Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2616018628

BIOLOGY **0610/43**

Paper 4 Theory (Extended) **October/November 2016**

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 **17** printed pages and **3** blank pages.

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1 An *in vitro* fertilisation (IVF) procedure is outlined in Fig. 1.1.

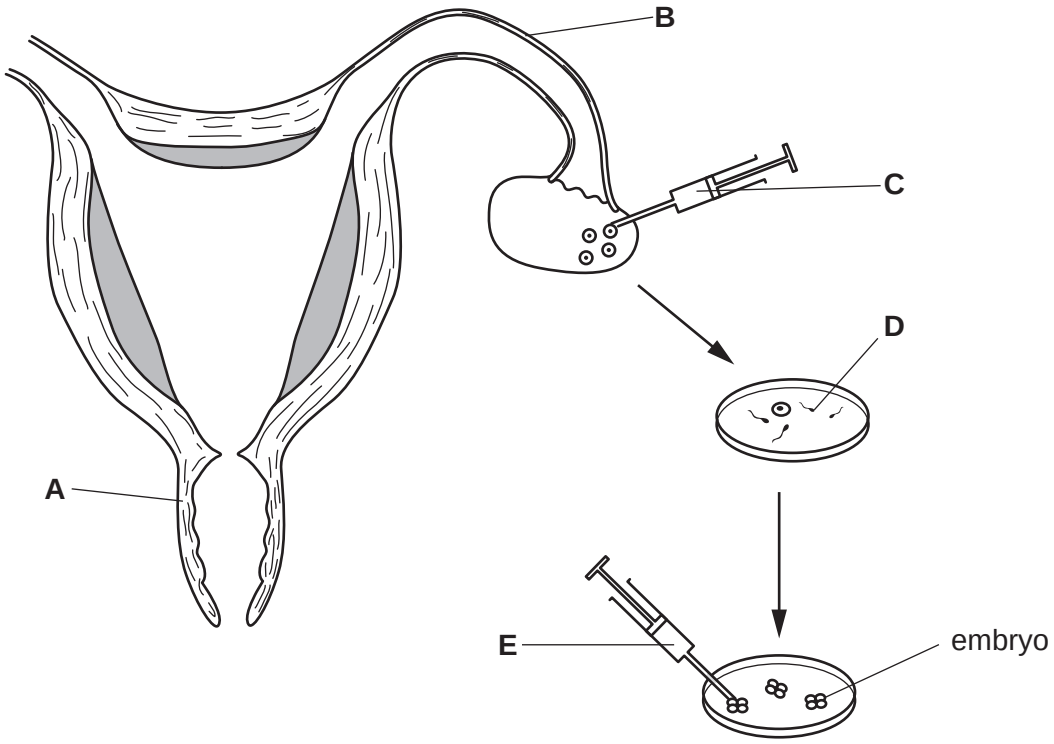


Fig. 1.1

(a) (i) Name structures **A**, **B** and **D**.

A .....

B .....

D .....

[3]

(ii) State the purpose of syringe **C**.

.....

.....[1]

(b) (i) Name a hormone that would be injected to stimulate egg cell development.

.....[1]

(ii) State when, during the menstrual cycle, this hormone should be injected.

.....[1]

(iii) Draw an **X** on Fig. 1.1 at the position where the embryos should be placed.

[1]

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(c) Discuss the social implications of IVF.

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.....[4]

[Total: 11]

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2 Pectinase is an enzyme used in the production of fruit juice.

(a) Describe in detail how enzymes function, using pectinase as an example.

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.....[6]

(b) An experiment to test the effect of the size of apple pieces on the activity of pectinase was performed by a group of students. Some of their apparatus is shown in Fig. 2.1.

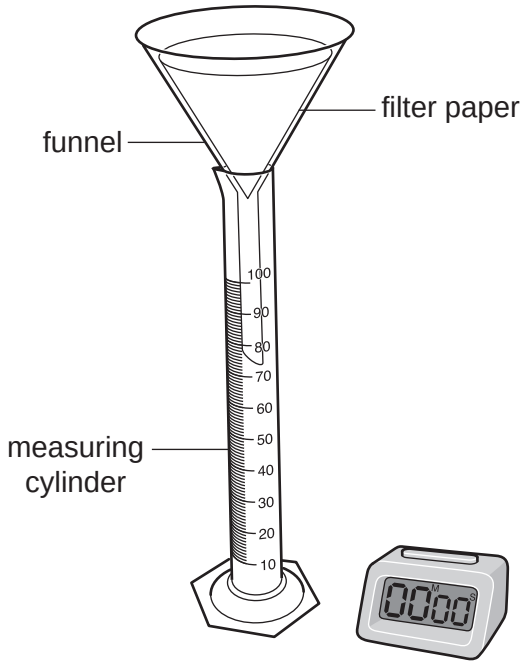


Fig. 2.1

Describe how the students should use the measuring cylinder to obtain **accurate** measurements of volume.

