Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	1	1	5	/	0	1	Signature	

Paper Reference(s)

6115/01

Edexcel GCE

Biology (Human)

Advanced

Unit 5H

Friday 13 June 2008 – Afternoon

Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
Total	

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Materials required for examination
Ruler

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
The paper reference is shown above. Check that you have the correct question paper.
Answer ALL EIGHT questions in the spaces provided in this booklet.
Show all the steps in any calculations and state the units. Calculators may be used.
Include diagrams in your answers where these are helpful.

Information for Candidates

The marks for individual questions and parts of questions are shown in round brackets: e.g. **(2)**.
The total mark for this question paper is 70.

Advice to Candidates

You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, taking account of your use of grammar, punctuation and spelling.
The Synoptic section (Questions 4 to 7) is designed to give you the opportunity to make connections between different areas of biology and to use skills and ideas developed throughout the course in new contexts. You should include in your answers any relevant information from the whole of your course.

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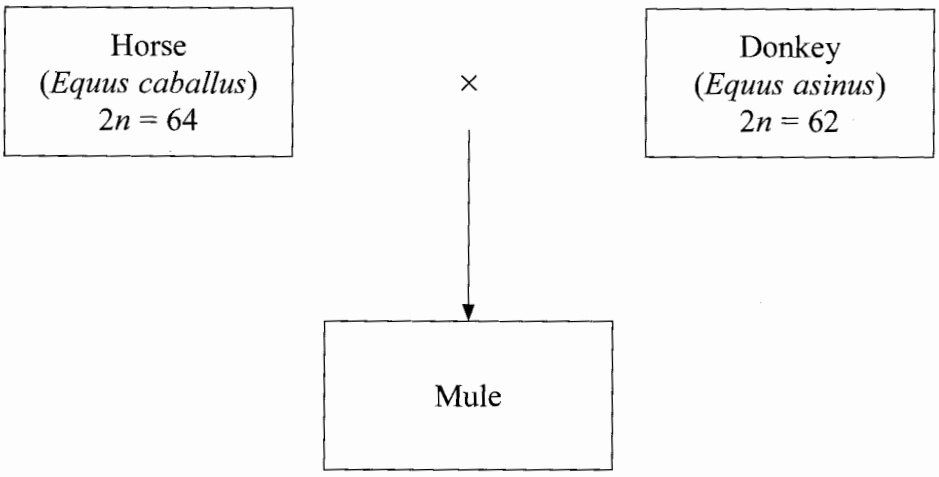
Answer ALL questions in the spaces provided.

1. If a horse, *Equus caballus*, is mated with a donkey, *Equus asinus*, a hybrid known as a mule is produced.



Mules are almost always sterile and produce no offspring. This phenomenon is an example of a post-zygotic isolating mechanism.

(a) State the diploid number of chromosomes in a mule and suggest why mules are unable to produce offspring.

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(b) State what is meant by the term **isolating mechanism**. Suggest why the production of a mule by mating a horse with a donkey is described as a post-zygotic isolating mechanism.

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(c) It has been suggested that the mule should be named as a new species, *Equus mulus*. Suggest why this might not be acceptable to some biologists.

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(2)

Q1

(Total 8 marks)

