Name:		Index Number:		Class:	

CATHOLIC HIGH SCHOOL
Preliminary Examination 3
Secondary 4

A1

BIOLOGY

5158/02

Paper 2

Friday 16 September 2016

1 hour 45 minutes

Additional Materials: -

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Section A	/ 50
Section B	/ 30

This paper consists of **20** printed pages.

[Turn over

Section A

Answer **all** questions.
Write your answer in the spaces provided.

1 Figure 1.1 shows the alimentary canals of two mammals, an insect-eating bat, which is a carnivore, and a rabbit, which is a herbivore.

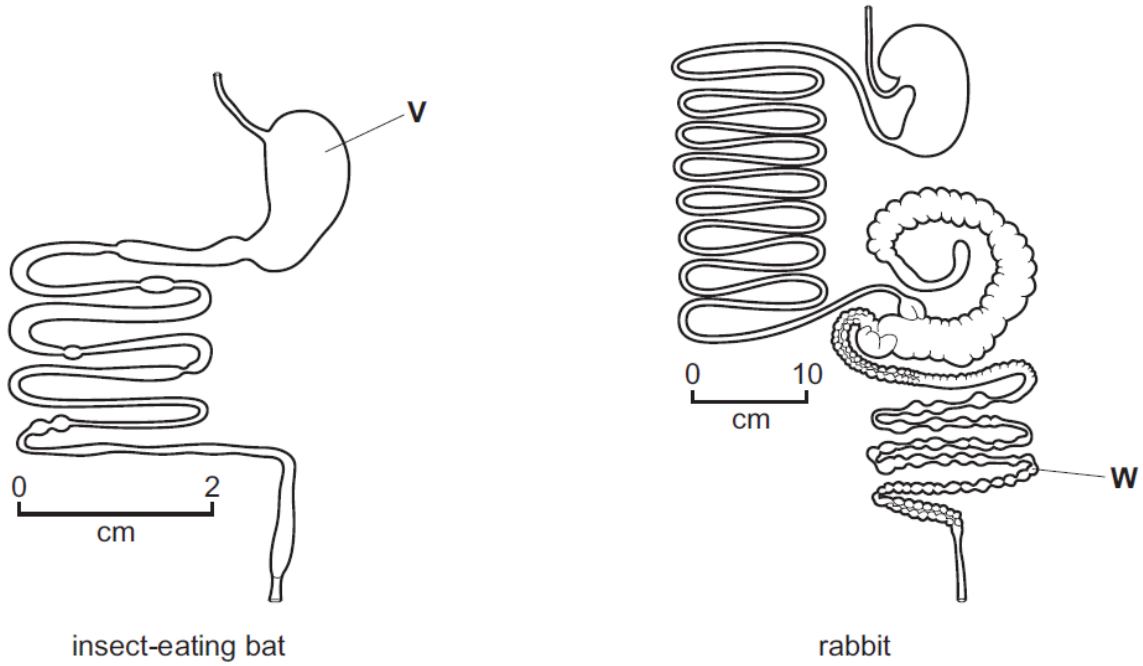

Figure 1.1

(a) Name the organs labelled **V** and **W**. [2]

V _____

W _____

(b) Explain the role of mechanical digestion. [3]

_____

_____

_____

_____

_____

_____

Scientists investigated digestion in different species of mammal. The mammals that they studied ranged in size from an elephant shrew, *Elephantulus edwardii*, with a mass of 50 g to an ox, *Bos taurus*, with a mass of 220 kg.

The scientists added indigestible particles to the animals' food and timed how long the particles stayed in the digestive system. The results for 24 different mammal species are shown in Figure 1.2.