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.....[2]

(c) The students added 1.5 cm^3 of pectinase solution to pieces of apple in a beaker.

They then poured the mixture into the funnel.

They found that it took 10 minutes to collect 19 cm^3 of juice.

(i) Calculate the rate of the enzyme reaction.

Show your working.

Write your answer to the nearest whole number.

..... cm^3 per min [2]

(ii) The students performed four experiments using different ways to prepare the apples.

The same total mass and type of apple was used each time.

A 0.5 cm^3 apple cubes

B 1.0 cm^3 apple cubes

C whole peeled small apples

D whole unpeeled small apples

Predict **and** explain which experiment (**A**, **B**, **C** or **D**) would result in the fastest rate of reaction.

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.....[2]

[Total: 12]

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[Turn over

3 The length of the small intestine was measured in four types of mammal.
The results are shown in Table 3.1.

Table 3.1

mammal	length of small intestine / cm	length of small intestine relative to body mass / cm per g
insect-eating bat	19	2.30
domestic cat	104	0.05
rat	98	0.34
human	552	0.01

(a) Use the information in Table 3.1 to compare the length of the small intestine of the four mammals.

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.....[3]

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(b) Fig. 3.1 is a diagram showing a short length of the small intestine of a mammal.

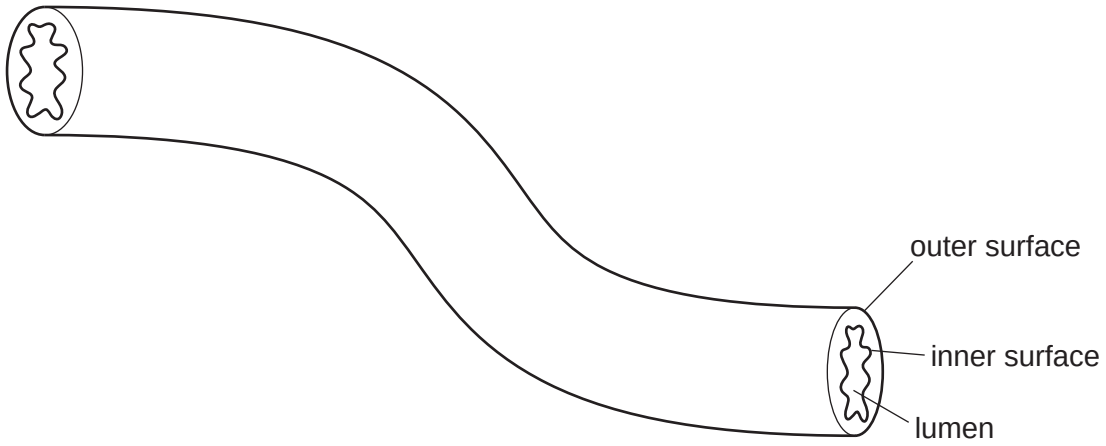


Fig. 3.1

A function of the small intestine is absorption.

Describe how a molecule of glucose passes from the lumen of the small intestine into the blood.

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.....[3]

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[Turn over

(c) Measurements were taken of the inner and outer surface area of two parts of the small intestine for the four mammals in Table 3.1. The results are shown in Table 3.2.

Table 3.2

mammal	ratio of inner surface area to outer surface area	
	duodenum	ileum
insect-eating bat	283:1	54:1
domestic cat	15:1	12:1
rat	6:1	4:1
human	7:1	3:1

(i) Suggest which mammal has the most villi per centimetre of small intestine.

.....[1]

(ii) The duodenum is more effective than the ileum at absorption. Use the information in Table 3.2 to explain why.

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.....[3]

(d) Bile is released into the small intestine from the gall bladder.

Outline the roles of bile.

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.....[4]

[Total: 14]

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4 Tobacco smoke is made up of over 7000 chemicals.

Nicotine is a component of tobacco smoke.

(a) Explain why nicotine is a drug.

.....

.....

.....

.....

.....[2]

(b) Describe the effect on the gas exchange system of the following components of tobacco smoke:

carbon monoxide .....

.....

.....

.....

tar .....

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[4]

(c) A study compared the percentages of men and women aged between 35 and 54 years who smoked cigarettes. The annual death rate caused by lung cancer was also recorded.

The results are shown in the two graphs in Fig. 4.1.