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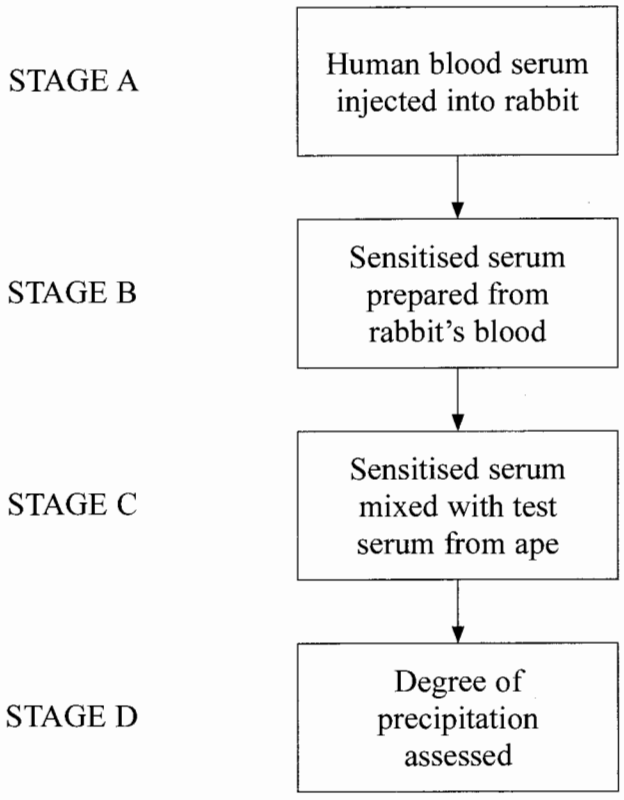
2. Immunological studies of blood sera can be used as evidence for the ancestral relationship between modern humans and the great apes.

The diagram below shows some of the stages in the process used to compare human blood serum with that of some of the modern great apes.



(a) Explain what happens in the blood of the rabbit following the injection of human blood serum at stage A.

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(b) The table below shows the relative degree of precipitation at stage D, following the mixing of sensitised serum with test serum from humans and apes at stage C.

Serum sample	Relative degree of precipitation
Human	+++++
Chimpanzee	++++
Gibbon	++
Gorilla	++++
Orang-utan	+++

Suggest why the sensitised serum was tested using a sample of human serum.

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(c) Explain why the results support the idea that humans had common ancestry with gorillas and chimpanzees more recently than with gibbons or orang-utans.

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(3)

Q2

(Total 6 marks)

