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General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

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9513753377

BIOLOGY **9700/31**

Paper 31 Advanced Practical Skills **October/November 2008**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the confidential instructions

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 in the spaces provided on the Question Paper.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **both** questions.
The number of marks is given in brackets [ ] at the end of each question or part question.
You are advised to spend an hour on each question.
At the end of the examination, fasten all your work securely together.

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1	
2	
Total	

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You are reminded that you have only one hour for each question in the practical examination.
You should read carefully through the whole of each question and then plan your use of the time to make sure that you finish all of the work that you would like to do.

For Examiner's Use

1 You are required to investigate the effects of two solutions, **S1** and **S2**, on the cells of onion epidermal tissue.

- Solution **S1** is a 1.0 mol dm^{-3} solution of sucrose.
- Beaker **W** contains distilled water.
- Beaker **O** contains distilled water and two pieces of onion.

Use the distilled water in the beaker labelled **W** and solution **S1** to produce a 0.5 mol dm^{-3} solution of sucrose and label it as **S2**.

It is very important to stop the onion from drying out. Place a few drops of water on a microscope slide.

Remove one piece of onion from beaker **O** and using forceps or fingers peel off the inner concave epidermis as shown in Fig. 1.1. Pull the epidermis from the top of the piece towards the tip. Immediately place in distilled water on the microscope slide as shown in Fig. 1.1.

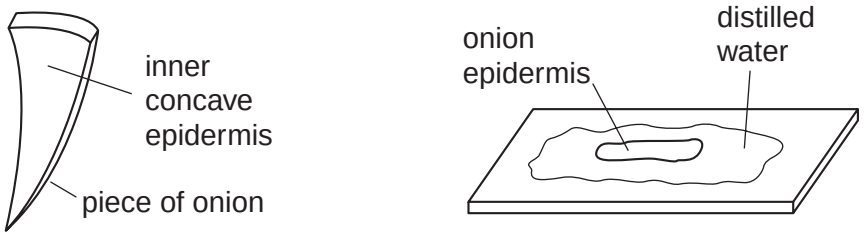


Fig. 1.1

Pour enough distilled water into the Petri dish to cover the base.
Using the scalpel carefully cut one piece of the epidermis approximately 5 mm by 5 mm and place into the distilled water in the Petri dish.
Use the second piece of onion if required.
Repeat until you have at least three small squares of epidermis floating in the Petri dish.

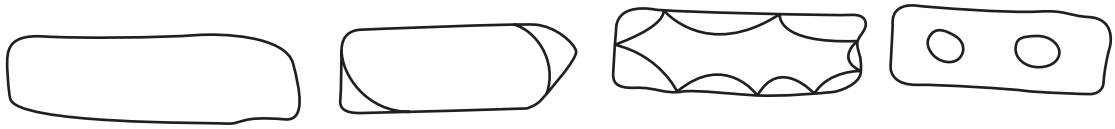
Mount one of the squares on a microscope slide in **distilled water**.
Cover with a cover slip and label the slide.
Repeat with two more squares of epidermis, mounting one in solution **S1** and another in solution **S2**.

Examine each of the slides using your microscope and carefully observe the state of the cells (**you may need to partially close the iris diaphragm** or **reduce the light intensity** to **increase the contrast**).

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(a) Estimate the degree of plasmolysis of five adjacent cells for slide **S1** first, using the reference diagrams in Fig. 1.2.
Use the numbers given in Fig. 1.2 to make your estimate.
Repeat with the slides for distilled water and **S2**.

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none	slight	extensive	severe
1	**2**	**3**	**4**

Fig. 1.2

(i) Prepare and use the space below to present your observations from the slides made with **distilled water**, **S1** and **S2**, and a numerical estimate of the mean degree of plasmolysis for each of these solutions.

[6]

(ii) Describe and explain your observations from the slides made with **distilled water**, **S1** and **S2**.

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.....[3]

(iii) Identify two significant sources of error in this experiment.

For Examiner's Use

1. .....

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2. .....