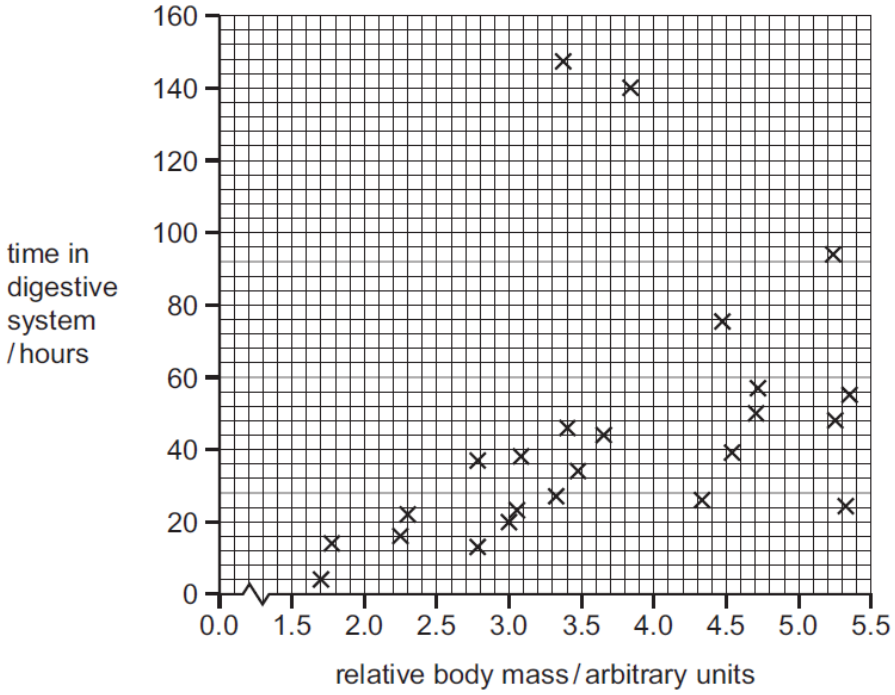

Figure 1.2

The scientists concluded that food stays longer in the digestive systems of larger mammals compared with smaller mammals.

(c) Discuss the evidence from Figure 1.2, for and against the statement that food stays longer in the digestive systems of larger mammals. [4]

[Total: 9 marks]

2 **(a)** Figure 2.1 shows the human heart and the main blood vessels. The functions of the parts of the heart and some of the blood vessels are given in Table 2.1.

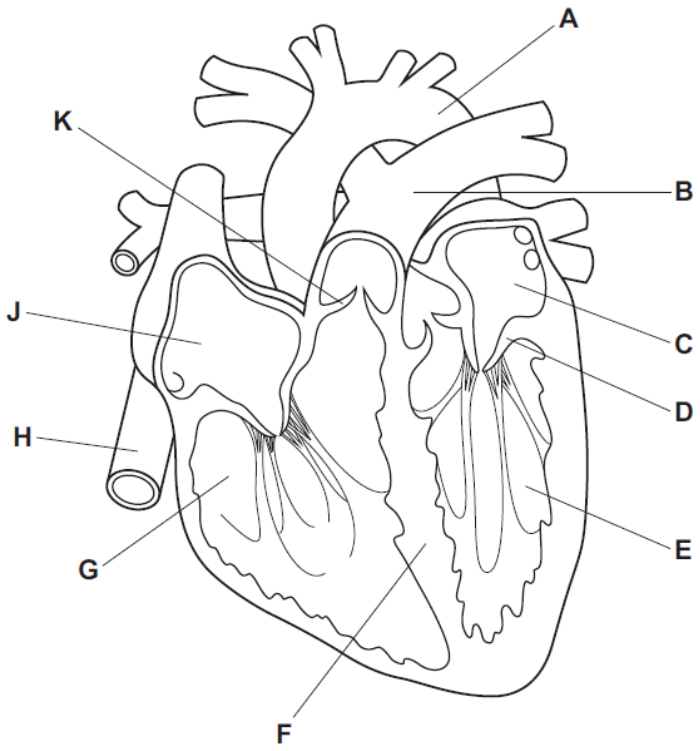

Figure 2.1

Complete Table 2.1. [4]

Table 2.1

function	letter on Figure 2.1	name
structure that separates oxygenated and deoxygenated blood		
structure that prevents backflow of blood from ventricle to atrium		
blood vessel that carries deoxygenated blood		
chamber of the heart that contains deoxygenated blood		

(b) A group of students used a heart monitor to record the pulse rate of an athlete during a 5000-metre race. The recordings started just before the race began and ended just after it had finished, as shown in Figure 2.2.