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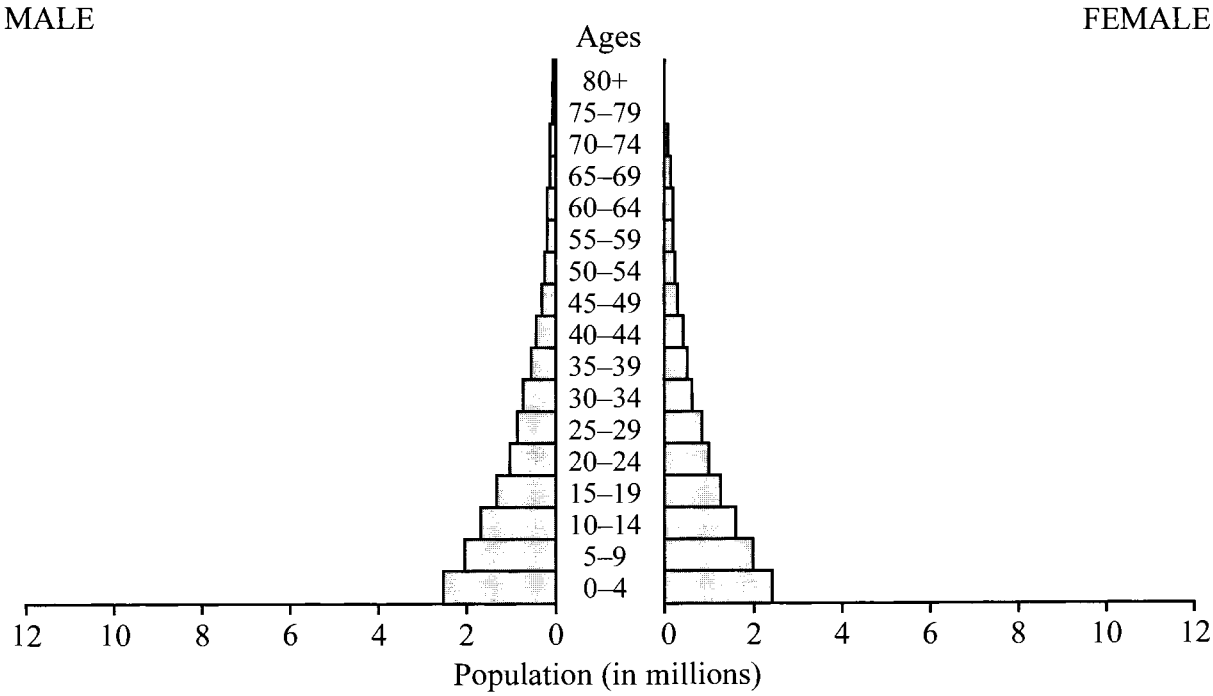
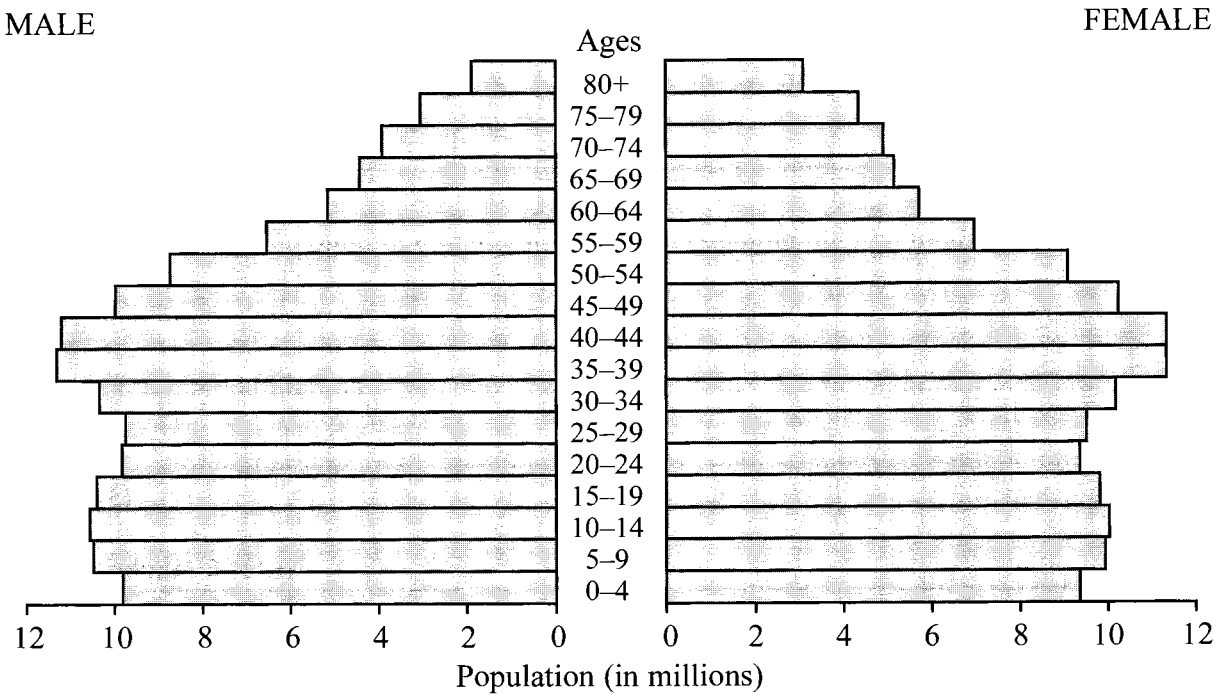
3. The diagrams below show population pyramids for Uganda and the USA for the year 2000 and the estimates for the year 2025.

