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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

6509236855

BIOLOGY **0610/31**

Paper 3 Extended **May/June 2012**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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1	
2	
3	
4	
5	
6	
Total	

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1 **(a)** Fig. 1.1 is a diagram of the human digestive system.

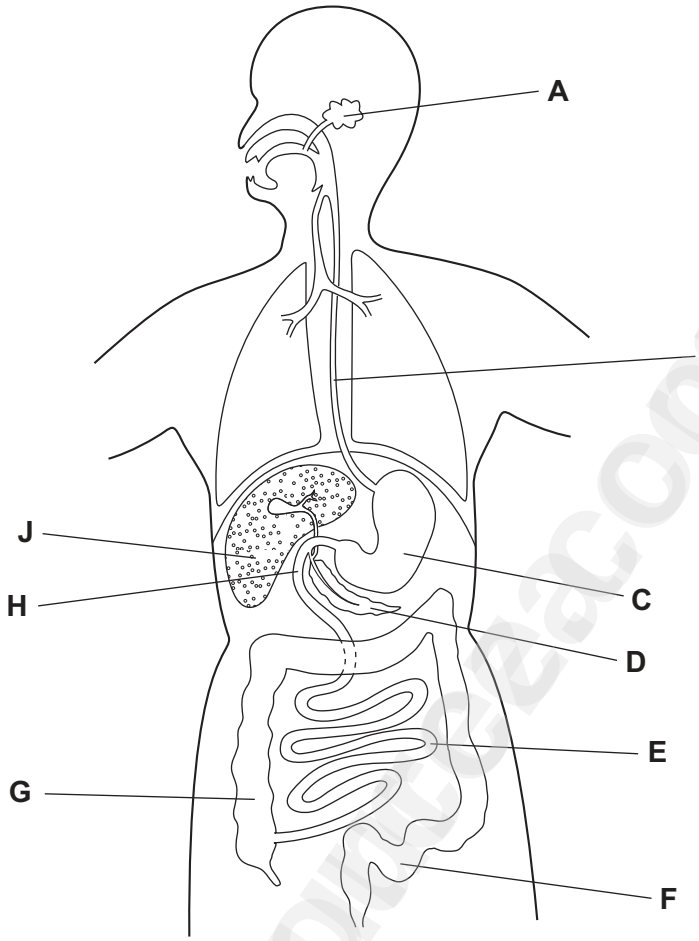

Fig. 1.1

Use the letters from Fig. 1.1 to complete Table 1.1 to give the part of the human digestive system that is identified by each function.

Write one letter only in each box. You may use the same letter more than once. There are some letters that you will not use. The first one has been done for you.

Table 1.1

function	letter
peristalsis	**B**
protein digestion	
insulin production	
deamination	
partially digested food is mixed with bile	
most water is reabsorbed	

[5]

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The human diet provides nutrients for the synthesis of biological molecules that make up cells, cell products and tissues.

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(b) (i) Complete Table 1.2 to show the nutrients that are absorbed from food to synthesise the large molecules listed.

Table 1.2

large molecules	nutrients absorbed
protein	
glycogen	
fat	

[3]

(ii) Mineral ions are required in the human diet in small quantities.

State the mineral ion required for each process:

making bone .....

making haemoglobin. ..... [2]

(iii) State another type of nutrient required in the human diet in small quantities.

..... [1]

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(c) One role of nutrients is to provide materials for the repair of damaged tissues. Fig. 1.2 shows the events that happen after a cut to the skin.

