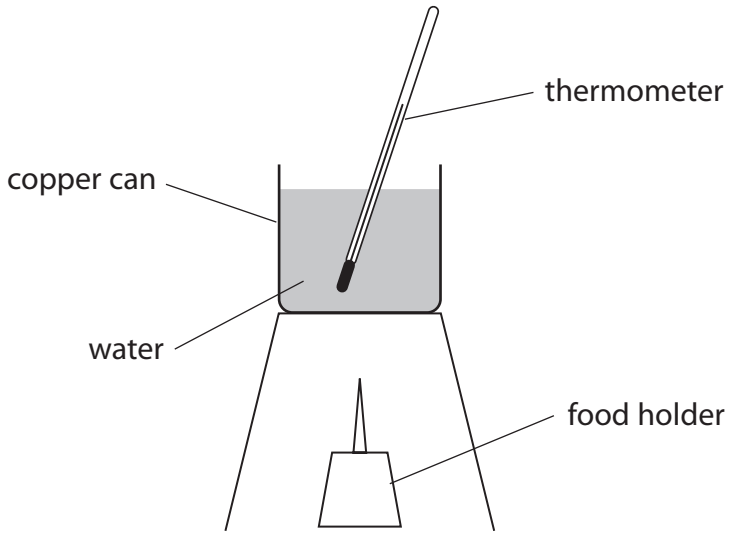
(b) The diagram shows some apparatus that can be used to measure the amount of energy contained in different foods.



(i) Explain how the apparatus can be used to obtain data about the energy content of different foods.

(4)

(ii) Explain how this apparatus can be changed to improve the accuracy of the data collected for each food.

(3)

(Total for Question 5 = 12 marks)

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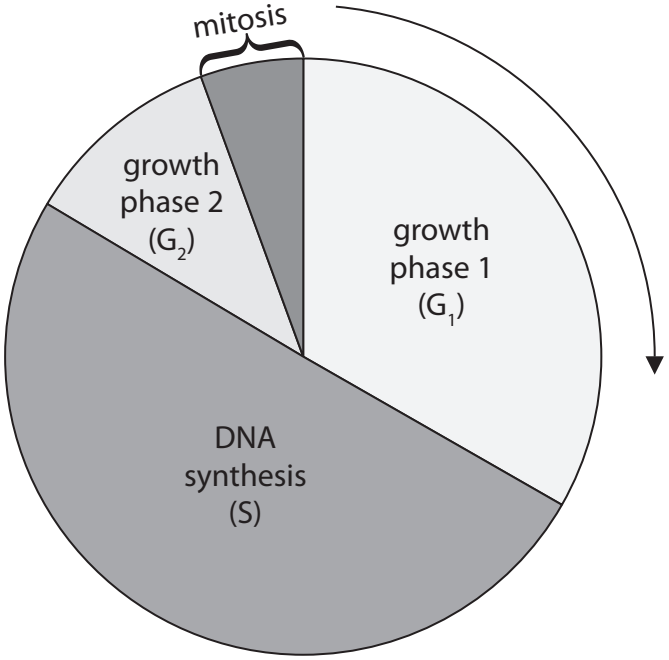
6 (a) Cells in the body go through several cell cycles in their lifetime.

Each cell cycle is divided into different stages.

Different events take place in the cell during each stage.

The diagram shows one cell cycle of a body cell.



(i) One cell cycle takes 24 hours to complete.

The total time spent in G_1 and G_2 is ten hours.

Calculate the time spent in mitosis.

(2)

time = ... hours

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(ii) Each of the phases of the cell cycle prepare the cell for mitosis.

Suggest the events that take place in the growth phases of the cell cycle.

(2)

(iii) The cell cycle completes by producing two new body cells.

Describe the genetic features of the two cells produced by mitosis.

(2)

(iv) The table lists some of the stages of mitosis.

Complete the table by giving details of the event that takes place in each stage.

(3)

Stage	Events
metaphase	
anaphase	
telophase	

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(b) Describe the role of DNA polymerase in the synthesis of new DNA molecules.