Population pyramids for Uganda and the USA in year 2000

Uganda: 2000



The USA: 2000



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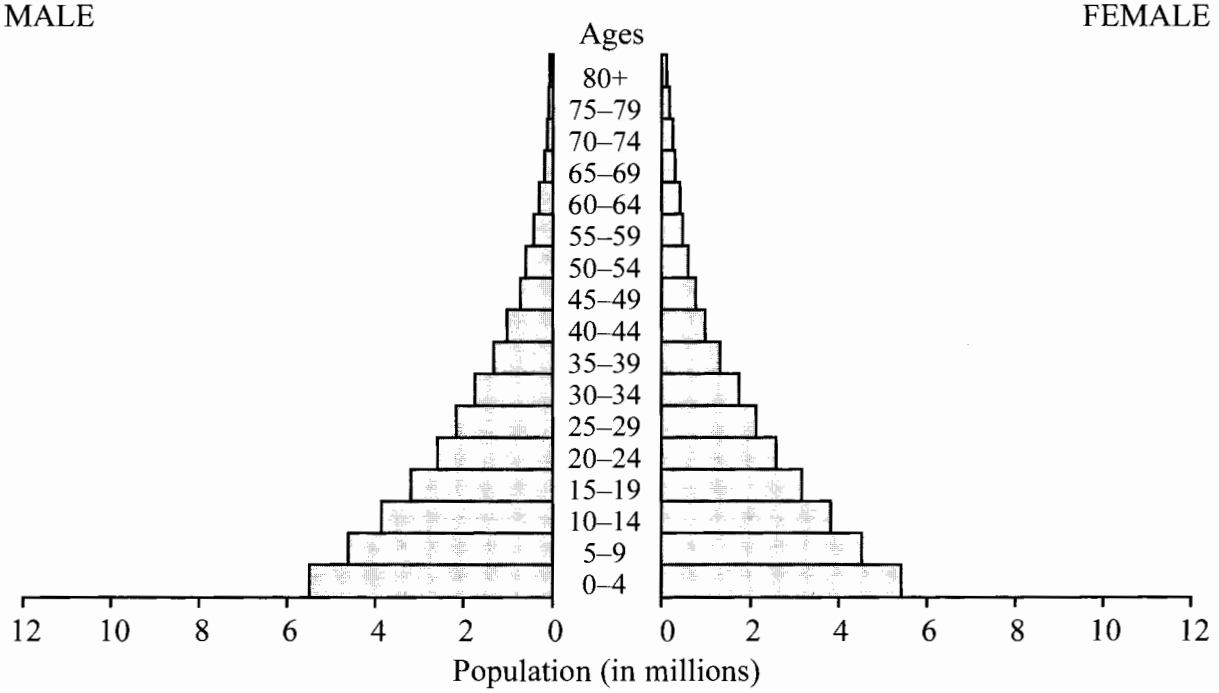
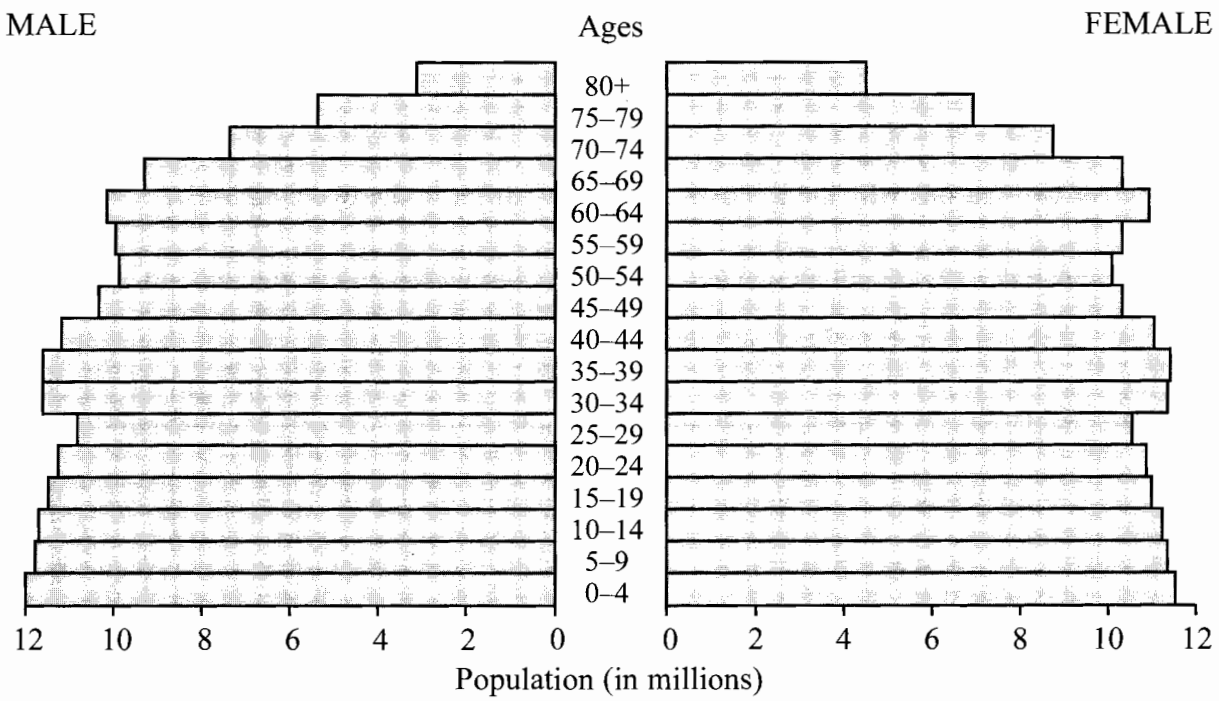
Population pyramids (estimated) for Uganda and the USA in year 2025