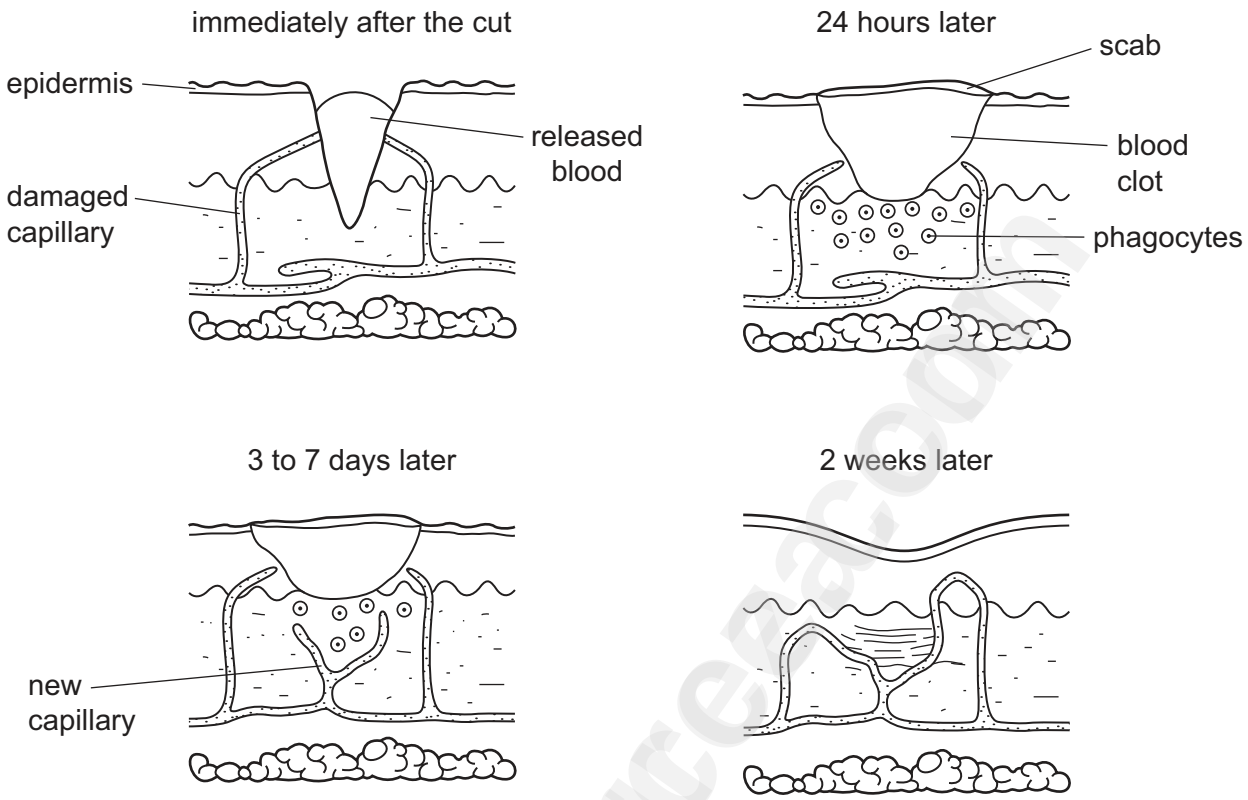

Fig. 1.2

Use the information in Fig. 1.2 to describe what happens to seal the wound in the skin and repair the skin tissue.

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..... [5]

[Total: 16]

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2 The Galápagos Islands in the Pacific Ocean have many species of animals and plants that live nowhere else. Iguanas are large herbivorous reptiles. Four species of iguana live on the Galápagos Islands:

- marine iguana, *Amblyrhynchus cristatus*
- land iguana, *Conolophus subcristatus*
- Santa Fe land iguana, *Conolophus pallidus*
- pink land iguana, *Conolophus rosada*

Fig. 2.1 shows a marine iguana.

Fig. 2.1

(a) Reptiles and mammals are both vertebrates.

State three features of mammals that are **not** found in reptiles.

1 .....

2 .....

3 ..... [3]

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(b) The marine iguana, *A. cristatus*, feeds on seaweed and must therefore dive several metres into the cold waters that surround the Galápagos Islands. Iguanas can only stay in the water for a short length of time, until their body temperature drops too low. Mammals of an equivalent size, such as sea otters, can stay in cold water for a long time.

Explain how some mammals are able to stay in cold water for a long time.

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..... [5]

Land iguanas live on Isabela, the largest island in the Galápagos. In 1986, some rangers from the Galápagos National Park found a population of pink land iguanas living at the northern end of the island. These iguanas have been studied in detail and are now classified as a new species, *C. rosada*.

(c) Define the term *population.*

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..... [2]

(d) Suggest how a study of the DNA of iguanas helps to classify them.

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..... [1]

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(e) The International Union for the Conservation of Nature describes these iguanas as vulnerable. This means that their populations are likely to become extinct.

Suggest two reasons why it is important to conserve individual species, such as the four species of iguana on the Galápagos Islands.

1 .....

.....

2 .....

..... [2]

[Total: 13]

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3 In Sichuan, in China, a sauce is made from broad bean seeds that have germinated and then have been left to ferment.

Fig. 3.1 shows a germinating broad bean seed.

