



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

CANDIDATE  
NAME

CENTRE  
NUMBER

--	--	--	--	--

CANDIDATE  
NUMBER

--	--	--	--



**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.

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

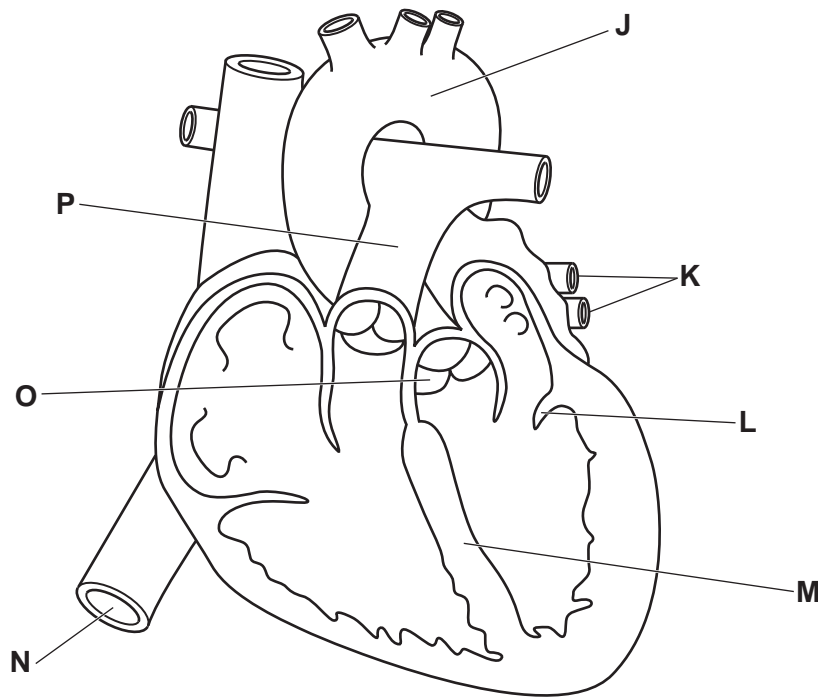


Fig. 1.1

(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]

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

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
..... [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.

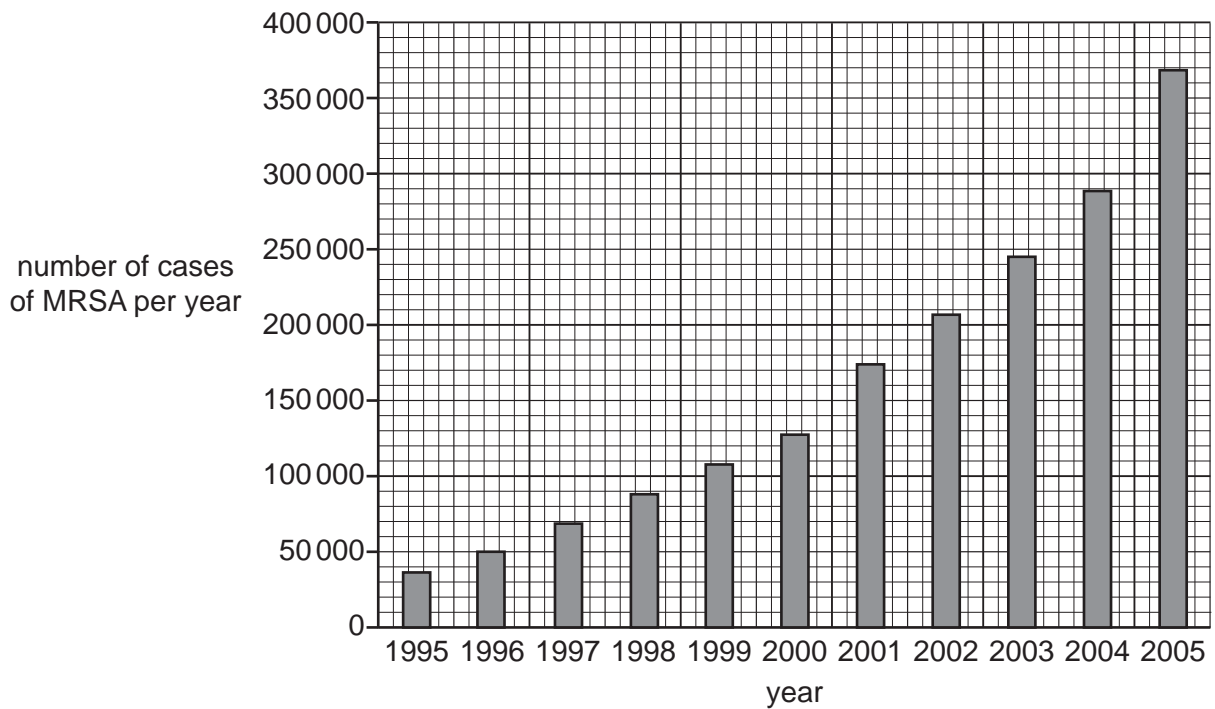


Fig. 2.1

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

.....  
.....  
.....  
.....  
..... [2]