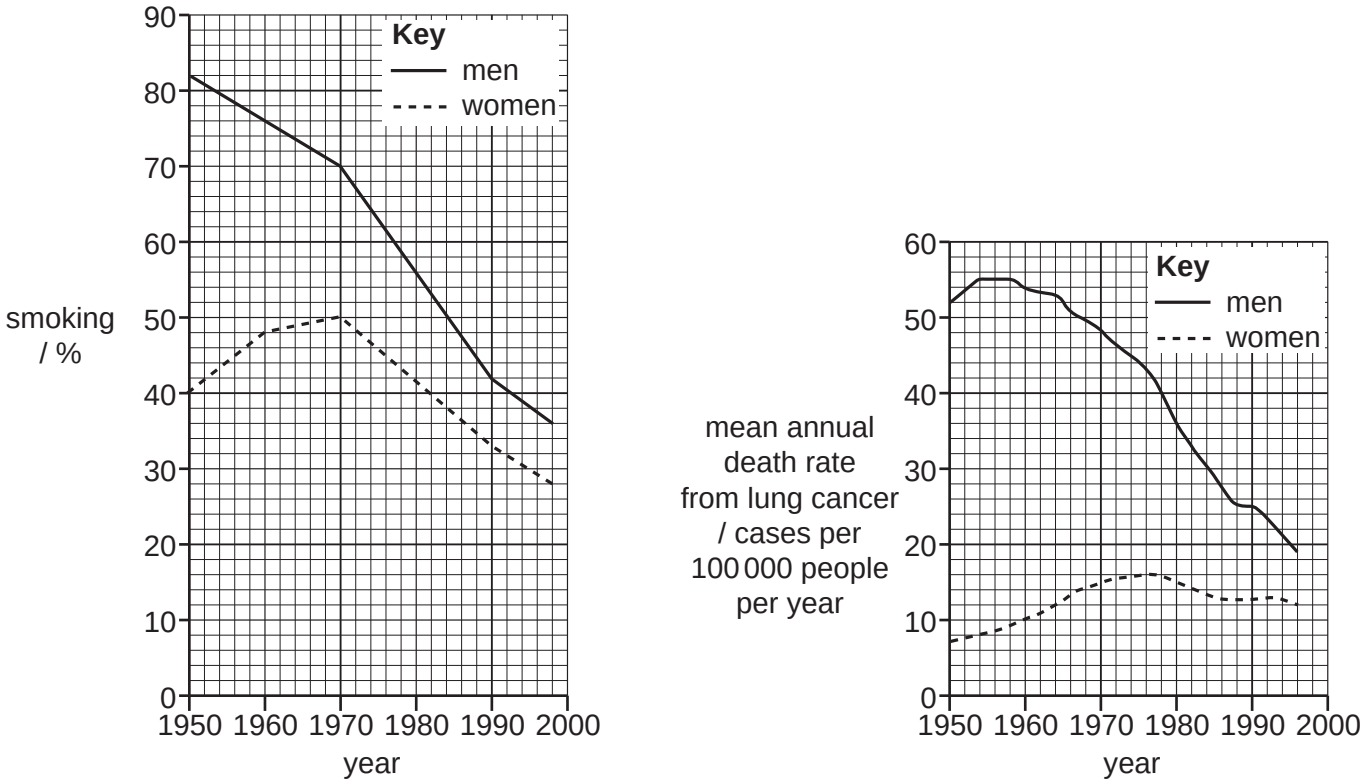


Fig. 4.1

(i) Use the data shown in Fig. 4.1 to compare the percentages of men and women who smoked cigarettes between **1950** and **1998**.

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.....[4]

(ii) Use the information from **both** graphs in Fig. 4.1 to discuss the link between smoking and lung cancer.

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.....[4]

(d) Explain why it is recommended that pregnant women do not smoke.

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.....[3]

[Total: 17]

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5 **(a)** **(i)** Describe the structure of a DNA molecule.

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.....

.....[3]

(ii) State the function of a gene.

.....

.....[1]

(b) Molecular biologists identified a gene found in all species of bacteria and in mitochondria.

State the function of mitochondria.

.....

.....[2]

(c) Some scientists think that mitochondria evolved from bacteria because they are similar in size and structure. Bacteria belong to the Prokaryote kingdom.

Give **two** features of all prokaryotes.

1 .....

2 .....
[2]

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[Turn over

DNA can be used to distinguish between different species of bacteria.

Molecular biologists compared the DNA sequences of the gene in mitochondria and six species of bacteria. They counted the number of differences.

Table 5.1 shows the number of differences between the DNA sequences.