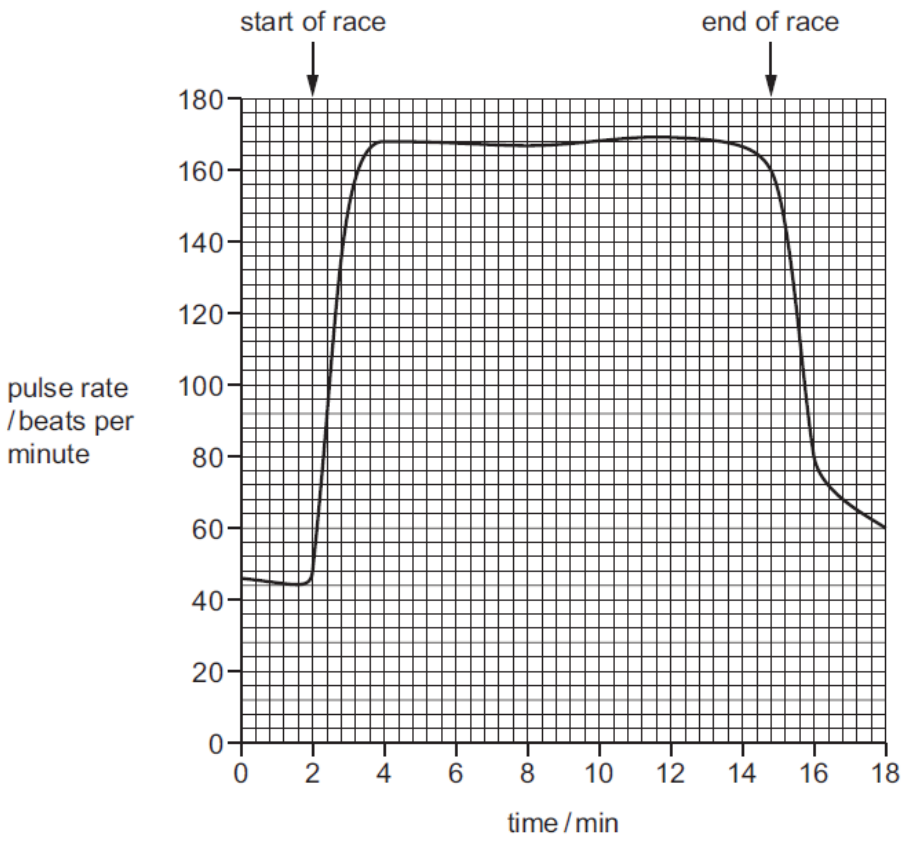

Figure 2.2

(i) Use data from Figure 2.2 to describe the effect of exercise on the pulse rate of the athlete. [3]

(ii) Explain the change in pulse rate between 2 minutes and 3 minutes after the recordings started. [4]

[Total: 11 marks]

3 Catalase is an enzyme that breaks down hydrogen peroxide inside cells. Red blood cells contain catalase.

Some dogs have an inherited condition in which catalase is not produced. This condition is known as acatalasia and it is caused by a mutation in the gene for catalase.

(a) Define the terms gene and gene mutation. [2]

gene

gene mutation

(b) A geneticist was asked to investigate the inheritance of acatalasia in dogs. The normal allele is represented by **B** and the mutant allele is represented by **b**.