(2)

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(Total for Question 6 = 11 marks)

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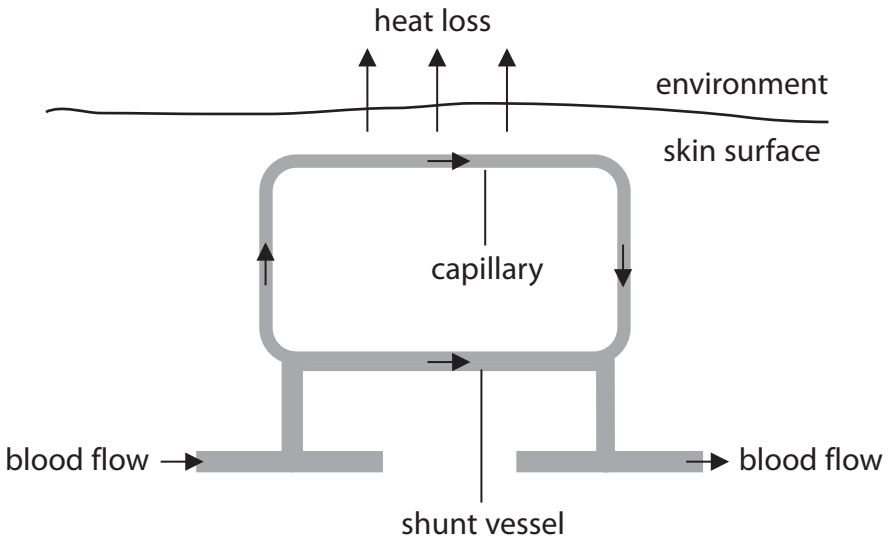
7 The diagram shows a section through skin on a cold day.



(a) Draw a diagram in the space to show how the section of skin shown in the diagram would be different on a hot day.

(2)

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(b) Explain why the section of skin shown in the diagram would be different on a hot day.

(4)

(c) Explain how the control of body temperature is an example of negative feedback.

(2)

(Total for Question 7 = 8 marks)

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8 (a) CFTR is a protein that is found in cell membranes.

This protein is responsible for transporting sodium ions across cell membranes using active transport.

(i) Describe the process of active transport.

(2)

.....

.....

.....

.....

(ii) In some people a DNA mutation causes the production of a faulty CFTR protein.

This results in cystic fibrosis.

Explain how an individual can inherit cystic fibrosis from their parents.

(2)

.....

.....

.....

.....

(iii) The faulty CFTR protein is unable to bind to the endoplasmic reticulum in the cell following protein synthesis.

Suggest how this might affect the CFTR protein.

(2)

.....

.....

.....

.....

(iv) The CFTR protein is made up of 1408 amino acids.

Calculate the number of nucleotides found in one strand of the CFTR gene.

(2)

number of nucleotides = ...

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(v) Describe the structure of a nucleotide found in a DNA molecule.

(3)

(b) There are 20 different amino acids that can be joined to form a polypeptide chain.

The table gives some base sequences that code for five of these amino acids.

Code	Name of amino acid
AAT or AAC	asparagine
TAT or TAC	tyrosine
TTT or TTC	phenylalanine
CGT or CGG	arginine
CAT or CAC	histidine

Diagram 1 shows part of the gene that codes for a CFTR protein that functions normally.

Diagram 2 shows the same part of the gene with a mutation that causes cystic fibrosis.

AATATCATCTTTGGTGTTTCCTATGAT

Diagram 1

AATATCATCGGTGTTTCCTATGAT

Diagram 2

Describe the changes that occur in the gene and the protein that cause cystic fibrosis.

(3)

(Total for Question 8 = 14 marks)

