



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

CANDIDATE  
NAME

CENTRE  
NUMBER

--	--	--	--	--

CANDIDATE  
NUMBER

--	--	--	--



**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.

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

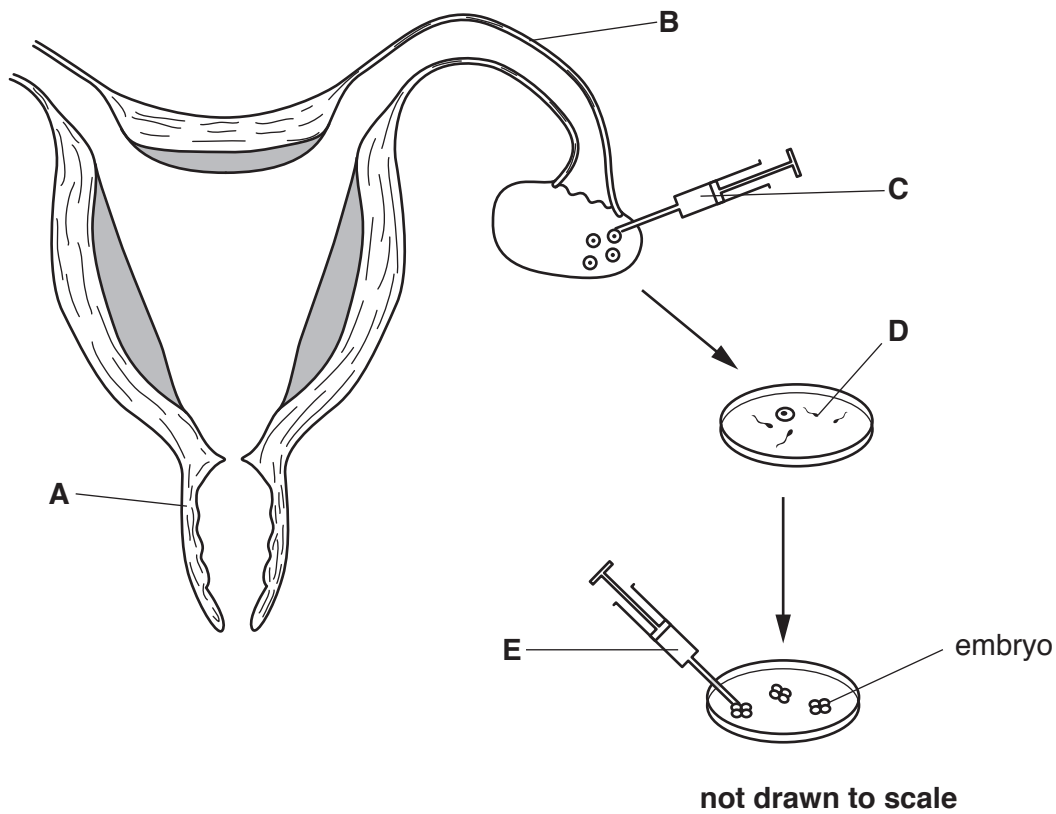


Fig. 1.1

(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]



**BLANK PAGE**



(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.

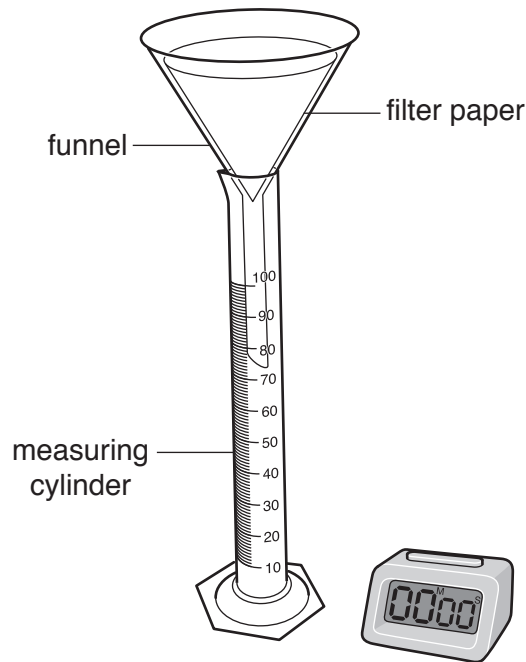


Fig. 2.1

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

.....