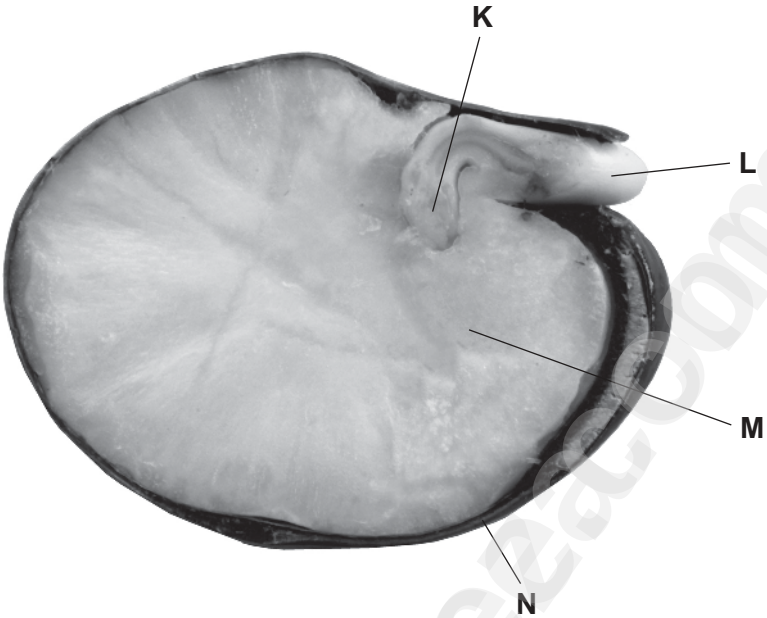

Fig. 3.1

(a) Name **K** to **N**.

K .....

L .....

M .....

N ..... [4]

Broad beans contain starch. The germinating beans are colonised by yeasts and other fungi, such as *Aspergillus*.

Aspergillus grows over the surface of beans and digests starch. It has a body made of thin threads that secrete enzymes, such as amylase.

(b) Name the thin threads that make up the body of a fungus, such as *Aspergillus*.

..... [1]

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(c) The action of enzymes is often explained in terms of the 'lock and key' model as shown in Fig. 3.2.

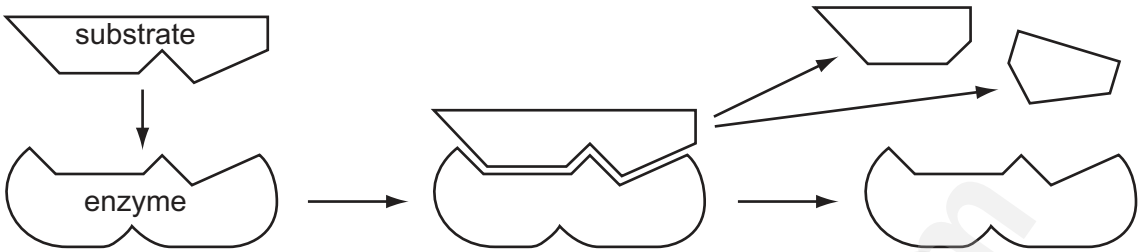

Fig. 3.2

Use the information in Fig. 3.2 to explain how enzymes work to break down nutrient materials, such as starch.

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..... [4]

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Enzymes in bean seeds are activated during germination. Some of these enzymes break down protein stored in the seeds.

A large number of bean seeds were soaked and germinated. Researchers took samples of germinating seeds over a period of 15 days. The seeds were chopped into small pieces and crushed with water to make an extract. Equal quantities of the extracts were placed into protein solutions at pH 5 and at pH 8.

The activity of the enzymes in each extract was determined by recording how quickly the protein was broken down. The results are shown in Fig. 3.3.