The geneticist made the diagram in Figure 3.1 to show the inheritance of acatalasia in a family of dogs. The shaded symbols indicate the dogs with acatalasia.

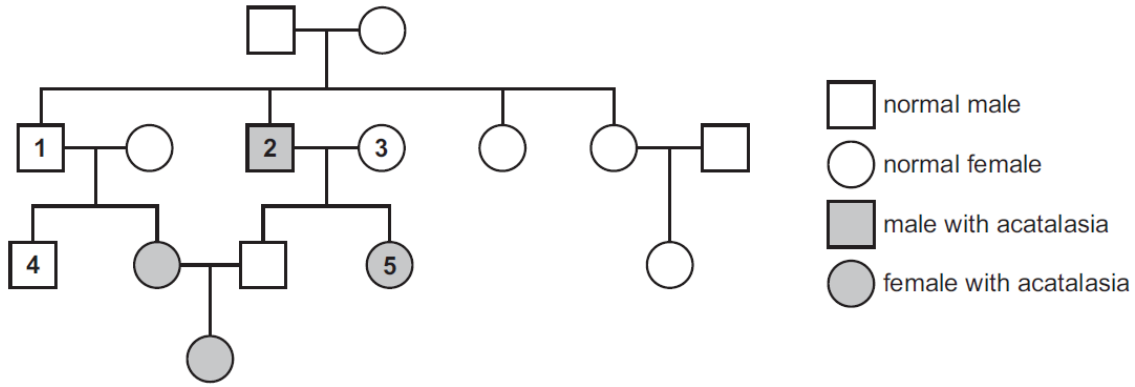

Figure 3.1

(i) State the genotypes of the dogs identified as **1**, **2** and **3** in Figure 3.1. [3]

1 ..... **2** ..... **3** .....

(ii) The geneticist crossed dog **4** with dog **5**. Approximately half of the offspring had acatalasia and half the offspring did not have acatalasia. Construct a genetic diagram to show how this is possible. [4]

(iii) State the name given to the type of cross that you have completed in **(b)(ii)**. [1]

.....

[Total: 10 marks]

- End of Section **A1** -

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A2

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4 Excretion is the process of removing waste products of metabolism from the body.

(a) Name the two main products of metabolism that need to be excreted from the human body. [2]

1 _____

2 _____

(b) The kidney is one of the main excretory organs of the body. Its role is to filter the blood. Some substances leave the blood and are removed from the body in the urine. The concentration of protein in the blood entering the kidneys in the renal arteries is 83 g dm^{-3}.

State the concentration of protein that you would expect in the urine of a healthy person and explain your answer. [2]

concentration _____ g dm^{-3}

explanation _____

_____

(c) Dialysis can be used to treat people whose kidneys do not function properly. Figure 4.1 shows dialysis treatment.