Uganda: 2025



The USA: 2025



Source: U.S. Census Bureau, International Data Base

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(a) Explain what is shown by a **population pyramid**.

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(2)

(b) (i) With reference to the year 2000, explain what the data indicate about life expectancy in the USA compared with that in Uganda.

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(ii) Give **two** reasons why the life expectancy may differ in the two countries.

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(2)

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(c) Compare the changes estimated for Uganda between the years 2000 and 2025 with those shown for the USA.

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(3)

Q3

(Total 10 marks)

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Synoptic Section

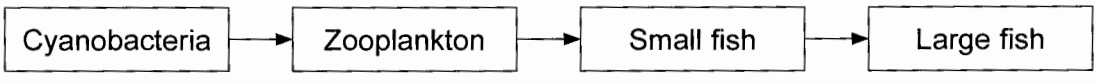
The questions in this section are designed to give you the opportunity to make connections between different areas of biology and to use skills and ideas developed throughout the course in new contexts. You should include in your answers any relevant information from the whole of your course.

4. In summer, algal blooms are a common sight on ponds and lakes. One type of algal bloom is caused by cyanobacteria. The cyanobacteria release poisonous chemicals that can kill animals that drink the water.

(a) Cyanobacteria are prokaryotes. In the space below, draw a diagram of a typical prokaryotic cell. On your drawing, label the following **four** structures: cell wall, cell surface (plasma) membrane, flagellum and plasmid.

(4)

(b) Under normal conditions, the numbers of cyanobacteria in a lake are controlled by zooplankton (microscopic animals) and fish. A typical food chain involving cyanobacteria is shown below.



Explain how a sudden increase in the level of nitrates in the lake could disrupt this food chain.

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(c) The numbers of cyanobacteria can be controlled by using mats of barley straw which float on the water. The barley straw releases growth inhibitors. Suggest how these inhibitors could interfere with the growth of the cyanobacteria.

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(2)

(d) It may be possible to reduce the numbers of cyanobacteria by introducing predators or parasites of the cyanobacteria. Suggest **one** reason why it would be preferable to use biological control, rather than chemical control, to reduce the cyanobacteria.

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Q4

(Total 10 marks)