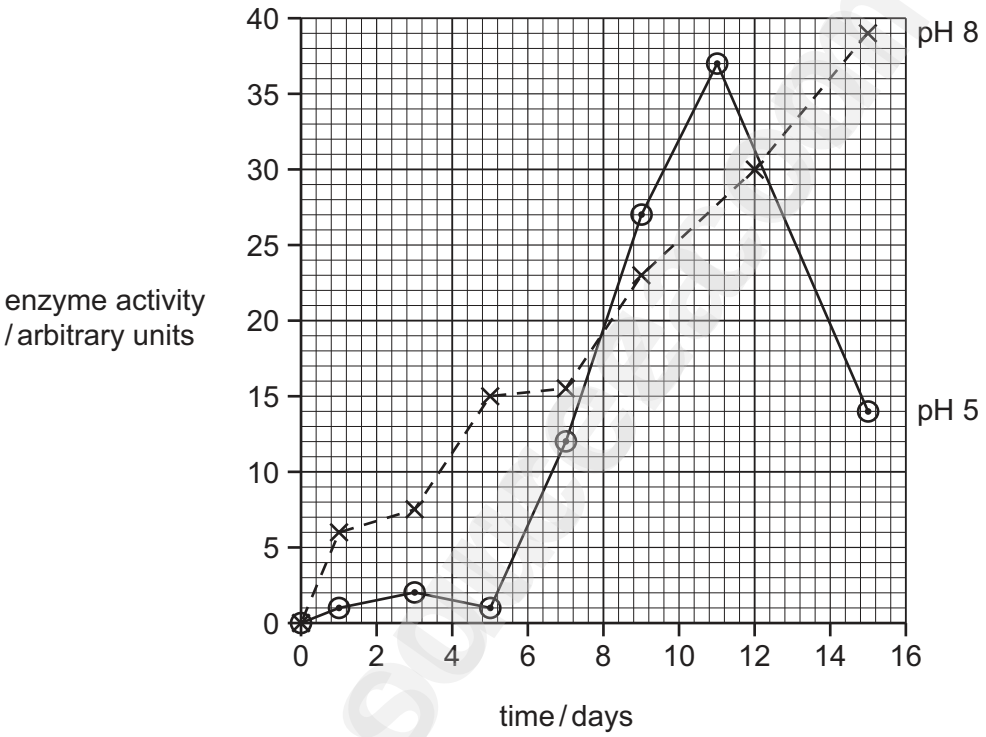

Fig. 3.3

(d) Describe the activity of the enzymes in the extracts at pH 5 over 15 days.

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..... [3]

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(e) The researchers concluded that the beans contained two different enzymes that break down protein.

State the evidence from Fig. 3.3 for this conclusion.

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..... [3]

[Total: 15]

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4 Fig. 4.1 is an electron micrograph of some red blood cells and lymphocytes.

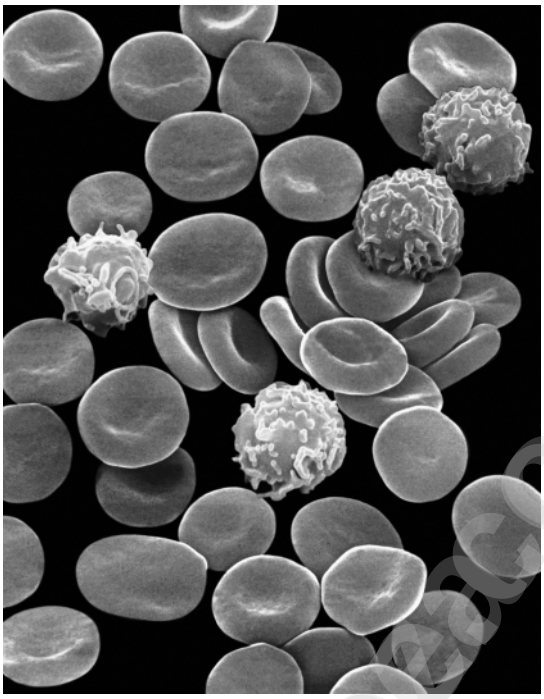

Fig. 4.1

(a) Lymphocytes respond to infection by making and releasing special protein molecules called antibodies.

Describe how antibodies provide protection from diseases caused by viruses and bacteria.

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..... [3]

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Red blood cells have special molecules on their cell membranes. These are known as antigens and they stimulate the production of antibodies. These antigens also determine a person's blood group.

Before carrying out kidney transplants, it is important to check that the blood group of the donor matches the blood group of the recipient. This is called blood typing. It is necessary because blood group antigens are present on the inner lining of blood vessels in the kidney.

(b) Explain what would happen if a kidney from a person with blood group A was transferred into the body of a person with blood group O.

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..... [2]

Tissue typing is carried out before transplanting a kidney. This makes sure that there is a close match between the donated kidney and the recipient. However, it is possible to carry out transplants of the cornea without blood typing or tissue typing.

(c) Suggest why it is possible to transplant corneas successfully without carrying out any tissue typing or blood typing.

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.....

..... [1]

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The gene for the ABO blood group has three alleles, I^A, I^B and I^o.

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(d) A person with blood group O has parents who have blood groups A and B. Complete the genetic diagram to show how this is possible.

Use the symbols, I^A, I^B and I^o, for the blood group alleles.

parental phenotypes	blood group A	×	blood group B
parental genotypes	.....	×	.....
gametes	....	+	....

offspring genotype .....

offspring phenotype blood group O

[3]

(e) Use your answer to **(d)** to give examples of the following. The first one has been completed for you.

term	example
a dominant allele	I^A
heterozygous genotype	.....
codominant alleles	.....
phenotype	.....

[3]

[Total: 12]

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5 Fig. 5.1 shows the structure of the placenta and parts of the fetal and maternal circulatory systems.

