Surname	Centre Number	Candidate Number
Other Names		2

GCE A LEVEL

1400U50-1E

S19-1400U50-1E-R1

BIOLOGY – A2 unit 5

Practical Examination

Practical Analysis Task

FRIDAY, 5 APRIL 2019 – MORNING

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**20**	
2.	**10**	
Total	**30**	

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ADDITIONAL MATERIALS

In addition to this examination paper, you will need a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** questions in the spaces provided.

INFORMATION FOR CANDIDATES

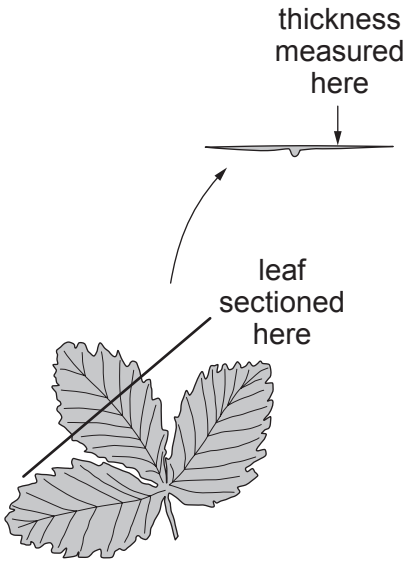
The number of marks is given in brackets at the end of each question or part-question.
The maximum mark for this paper is 30.

Answer **all** *questions.*

1. The image below shows the woodland strawberry *(Fragaria vesca)*. This plant was used to test whether light intensity had any effect on the mean thickness of its leaves.

Fragaria vesca, the woodland strawberry

Woodland strawberry plants were grown from seeds taken from a single parent plant and maintained at either high or low light intensity. All other environmental conditions were kept the same. After germination, leaves of the same age were removed from the plant and microscope slides prepared from the leaves from the point shown in the diagram below. The thickness of each section was then measured using a microscope at the point indicated below.



Examiner only

(a) (i) Explain why the seeds were taken from a single parent plant and were grown under the same conditions, other than light intensity. [2]

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(ii) Suggest **three** environmental conditions that should be controlled when growing plants for this experiment. [3]

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(iii) Why were measurements taken from leaves of the same age? [1]

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(b) The results of the investigation are shown in the table below:

Leaf number	Leaf thickness / µm	
	Low light intensity	High light intensity
1	100	98
2	98	101
3	86	110
4	87	108
5	102	99
6	106	99
7	99	89
8	110	99
9	78	110
10	83	120
11	86	98
12	94	96
13	105	99
14	92	101
15	93	99
Mean	94.6	

Calculate the mean thickness of the leaves at high light intensity. [1]

Mean thickness = ... µm

Examiner only

(c) Student's t test can be used to determine whether the difference between the mean thicknesses of the leaves grown at different light intensities is statistically significant.

(i) Explain why the statistical test chosen was the Student's t test. [1]

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(ii) State a suitable null hypothesis for this test. [1]

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(iii) The number of degrees of freedom is given by the formula:

$$\textit{number of degrees of freedom} = (n_1 - 1) + (n_2 - 1)$$

Where n_1 and n_2 are the numbers of samples from low and high light intensity respectively.
Calculate the number of degrees of freedom to be used in this test. [1]

Degrees of freedom = ...

(iv) The calculated value of t is 2.386.

Level of significance	0.50	0.10	0.05	0.01
Critical value of t	0.683	1.701	2.048	2.763

Using the information provided, state the critical value at a suitable level of significance and draw a conclusion for this experiment. [4]

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Examiner only

(v) At a level of significance of 0.005, the critical value of t is 3.047. What would your conclusion be if a level of significance of 0.005 had been used? [1]

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(d) Some plant species are adapted to growing at high light intensity and some are adapted to growing at low light intensity. In some species the leaves are thicker when grown at low light intensity but in others they are thinner.

(i) Explain why leaves grown at low light intensity might be thicker than those grown at high light intensity in some species. [3]

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(ii) Thinner leaves may result in a lower rate of photosynthesis. Suggest one way that leaves grown at low light intensity might be adapted to overcome this problem, while remaining thin. Explain your answer. [2]

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20

Turn over.

Examiner only

2. **Image 1** below is an electron micrograph of part of a columnar epithelial cell taken from the oviduct (Fallopian tube) of a mammal.