.....

.....

.....

.....

.....[2]

(c) The students added  $1.5\text{ cm}^3$  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  $19\text{ cm}^3$  of juice.

(i) Calculate the rate of the enzyme reaction.

Show your working.

Write your answer to the nearest whole number.

.....  $\text{cm}^3$  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  $0.5\text{ cm}^3$  apple cubes
- B  $1.0\text{ cm}^3$  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.

.....

.....

.....

.....

.....

.....[2]

[Total: 12]









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







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

.....  
.....  
.....  
.....  
.....  
.....  
.....  
..... [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]

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

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.



(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.

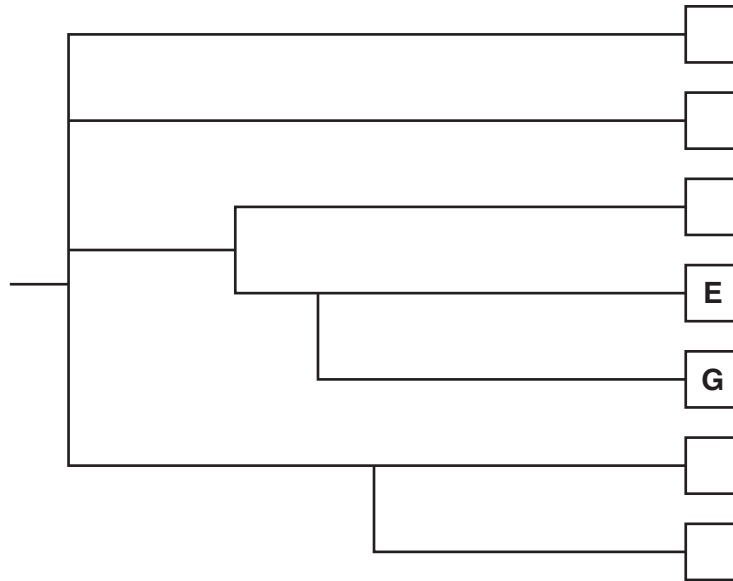


Fig. 5.1

[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.

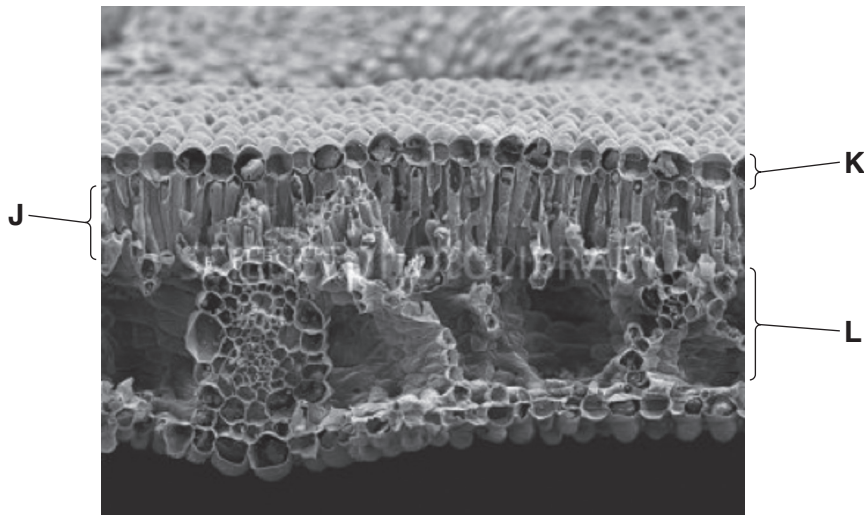


Fig. 6.1

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.

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

[Total: 14]

**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.