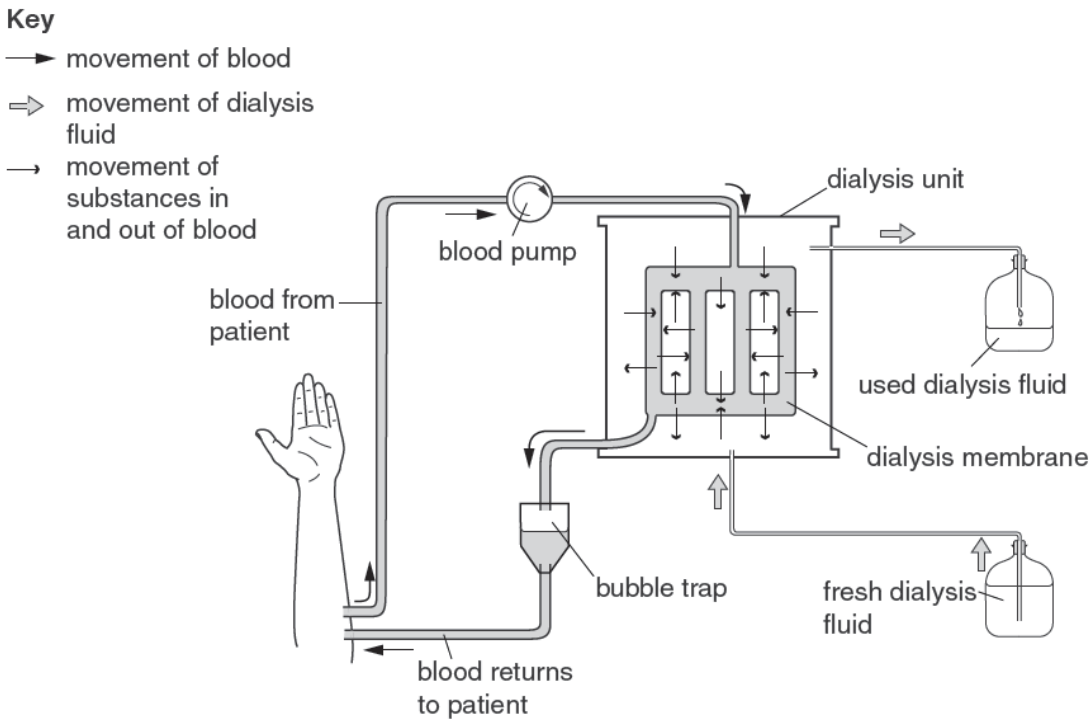

Figure 4.1

Use Figure 4.1 to describe the process of dialysis and explain changes that occur in a person's blood. [5]

(d) Some people with kidney failure are given a kidney transplant.

State **one** advantage and **one** disadvantage of having a kidney transplant instead of dialysis treatment. [2]

advantage

disadvantage

[Total: 11 marks]