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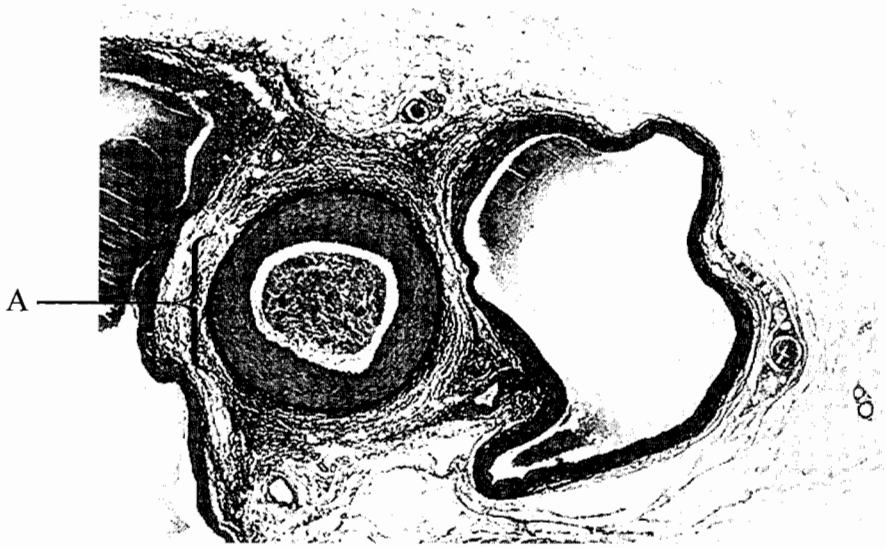
5. The photograph below shows two blood vessels, as seen using a light microscope.



Magnification ×50

(a) (i) Identify the type of blood vessel labelled A on the photograph.

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(ii) Describe **two** features of blood vessel A and explain the function of each feature.

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(b) People suffering from high blood pressure may be given Angiotensin Converting Enzyme (ACE) inhibitors. The ACE inhibitor stops the conversion of an inactive substance in the blood called angiotensin I to the active form, angiotensin II. Angiotensin II causes blood vessels to constrict.

Suggest how the ACE inhibitor could prevent the conversion of angiotensin I to angiotensin II.

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(4) **Q5**

(Total 9 marks)

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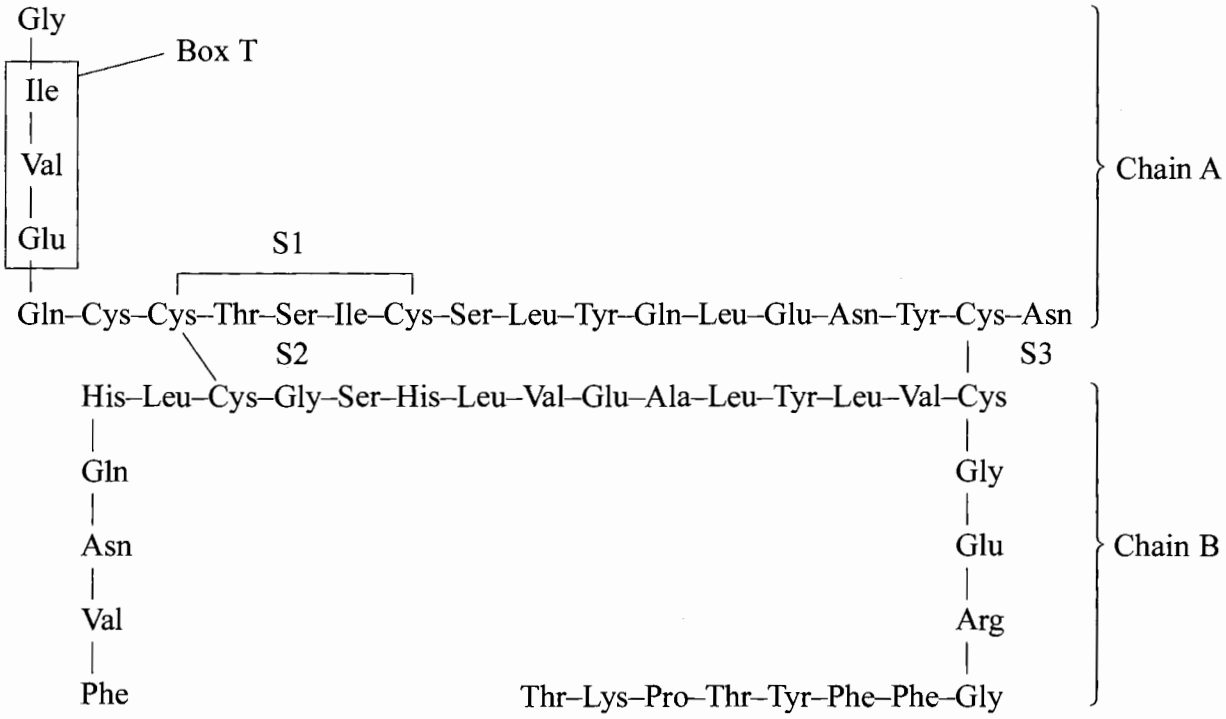
6. The polypeptide hormone, insulin, is involved in the regulation of blood glucose levels in mammals. Human insulin is composed of two chains of amino acids. Chain A consists of 21 amino acids and Chain B of 30 amino acids. The chains are held together by two disulphide bridges (S2 and S3). A third disulphide bridge (S1) is present within the A chain.