.....[2]

(iv) Suggest how you would improve this experiment.

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.....[3]

(b) In a similar investigation involving a range of different temperatures and 0.25 mol dm^{-3} sucrose solution, a student obtained the results shown in Table 1.1.

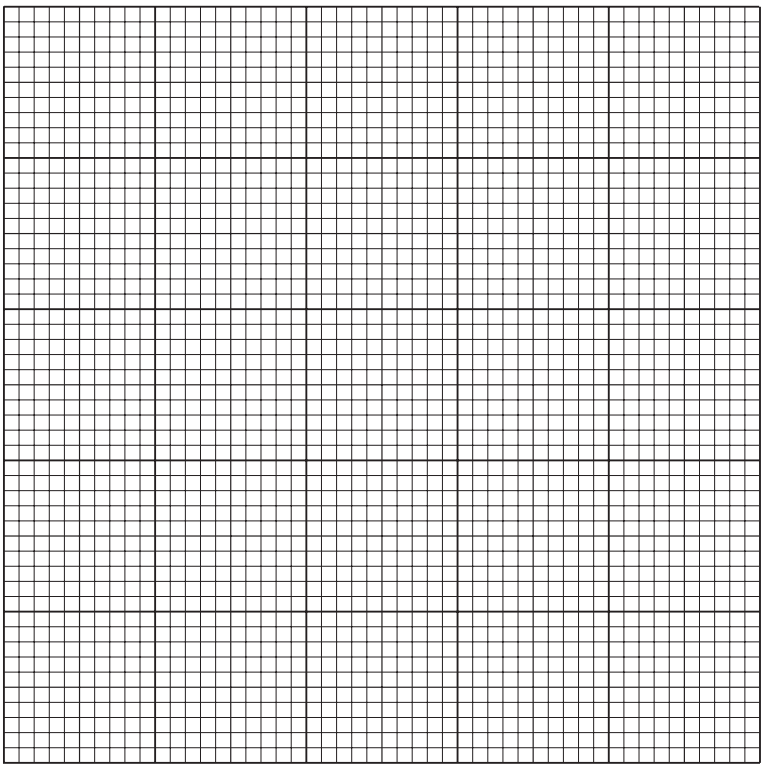
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Table 1.1

	percentage plasmolysis of cells in 0.25 mol dm^{-3} sucrose solution					
temperature °C	batch 1	batch 2	batch 3	batch 4	batch 5	mean
5	22	19	20	20	21	20
15	65	63	66	62	63	
25	79	74	76	78	75	76
35	83	85	86	45	87	
45	85	85	86	84	85	85
55	84	82	86	85	86	85

(i) Complete Table 1.1 by calculating the missing values taking into account any anomalous values. [1]

(ii) Plot a graph of temperature against the mean percentage plasmolysis of the cells.



[3]

(iii) State the temperature at which 50% plasmolysis occurred.

.....[1]

(c) The student's hypothesis was:

For Examiner's Use

Percentage plasmolysis is proportional to temperature.

Draw an appropriate conclusion to the student's experiment.
You should include in your conclusion whether the experimental data support the hypothesis and produce a revised hypothesis if necessary.

.....

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..... [2]

[Total: 21]