(ii) Explain how bacteria become resistant to antibiotics.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
..... [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.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

[5]

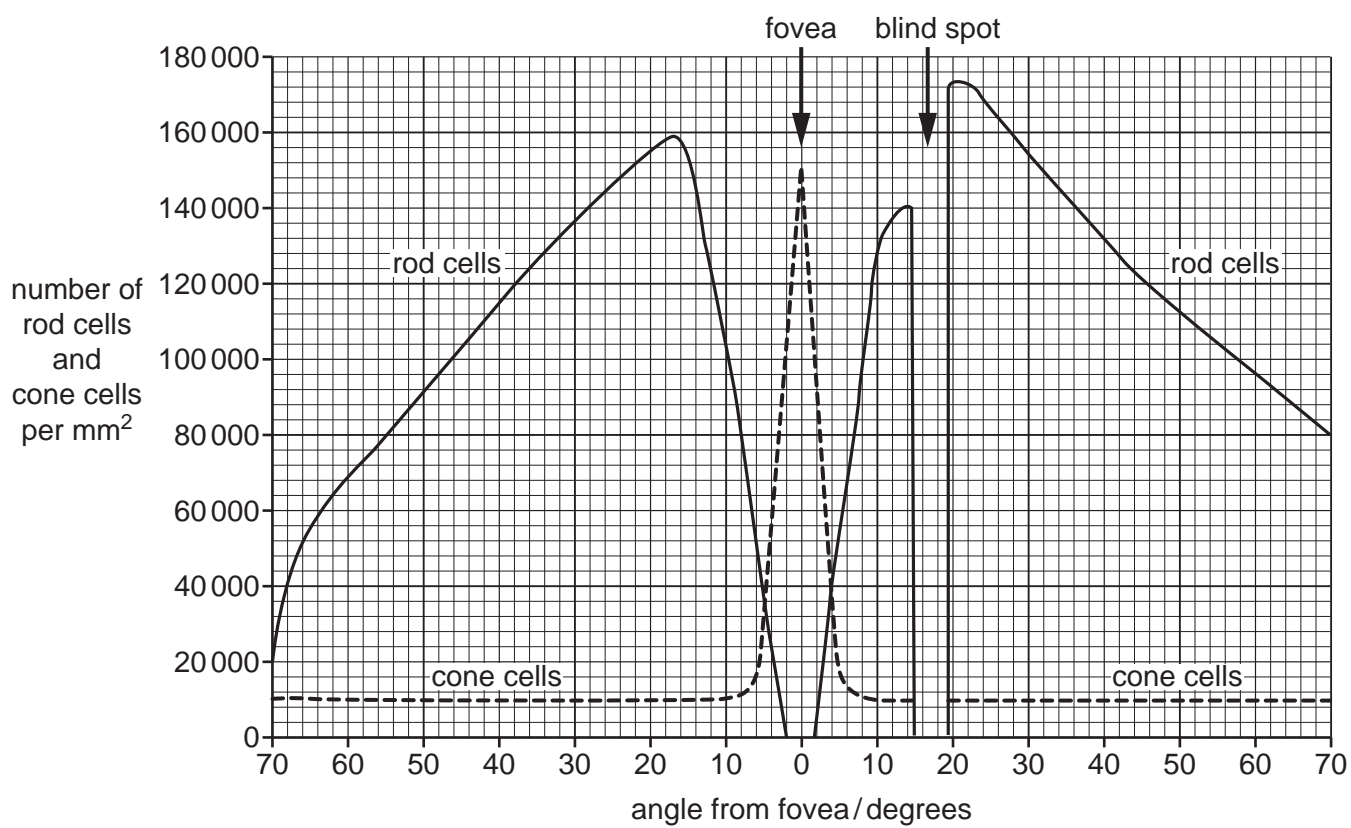
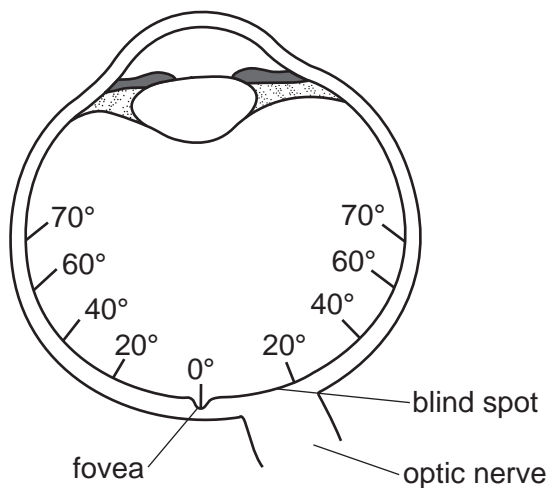


