Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

0105482266

BIOLOGY **0610/42**

Paper 4 Theory (Extended) **February/March 2017**

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

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1 Fig. 1.1 shows a vertical section through a human heart and the major blood vessels.

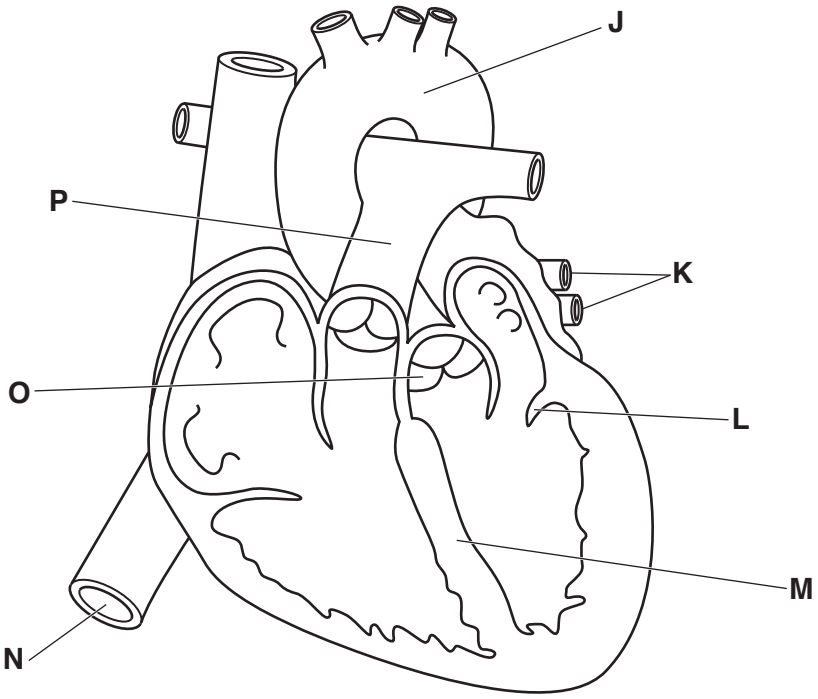


Fig. 1.1

(a) (i) State the names of the structures labelled **L**, **M** and **O** as shown in Fig. 1.1.

L .....

M .....

O .....

[3]

(ii) Identify a letter on Fig. 1.1 that represents a blood vessel that has:

blood with the highest concentration of carbon dioxide .....

blood with the highest concentration of oxygen .....

the highest pressure .....

[3]

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(b) (i) Describe how blood is moved by the heart from blood vessel **K** to blood vessel **J**.

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.....[5]

(ii) Explain why the wall of the left ventricle is thicker than the wall of the right ventricle.

.....

.....

.....

.....

.....[2]

[Total: 13]

2 Bacteria are classified as belonging to the Prokaryote kingdom.

(a) State **two** features of **all** prokaryotes.

1 .....

2 .....
[2]

MRSA is a type of bacterium that is resistant to antibiotics. The number of cases of MRSA identified in hospitals in the USA between 1995 and 2005 was recorded.
Fig. 2.1 shows these data.