2 Fig. 2.1 is a photomicrograph of a transverse section through a tubular structure from an animal.

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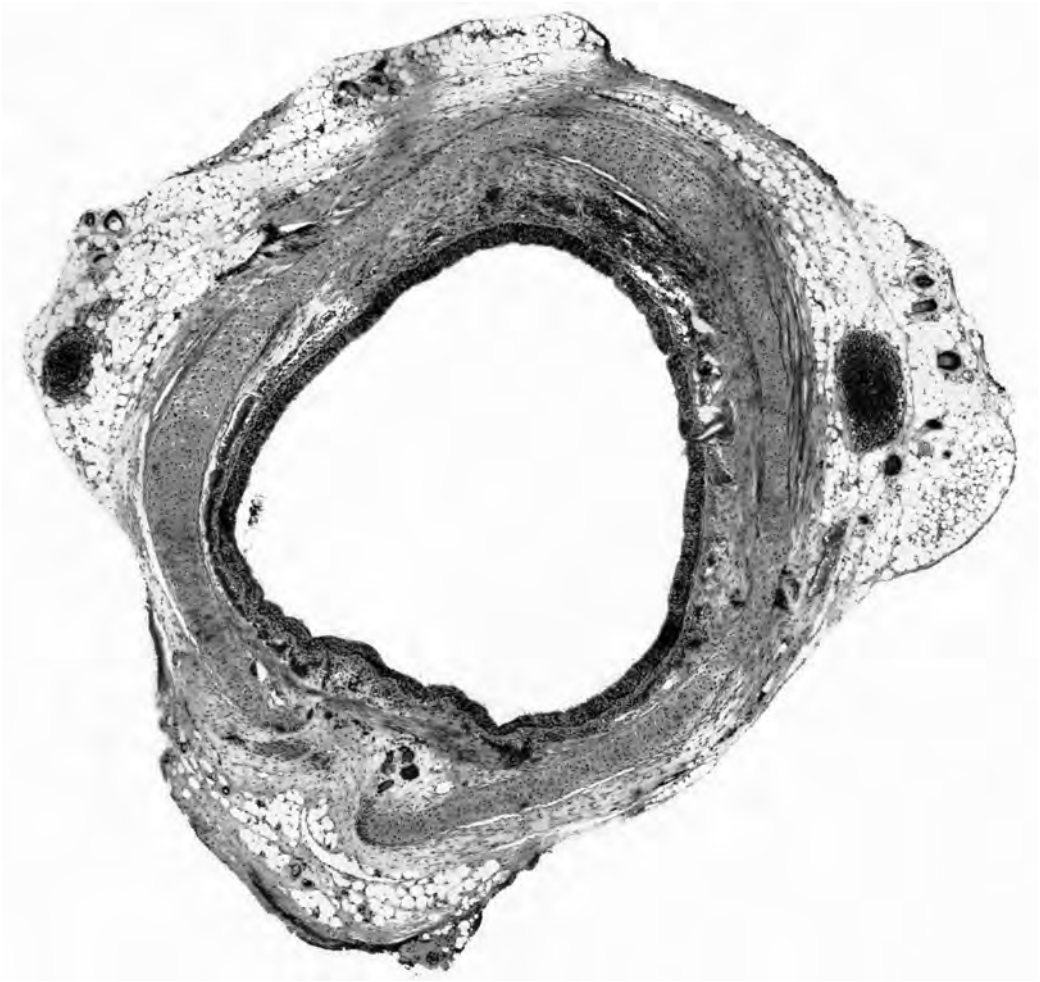


Fig. 2.1

(a) (i) Draw a large low-power plan diagram of the specimen in photomicrograph Fig. 2.1.

[4]

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(ii) Fig. 2.2 shows the same photomicrograph as Fig. 2.1 and includes the image of an eyepiece graticule.
Fig. 2.3 shows a photomicrograph of a stage micrometer scale using the same lenses as Fig. 2.2 and includes an image of the same eye piece graticule.

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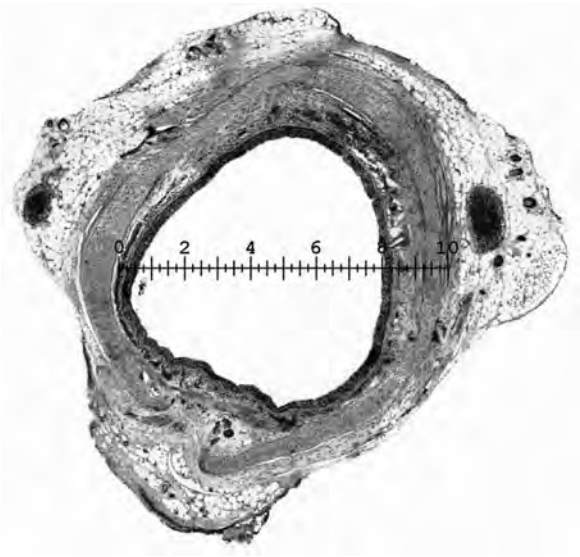