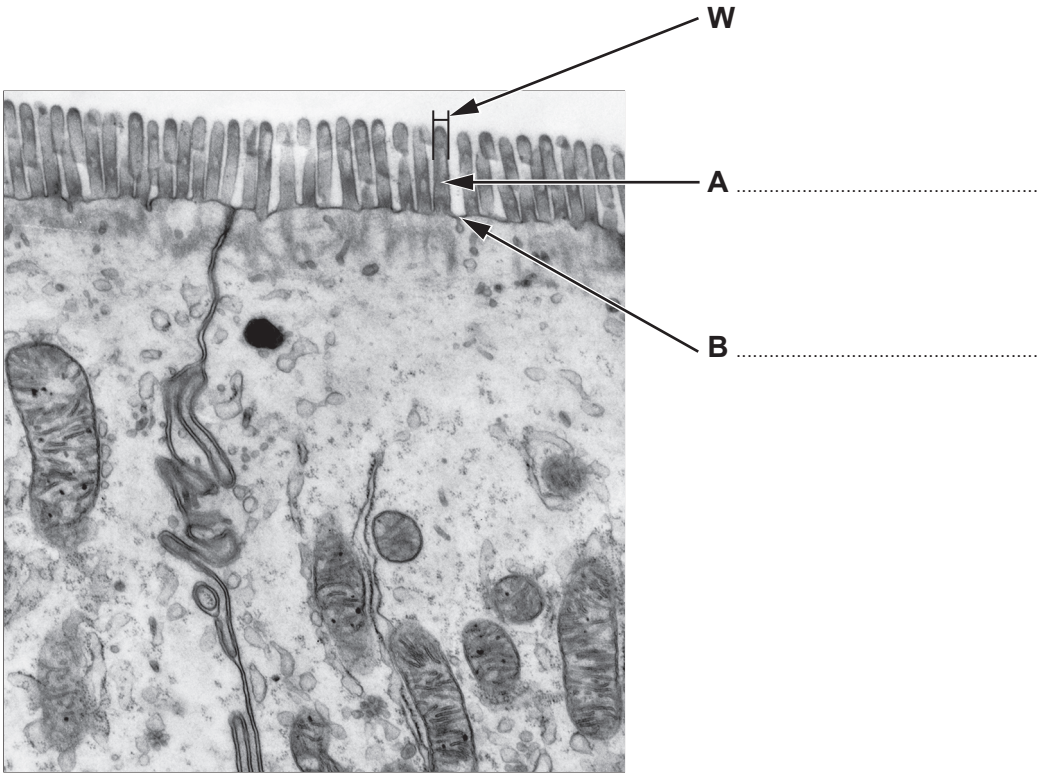

Image 1

(a) (i) On **Image 1**, label structures **A** and **B**. [2]

(ii) **Image 1** is printed at a magnification of ×8000. Calculate the width of structure **A** at the position labelled **W**, giving your answer to 2 decimal places. [2]

Width = ... µm

Examiner only

(b) **Image 2** shows a transverse section through the structures labelled **A** in **Image 1**.

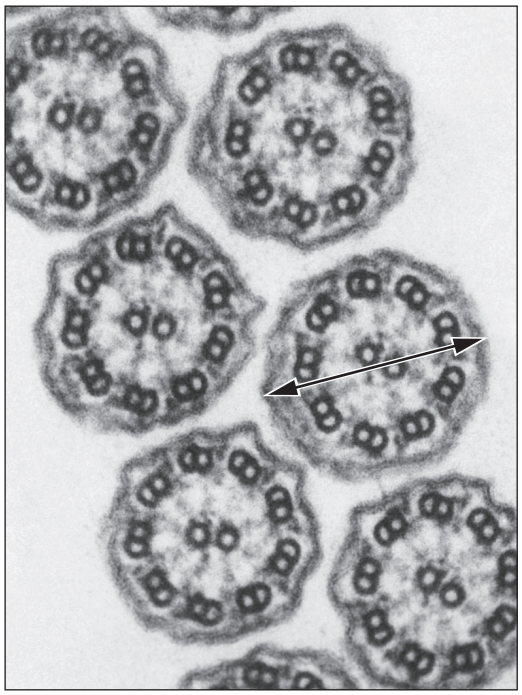

Image 2

(i) Explain why the structures in **Image 2** appear to be a different shape from structure **A** in **Image 1**. [1]

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(ii) Use the width calculated in *(a)*(ii) to calculate the magnification of **Image 2** at the position indicated. [2]

Magnification = ...

(iii) Explain why an electron microscope, rather than a light microscope, is needed to show the internal detail of structure **A**. [1]

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Examiner only

(c) (i) State another site in the human body where cells similar to those in **Image 1** would be found. [1]

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(ii) Describe how the shape of the cells lining the proximal convoluted tubule of the mammalian kidney differs from the columnar epithelial cells shown in **Image 1**. [1]

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END OF PAPER