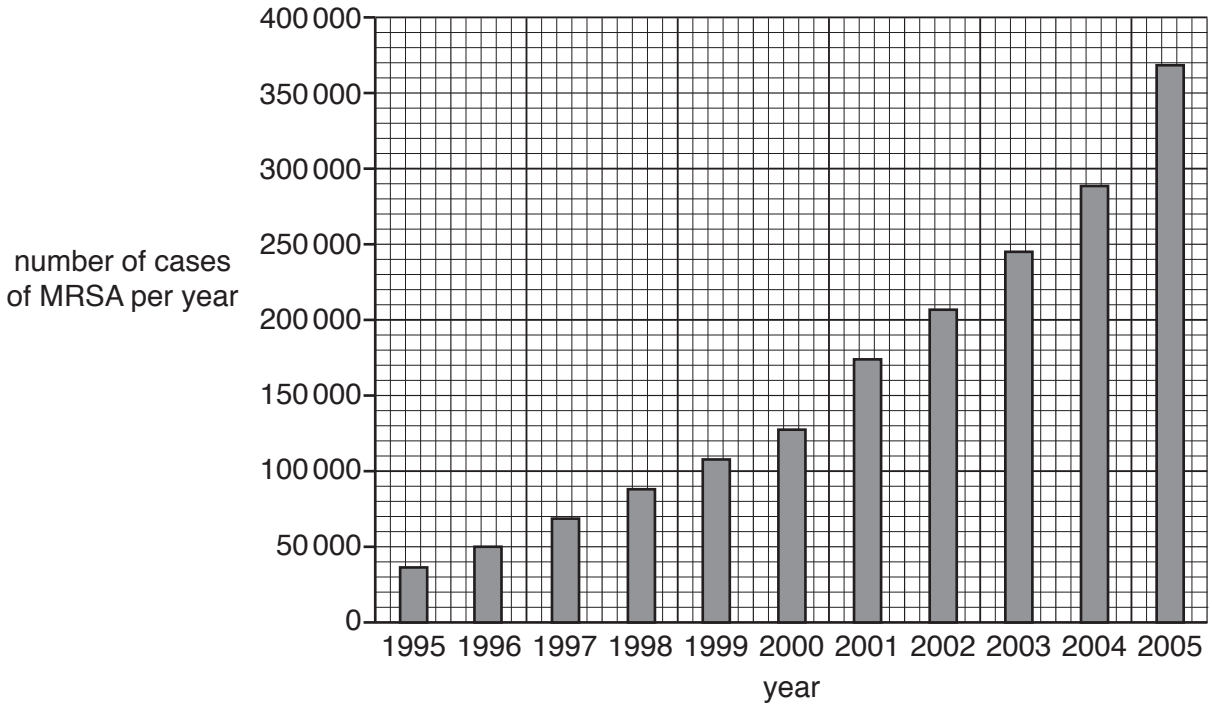


Fig. 2.1

(b) (i) Describe the results shown in Fig. 2.1.

.....

.....

.....

.....

.....[2]

(ii) Explain how bacteria become resistant to antibiotics.

.....

.....

.....

.....

.....

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.....[4]

(c) The number of cases of MRSA has decreased since 2005.

Suggest reasons for this decrease.

.....

.....

.....

.....

.....[2]

[Total: 10]

3 Colour blindness in humans is caused by a fault in some of the light receptor cells in the retina of the eye. Rod cells and cone cells are two types of light receptor.

(a) Complete Table 3.1 to state the function of three types of cell in the eye.

Table 3.1

type of cell in the eye	function
rod cells	....
cone cells	....
sensory neurones	....

[3]

(b) The number of rod cells and cone cells at places across the retina were recorded.

The diagram of an eye in Fig. 3.1 shows the angles from the fovea where the recordings were made.

The graph in Fig. 3.1 shows the number of rod cells and cone cells across the retina.

Use Fig. 3.1 to describe **and** explain the distribution of rod cells and cone cells across the retina.

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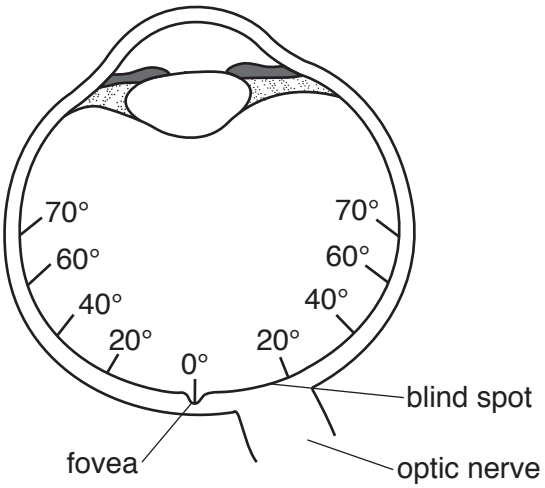
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.....[5]

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70°
70°
60°
60°
40°
40°
20°
20°
0°
blind spot
fovea
optic nerve