The diagram below shows the structure of human insulin. Each three-letter code in Chain A and Chain B represents an amino acid. S1, S2 and S3 show the three disulphide bridges.



(a) Explain how the amino acids, isoleucine (Ile), valine (Val) and glutamic acid (Glu), shown in Box T, are linked together.

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(2)

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(b) Chain A and Chain B are held together by disulphide bridges, a type of covalent bond. Give examples of **two** other types of bond that may be found between polypeptide chains. State how the relative strength of these bonds compares with that of disulphide bridges.

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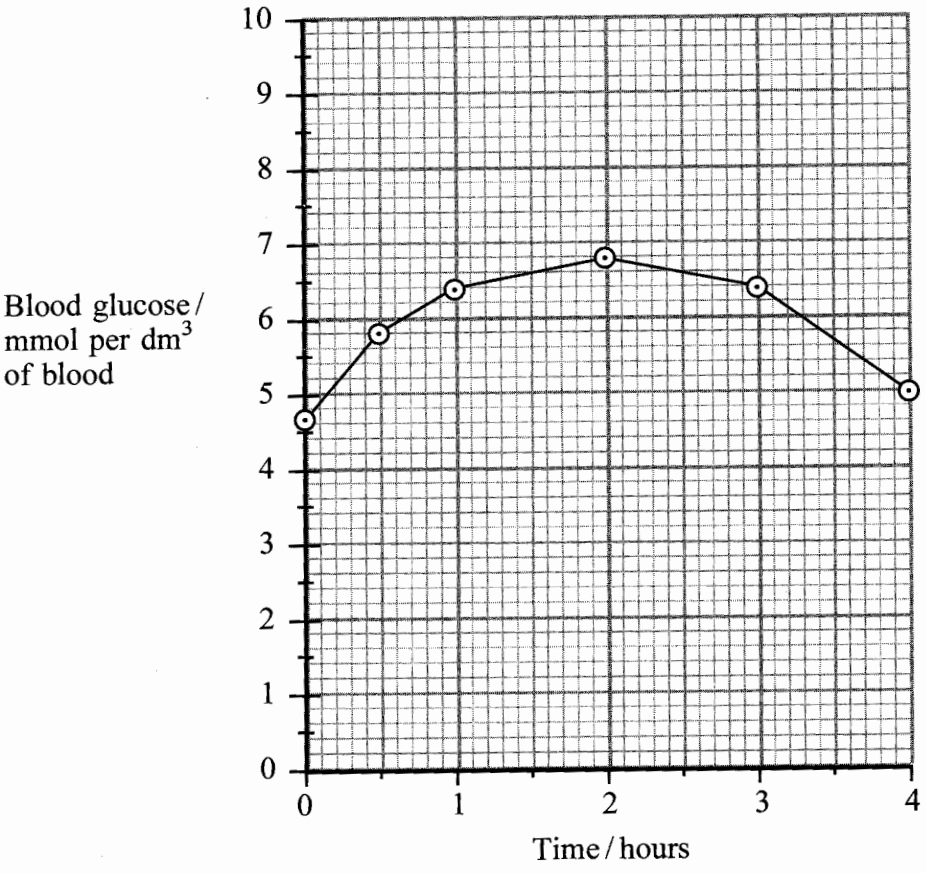
(c) In an investigation a student, who had not eaten for 12 hours, drank a solution containing 100 g of glucose. The level of glucose in the blood of the student was then monitored for the next 4 hours. The graph below shows the results of the investigation.