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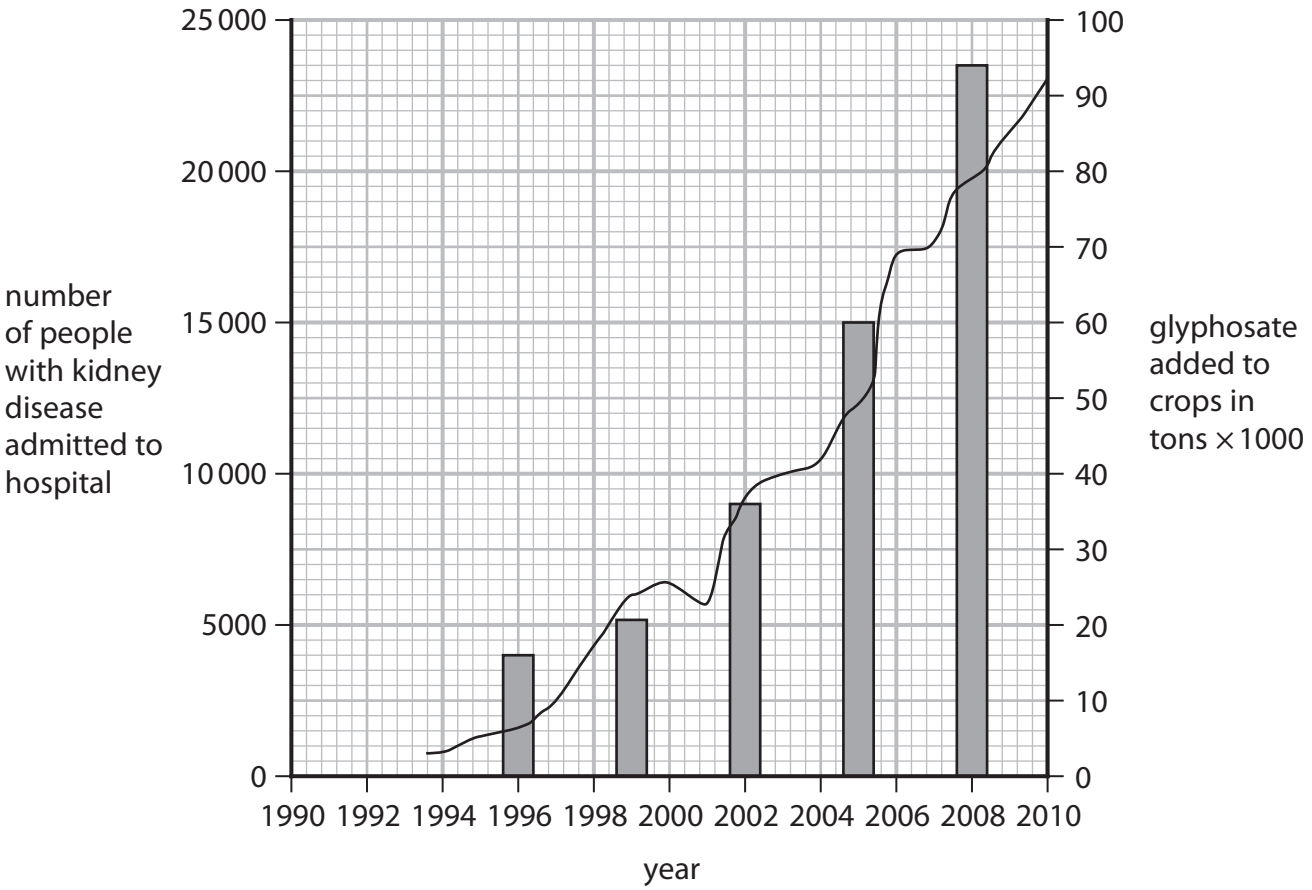
9 (a) Glyphosate is a chemical found in some weed killers.

The use of this chemical is linked to several health conditions including kidney disease.

The graph shows the number of people with kidney disease admitted to hospital and the amount of glyphosate added to crops.



(i) Calculate the percentage increase in the number of people admitted to hospital with kidney disease in 1996 compared with 2008.

(3)

percentage increase = ... %

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(ii) Give a reason why the graph does not confirm that glyphosate is a cause of kidney disease.

(1)

.....

.....

(b) Draw a diagram to show the structure of a kidney nephron.

Add these labels to the diagram.

- glomerulus
- proximal convoluted tubule
- Bowman's capsule

(4)

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(c) There is evidence to show that glyphosate causes inflammation of the glomeruli and the kidney tubules.

Suggest how these symptoms will affect the normal functioning of the kidney and the waste product that it produces.

(4)

(Total for Question 9 = 12 marks)

TOTAL FOR PAPER = 90 MARKS

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