5 Figure 5.1 shows the stages in the process of genetic engineering to produce the hormone insulin.

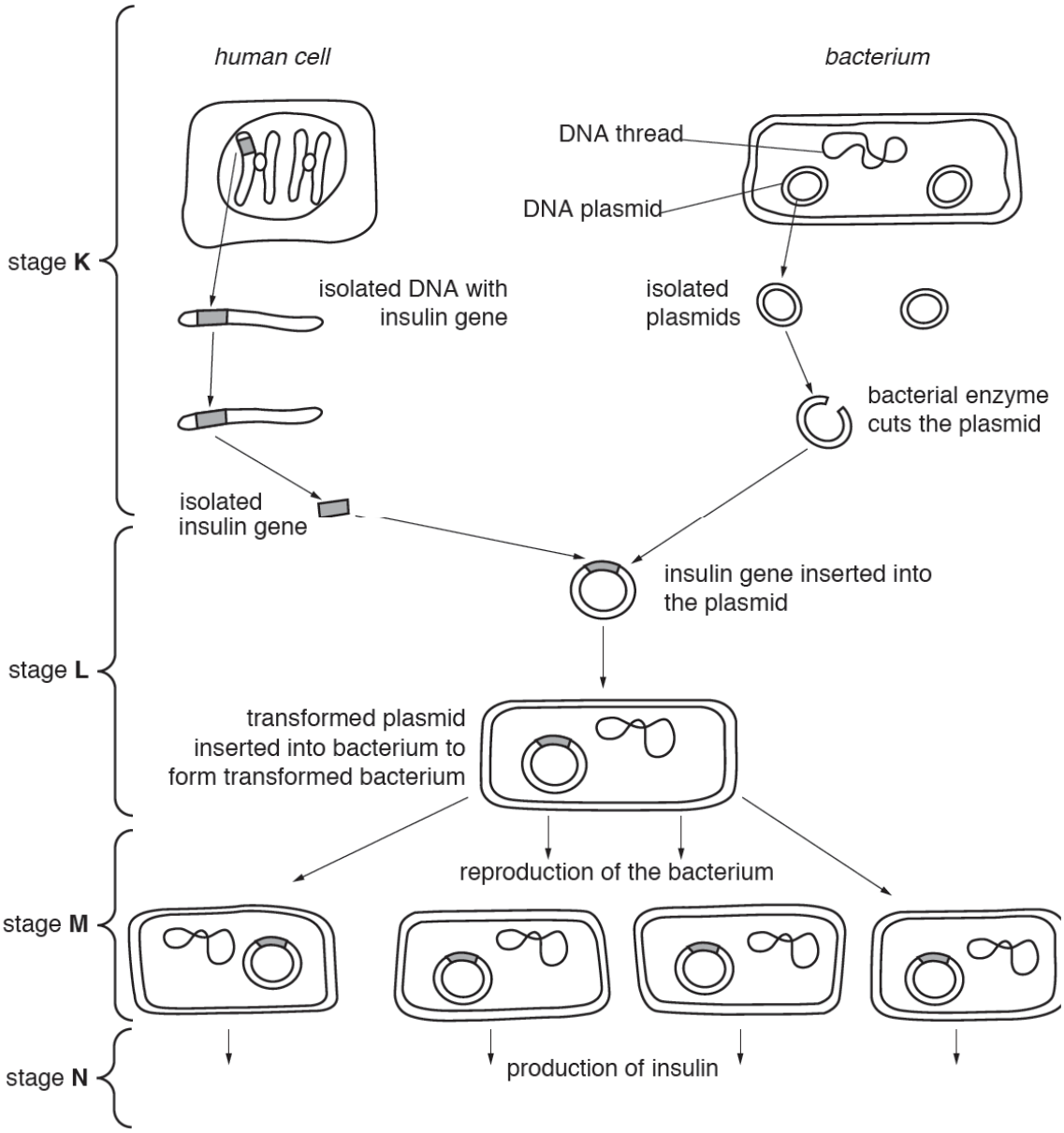

Figure 5.1

(a) Describe how the location and organisation of genetic material in the human cell shown in stage **K** of Figure 5.1 is different from that in the bacterial cell shown. [3]

(b) Use your knowledge of cells to name two structures that the transformed plasmid must pass through to form a transformed bacterium in stage **L** of Figure 5.1. [2]

..... and .....

(c) State the type of reproduction that takes place in stage **M** of Figure 5.1. Use your knowledge of the process of cell division to explain why it is important that this type of reproduction occurs. [3]

type of reproduction .....

explanation .....

.....

.....

.....

.....

(d) Name the condition in humans that is treated using insulin produced by the bacteria in stage **N** of Figure 5.1. [1]

.....

[Total: 9 marks]

- End of Section **A2** -

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B

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Section B

Answer **three** questions.

Question **8** is in the form of an **Either/Or** question. Only one part should be answered.

6 In an investigation into the effects of alcohol on the nervous system, people were asked to carry out a test on their reaction time.

The person being tested looked at a coloured block on a computer screen. As soon as the colour changed they pressed a button. The time taken to press the button was recorded by the computer. This was their reaction time.

Twenty people were tested before and after consuming a drink containing the same concentration of alcohol.