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Suggest why the level of glucose in the blood of the student started to rise within the first hour after drinking the solution.

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(1)

(d) A point mutation may lead to the replacing of the amino acid, cysteine (Cys), with another amino acid during the production of insulin. The resulting insulin would have a different structure. Suggest how the results of the investigation would have differed had the student used this insulin. Explain your answer.

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Q6

(Total 12 marks)

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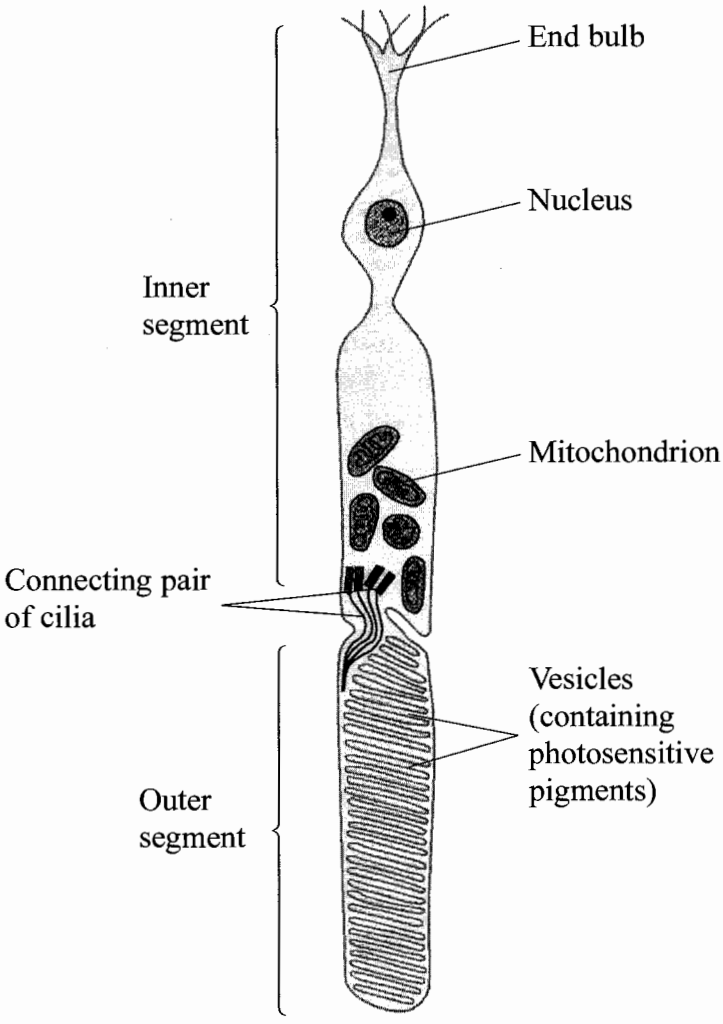
7. The diagram below shows a rod cell from the retina of the human eye.



The function of rod cells can be affected by the condition known as retinitis pigmentosa. Retinitis pigmentosa causes the gradual breakdown of photoreceptor cells in the retina. As these cells degenerate and die, patients experience progressive loss of vision.

One of the most common forms of retinitis pigmentosa can be caused by a recessive allele inherited from parents who have normal vision.

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(a) With reference to the function of rod cells and rhodopsin as photoreceptors, explain why people with retinitis pigmentosa experience progressive loss of vision.

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(b) Two parents with normal vision have a child who develops retinitis pigmentosa. With the aid of a genetic diagram, explain the probability of the disorder developing in any future children they have.

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Q7

(Total 9 marks)

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8. Describe **three** uses of lipids in humans.

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Q8

(Total 6 marks)

TOTAL FOR PAPER: 70 MARKS

END