Fig. 2.2

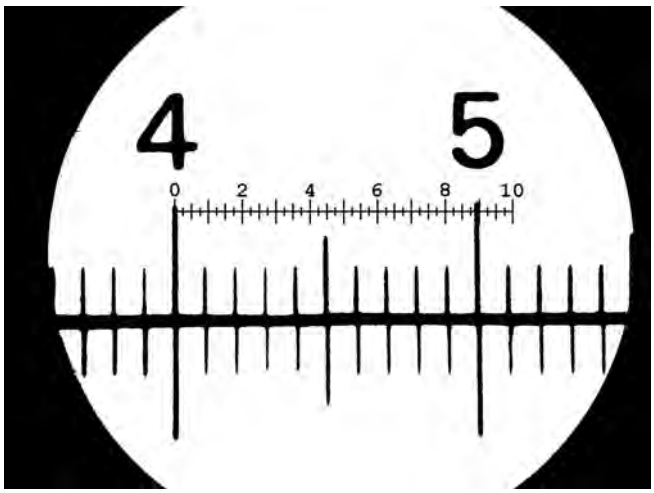


Fig. 2.3

Each division on the stage micrometer scale is 0.1 mm

Count the number of the eyepiece graticule units across the lumen of the structure in Fig. 2.2.

number of eyepiece graticule units .....

Count the number of eyepiece graticule units that match an exact number of stage micrometer scale divisions.

number of eyepiece graticule units .....

number of stage micrometer scale divisions .....

Use this information to calculate the actual width of the lumen in Fig. 2.2.

Show your working.

actual width of the lumen in Fig. 2.2. ..... [4]

(iii) Suggest how an error in measuring the width of the lumen could occur.

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.....[1]

(b) Fig. 2.1 is repeated below. Fig. 2.4 shows another transverse section through a different tubular structure from the same organism at the same scale.

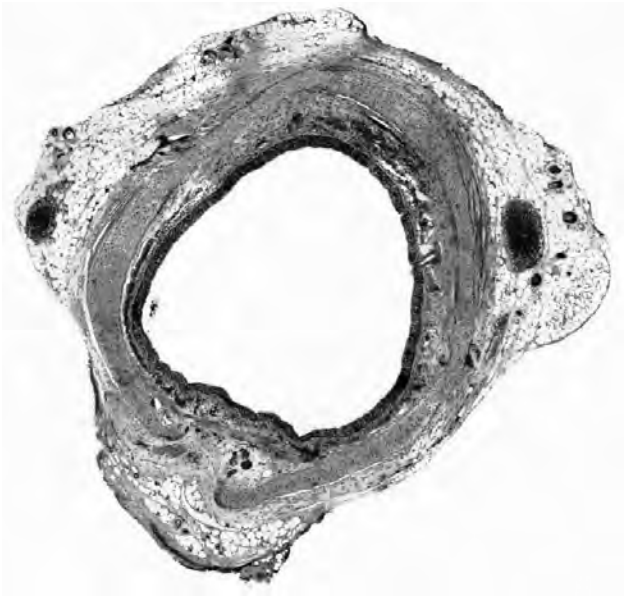


Fig. 2.1 (repeated)



Fig. 2.4

(i) Prepare the space below so that it is suitable for you to compare and contrast the specimens on Fig. 2.1 and Fig. 2.4 and then record your observations.

[5]

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(ii) Both the specimens on Fig. 2.1 and Fig. 2.4 are involved in the transport of substances.

State one observation that relates to this function.

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..... [1]

(c) Fig. 2.5 is a high power photomicrograph of part of the specimen shown in Fig. 2.1.