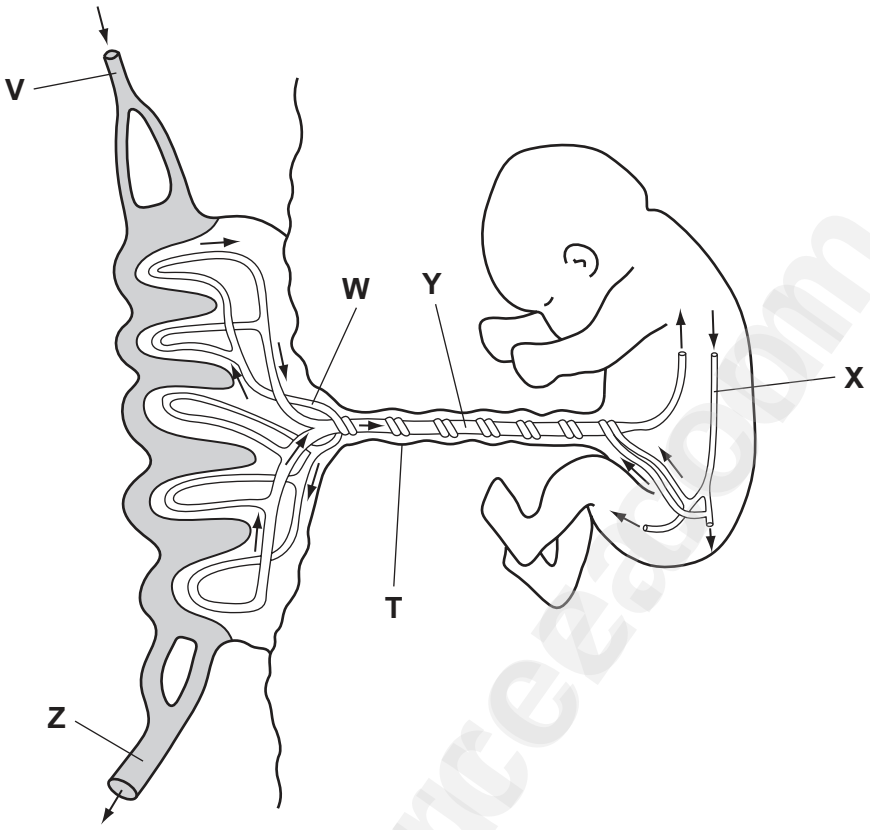

Fig. 5.1

(a) (i) Complete Table 5.1 by listing the blood vessels that carry oxygenated blood. Use the letters in Fig. 5.1 to identify the blood vessels.

Table 5.1

circulatory system	blood vessels that carry oxygenated blood
maternal	
fetal	

[2]

(ii) Name structure **T** and describe what happens to it after birth.

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..... [2]

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(iii) The placenta is adapted for the exchange of substances between the maternal blood and the fetal blood.

Describe the exchanges that occur across the placenta to keep the fetus alive and well.

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..... [4]

(b) The placenta secretes the hormones oestrogen and progesterone.

Describe the roles of these hormones during pregnancy.

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..... [3]

[Total: 11]

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6 In South America, forests have been cut down to provide land for cattle grazing and for growing crops, such as soya beans.

Fig. 6.1 shows an area before deforestation and after the planting of soya. Occasionally small areas of forest are left if the land cannot support agriculture.

Fig. 6.1

(a) Suggest the disadvantages of removing the forest from all but small areas of land.

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..... [3]

(b) Much of the soya is used to feed farm animals rather than to make foods that humans can eat.

Explain the advantages of using soya as food for humans rather than for farm animals.

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..... [3]

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(c) Much of the cleared forest in South America is used as land for cattle grazing.

The clearing of forest and keeping large numbers of cattle have severe effects on the environment, especially the atmosphere.

Outline the effects of forest clearance and cattle farming on the atmosphere.

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..... [3]

(d) Yields from crops grown on soils like those in Fig. 6.1 are likely to decrease over time.

State reasons for the likely decrease in yields.

1 .....

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2 .....

..... [2]

(e) Forest products are used in the manufacture of paper.

Explain the environmental **advantages** of recycling paper.

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.....

.....

..... [2]

[Total: 13]

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Figure 2.1 Photograph	© Steve Allen; Ref: 88176896; *Marine iguanas on rocks by ocean;* Getty Images.
Figure 3.2	© R Usha & M Singh; *Proteases of germinating winged-bean (Psophocarpus tetragonolobus) seeds: purification and characterization of an acidic protease;* Biochem.J; 1996; 313; http://www.biochemj.org/bj/313/0423/3130423.pdf.
Figure 4.1 Photograph	© Dr David Phillips; Ref: vis901045; *Human blood showing red blood cells (erythrocytes) and white blood cells (leukocytes). SEM;* Getty Images.
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