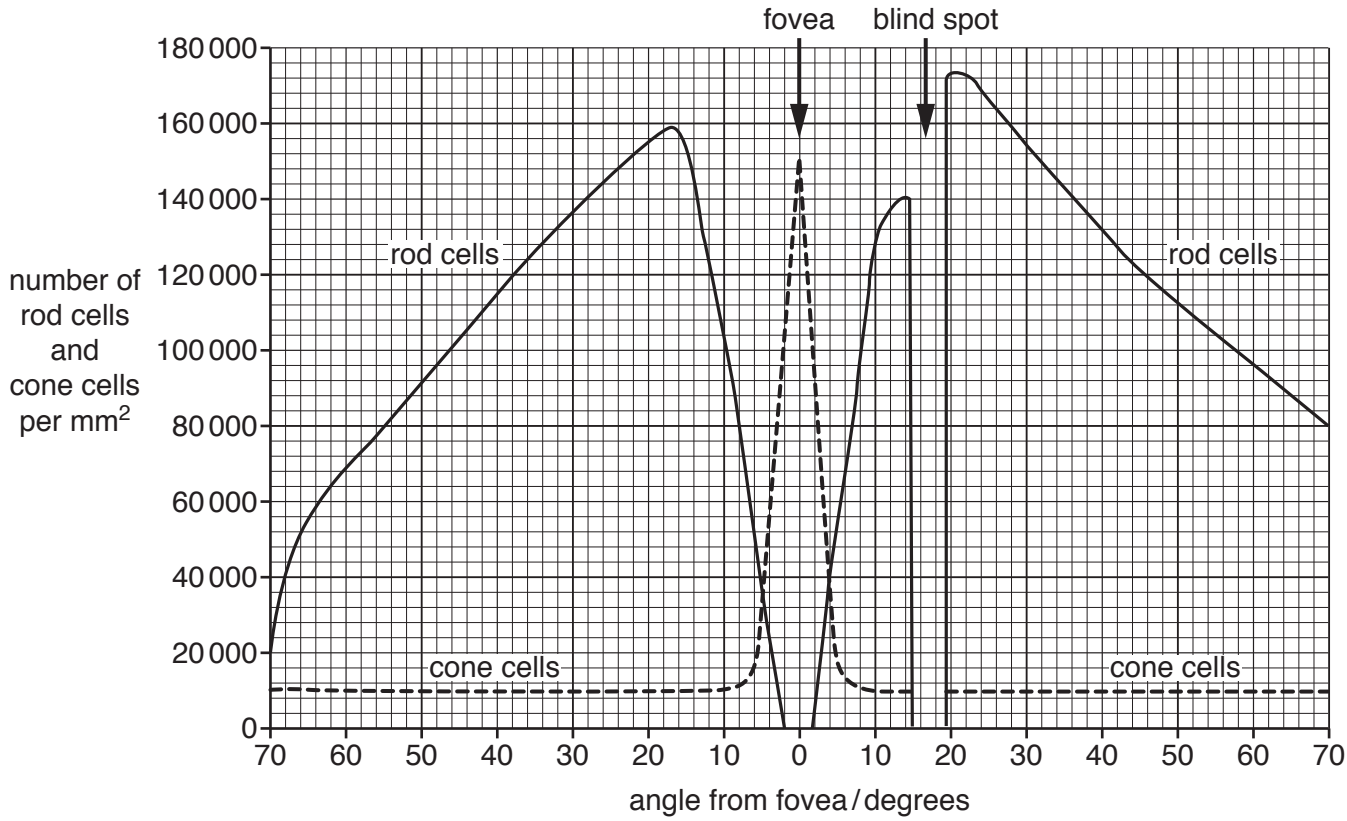

fovea
blind spot
180 000
160 000
140 000
120 000
100 000
80 000
60 000
40 000
20 000
0
number of rod cells and cone cells per mm2
rod cells
rod cells
cone cells
cone cells
70 60 50 40 30 20 10 0 10 20 30 40 50 60 70
angle from fovea / degrees

Fig. 3.1

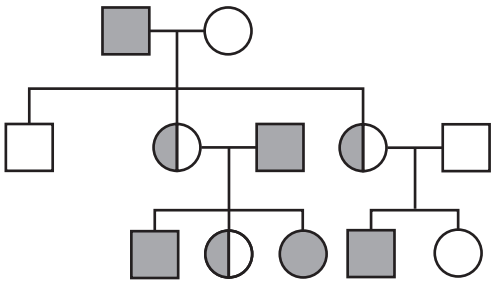
(c) Colour blindness is a sex-linked characteristic.

The gene for colour vision is on the X chromosome.

There are two alleles of this gene:

- **B** is the allele for normal colour vision
- **b** is the allele for colour blindness.

Fig. 3.2 is a pedigree chart showing the inheritance of colour blindness in a family. The key shows the sex chromosomes and the alleles of the gene for colour vision.



Key

male with normal colour vision	X^BY
colour-blind male	X^bY
female with normal colour vision	X^BX^B
carrier female with normal colour vision	X^BX^b
colour-blind female	X^bX^b

Fig. 3.2

Describe evidence from Fig. 3.2 that shows that colour blindness is a sex-linked characteristic.

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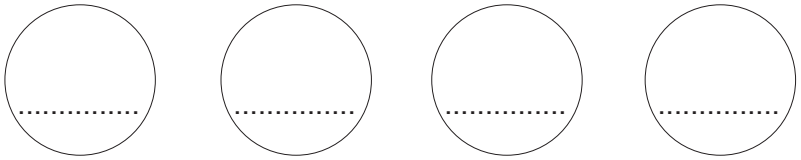
.....[2]

(d) A man with normal colour vision (X^BY) and a woman who is colour-blind (X^bX^b) have a baby.