Fig. 3.1

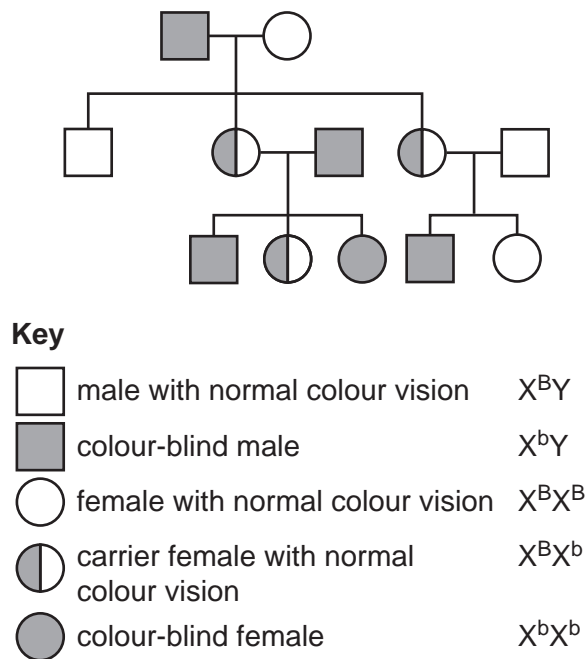
(c) Colour blindness is a sex-linked characteristic.

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.



**Fig. 3.2**

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

.....

.....

.....

.....

.....

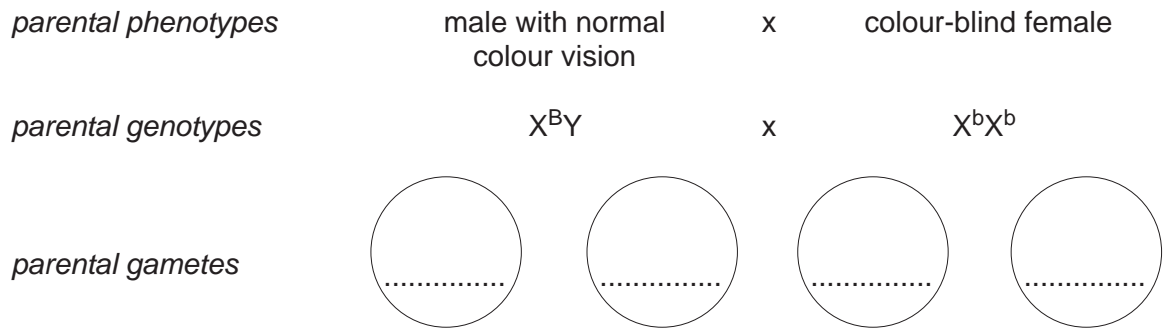
.....[2]



9

(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.



*offspring genotypes*      .....      .....      .....      .....

*offspring phenotypes*      .....      .....      .....      .....

probability that the baby is colour-blind:

..... [4]

[Total: 14]



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

.....  
.....  
.....  
.....  
.....  
.....  
.....  
..... [3]

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

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
..... [4]

**[Total: 14]**

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

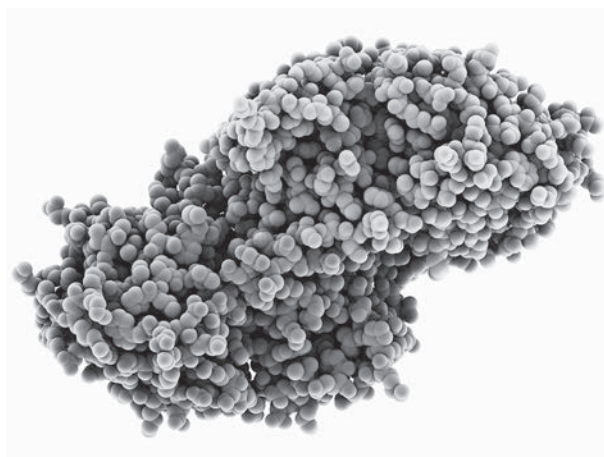
State the balanced chemical equation for the production of alcohol by yeast.

.....[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]





(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.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....[3]

**[Total: 15]**

**BLANK PAGE**

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at [www.cie.org.uk](http://www.cie.org.uk) after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.