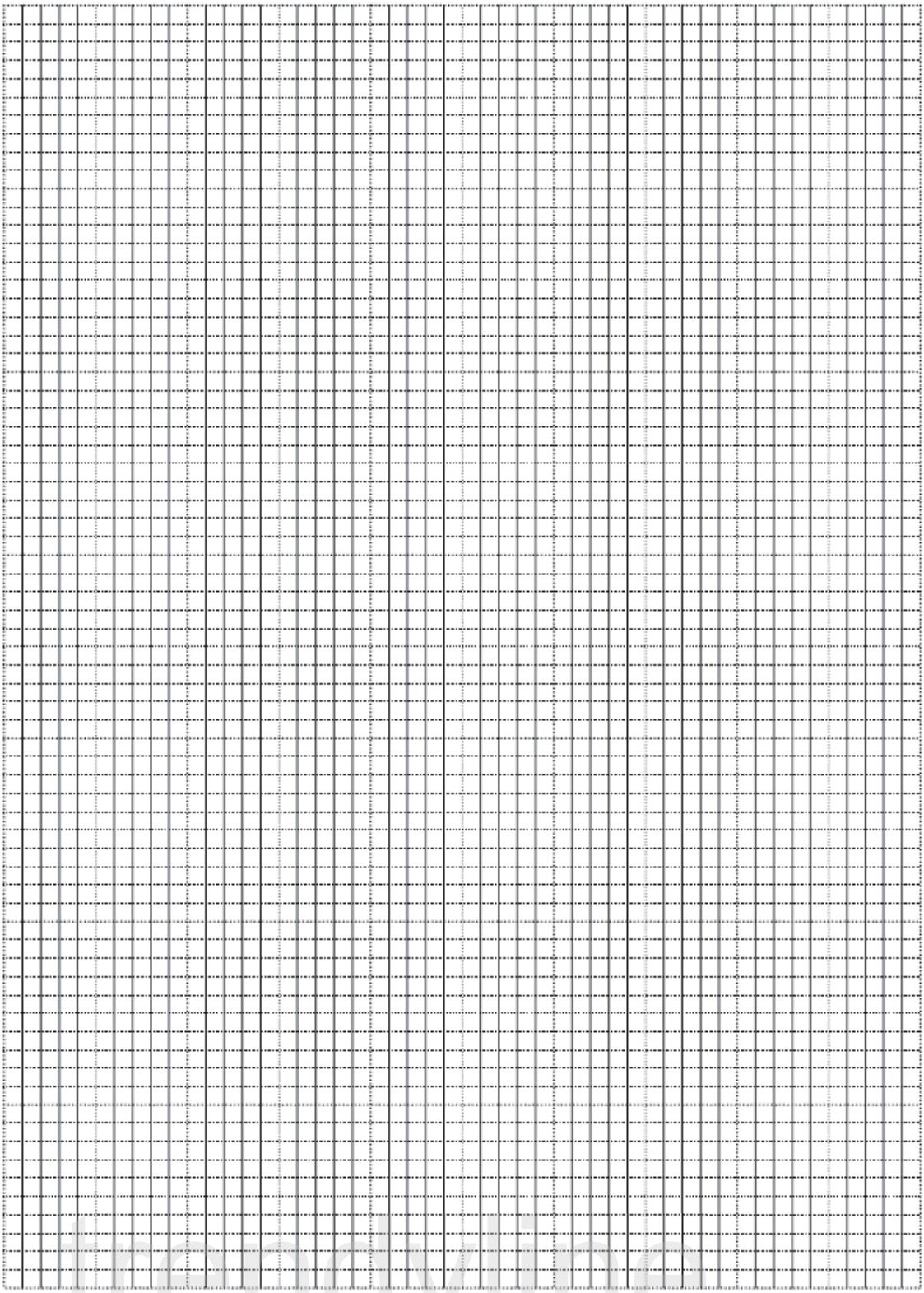
Table 6.1 shows the results of this investigation.

Table 6.1

test person	reaction time before consuming alcohol / milliseconds	reaction time after consuming alcohol / milliseconds
1	272	322
2	310	350
3	225	270
4	243	290
5	240	308
6	264	315
7	201	238
8	262	300
9	225	252
10	235	278
11	225	253
12	247	271
13	226	266
14	194	220
15	206	239
16	309	340
17	223	261
18	243	286
19	270	316
20	180	225
mean	240	

(a) Calculate the mean for the reaction time after consuming alcohol. [1]
Write your answer in Table 6.1.