Table 5.1

	mitochondria **A**	species **B**	species **C**	species **D**	species **E**	species **F**	species **G**
mitochondria **A**		29	26	34	25	3	23
species **B**			18	12	17	26	24
species **C**				19	10	19	14
species **D**					28	29	30
species **E**						19	6
species **F**							16
species **G**							

The most closely related species have:

- the least number of differences between their DNA sequences
- the shortest distance from a branching point on a classification tree.

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(d) Use the information in Table 5.1 to complete the classification tree in Fig. 5.1. Place the letter for each species or the mitochondria in the box next to the correct branch of the classification tree. Two have been done for you.

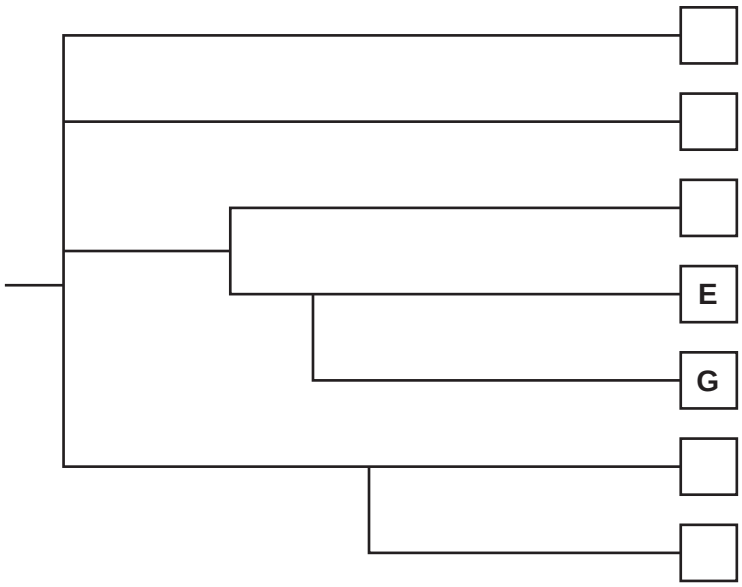


Fig. 5.1

[3]

(e) Suggest why using DNA sequences is a useful method for identifying species of bacteria.

.....

.....[1]

[Total: 12]

6 **(a)** Name **one** feature of dicotyledonous leaves that distinguishes them from monocotyledonous leaves.

.....[1]

(b) Explain why a leaf is an organ.

.....

.....[1]

(c) Photosynthesis occurs in leaves.

State the balanced chemical equation for photosynthesis.

.....[3]

(d) Fig. 6.1 is an image of a section through a dicotyledonous leaf from a scanning electron microscope.

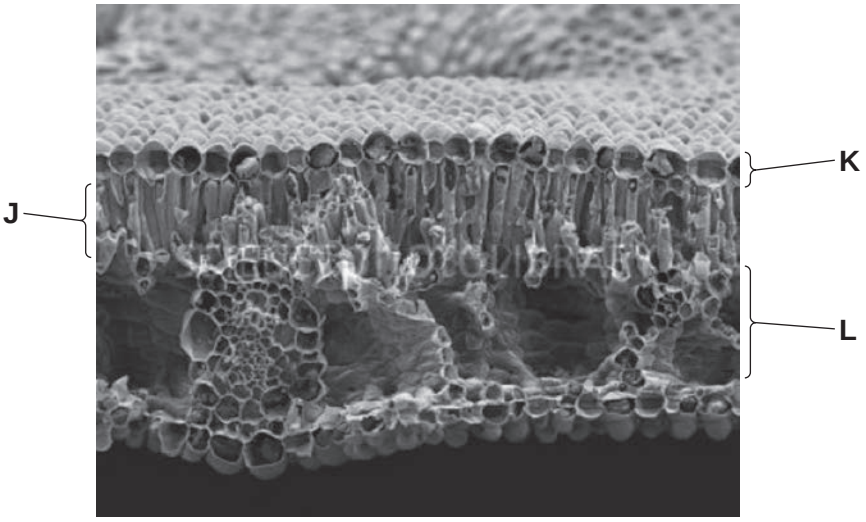


Fig. 6.1

Identify the layers labelled in Fig. 6.1 and explain how their adaptations allow photosynthesis to occur in the leaf.

(i) layer **J** .....

adaptation for photosynthesis .....

.....

[2]

(ii) layer **K** .....

adaptation for photosynthesis .....

.....

[2]

(iii) layer **L** .....

adaptation for photosynthesis .....

.....

[2]

(e) Plants need nitrate ions for growth.

Explain why.

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.....[3]

[Total: 14]

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