Complete the genetic diagram to predict the probability that the baby is colour-blind.

parental phenotypes	male with normal colour vision	x	colour-blind female
parental genotypes	X^BY	x	X^bX^b

parental gametes



offspring genotypes ....

offspring phenotypes ....

probability that the baby is colour-blind:

.....

[4]

[Total: 14]

4 **(a)** Water is one requirement for photosynthesis.

State **two** other requirements needed by plants to carry out photosynthesis.

1 .....

2 .....
[2]

Table 4.1 shows the number of hectares of forested area in some countries in Africa in the years 1990, 2000 and 2005.

Table 4.1

country	hectares of forest per 1000 hectares of land		
	1990	2000	2005
Cameroon	25	22	21
Tanzania	41	37	35
Nigeria	17	13	11
Zambia	49	45	43
Zimbabwe	22	19	18

(b) Calculate the percentage loss of forested area in Nigeria between **2000** and **2005**.

Show your working and give your answer to the nearest whole number.

..... %
[2]

(c) Some forested areas are cleared to provide land to grow crop plants. Deforestation reduces the local rainfall and the concentration of water vapour in the air.

(i) Describe **and** explain how a reduced concentration of water vapour in the air would increase the movement of water through crop plants.

.....

.....

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.....

.....[3]

(ii) Describe how water moves from the soil into the roots of crop plants.

.....

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.....[3]

(d) Describe the consequences of deforestation on the animals that live in forests.

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.....[4]

[Total: 14]

5 **(a)** **(i)** Alcohol can be made by the microorganism yeast.

State the balanced chemical equation for the production of alcohol by yeast.

.....[2]

(ii) Name the organ that breaks down alcohol in the human body.

.....[1]

(b) Fig. 5.1 shows a computer model of the enzyme alcohol dehydrogenase, which is the enzyme responsible for breaking down alcohol.

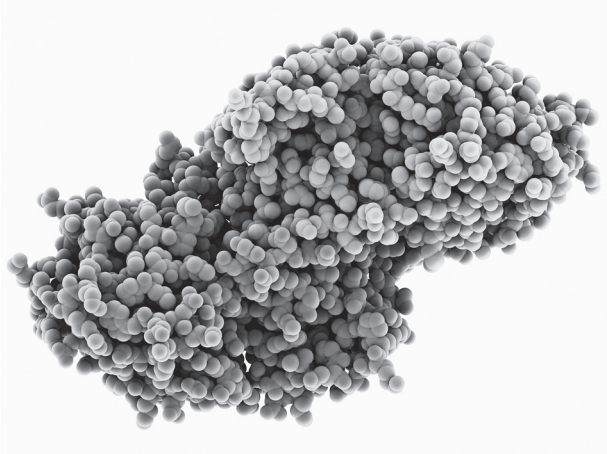


Fig. 5.1

Enzymes have a specific three dimensional shape.

Explain why the shape of an enzyme is important.

.....

.....

.....

.....

.....

.....

.....[3]

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(c) Table 5.1 shows the enzyme activity of alcohol dehydrogenase at different temperatures.

Table 5.1

temperature / °C	enzyme activity / arbitrary units
30	115
42	175

(i) The information in Table 5.1 shows that an increase in temperature increases the activity of alcohol dehydrogenase.

Explain why an increase in temperature causes an increase in enzyme activity.

.....

.....

.....

.....

.....

.....

.....[3]

(ii) State **one** factor, **other than** temperature, that affects enzyme activity.

.....[1]

(d) A gene is involved in the production of the enzyme alcohol dehydrogenase.

(i) Define the term *gene*.

.....

.....

.....[2]

(ii) Describe the role of ribosomes in the synthesis of proteins such as enzymes.

.....

.....

.....

.....

.....[2]

[Total: 14]

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[Turn over

6 **(a)** Table 6.1 shows some of the enzymes, their substrates, products and where they are produced in the digestive system.

Complete Table 6.1.

Table 6.1

enzyme	substrate	product(s)	location of enzyme production
.....	starch	.....	salivary glands
maltase	maltose	.....	.....
.....	.....	amino acids	stomach wall
.....	.....	amino acids	pancreas and small intestinal wall
lipase	fats	.....	.....

[5]

(b) Bile is made in the liver, stored in the gall bladder and passes into the small intestine.

Describe the role of bile in digestion.

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.....[3]

(c) After chemical digestion the products of digestion are absorbed.

Define *absorption*.

.....

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.....[3]

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(d) Lack of protein in the diet can result in protein-energy malnutrition.

State the name of **one** disease caused by protein-energy malnutrition.

.....[1]

(e) People that eat a diet that is high in fats are often advised to reduce their intake of fats.

Suggest the health benefits of this change in diet.

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.....[3]

[Total: 15]

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