(b) Plot a bar chart to show the mean reaction time of the people tested before and after consuming alcohol. [4]



(c) The range of reaction times recorded before consuming alcohol is 180-310 milliseconds. Use Table 6.1 to identify the range of reaction times recorded after consuming alcohol. [1]

(d) Describe effects on the body of long-term, excessive consumption of alcohol. [3]

(e) Suggest one social implication of alcohol misuse. [1]

[Total: 10 marks]

7 Figure 7.1 shows an area of forest where some of the trees have been cut down.

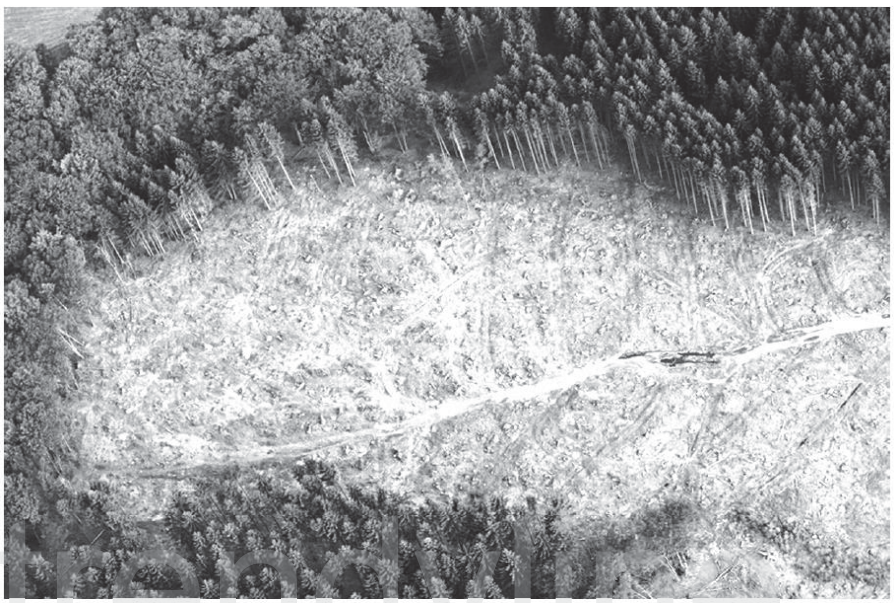


Figure 7.1

(a) Explain the reasons why forests may be cut down as shown in Figure 7.1. [2]

(b) The loss of forests from parts of the world is assessed by satellite imagery. Table 7.1 shows data on the forests in Indonesia and Malaysia, two countries in South-East Asia which have large areas of forest.

Table 7.1

country	type of forest	area / thousands of hectares			
		1990	**2000**	**2005**	**2010**
Indonesia	natural forest	118 545	95 737	94 158	90 883
Malaysia	natural forest	20 420	19 932	19 317	18 649

Calculate the percentage loss of natural forest in Indonesia between 1990 and 2010 (Show your working and express your answer to the nearest whole number). [2]

(c) Many hectares of natural forest have been cleared in countries such as Malaysia and Indonesia for oil palm plantations. Both countries have also replanted forests to grow timber and other forest products. [2]

Suggest why replanted forests and plantations are less useful for conservation than natural forest.

(d) Discuss the effects of deforestation on areas of land. [4]

[Total: 10 marks]

8 Either

(a) Many flowering plants can reproduce sexually and asexually. [3]
Define the term asexual reproduction.

(b) Describe advantages and disadvantages of asexual reproduction for flowering plants with reference to a named commercially important application. [7]

[Total: 10 marks]

8 Or

(a) Describe what happens at ovulation. [2]

(b) If an embryo implants in the uterus, the embryo secretes a hormone known as hCG that stimulates the reproductive organs of the woman to continue to secrete progesterone. Describe what happens after fertilisation until the time that the embryo secretes hCG. [7]

(c) Fertility drugs are taken to increase the chance that a woman may become pregnant. Suggest how these drugs improve the chances of becoming pregnant. [1]

[Total: 10 marks]

- End of Section **B** -