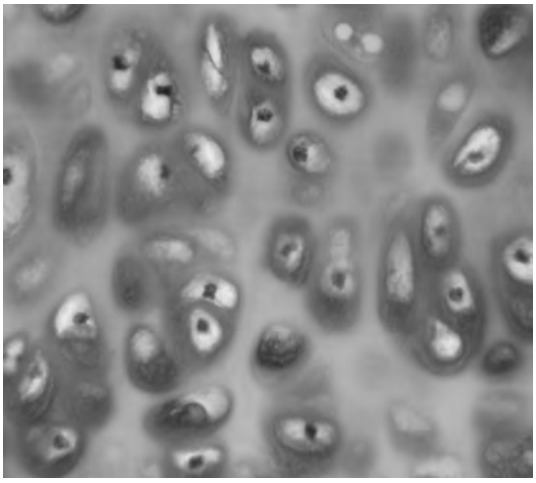


Fig. 2.5

In the space below make a labelled drawing of a group of five representative cells that are close together. On Fig. 2.5 draw a ring around the cells that you have drawn.

[4]

[Total: 19]

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1614223447

BIOLOGY **9700/32**

Paper 32 Advanced Practical Skills **October/November 2008**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the confidential instructions

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Answer **both** questions.
The number of marks is given in brackets [ ] at the end of each question or part question.
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1 You are required to investigate the effects of two solutions, **T1** and **T2**, on the cells of onion epidermal tissue.

- Solution **T1** is a 1.0 mol dm^{-3} solution of potassium nitrate.
- Solution **T2** is a 1.0 mol dm^{-3} solution of lead nitrate (**toxic**).
- Beaker **W** contains distilled water.
- Beaker **O** contains distilled water and two pieces of onion.

It is very important to stop the onion from drying out.
Place a few drops of distilled water on a microscope slide.
Remove a piece of onion and using forceps or fingers peel off the inner concave epidermis as shown in Fig. 1.1. Pull the epidermis from the top of the piece towards the tip.
Immediately place the epidermis of the onion in the distilled water on the microscope slide.

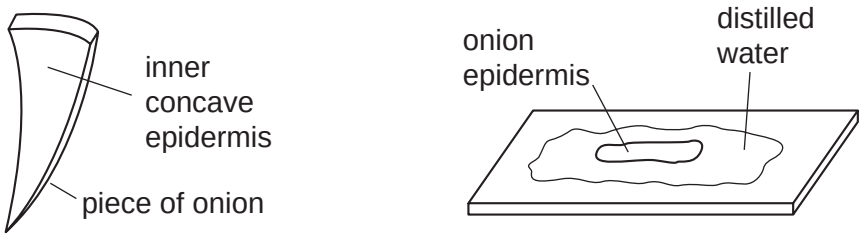


Fig. 1.1

Pour enough distilled water into the Petri dish to cover the base.
Using a scalpel carefully cut one piece of the epidermis approximately 5 mm by 5 mm and place it into the water in the Petri dish.
Repeat until you have at least 3 small square pieces of epidermis floating in the Petri dish.

Mount one of the squares of epidermis on a microscope slide in distilled water.
Cover with a cover slip and label the slide.
Repeat with two more squares of epidermis, mounting one in solution **T1** and another in solution **T2**.

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(a) (i) Using low and high power, carefully examine the onion cells in the distilled water and draw and label one cell which shows the most details of its structure.

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[2]

You may need to reduce the amount of light entering the microscope by closing the iris diaphragm or reducing the light intensity.

Then look at the onion cells in **T1** and **T2** and observe as many cells as possible. Record your observations carefully.

(ii) Prepare and use the space below to present your observations from the slides made with **distilled water**, **T1** and **T2**.

[4]

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(iii) Explain your observations from the slides made with **distilled water**, **T1** and **T2**.

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..... [3]

(iv) Identify **two** significant sources of error in the experiment.

1. .....

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2. .....

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[2]

(b) Suggest how you could modify this experiment to investigate more fully the effect of lead nitrate.

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(c) In a similar investigation involving a range of sodium chloride concentrations, a student obtained the results shown in Table 1.1.

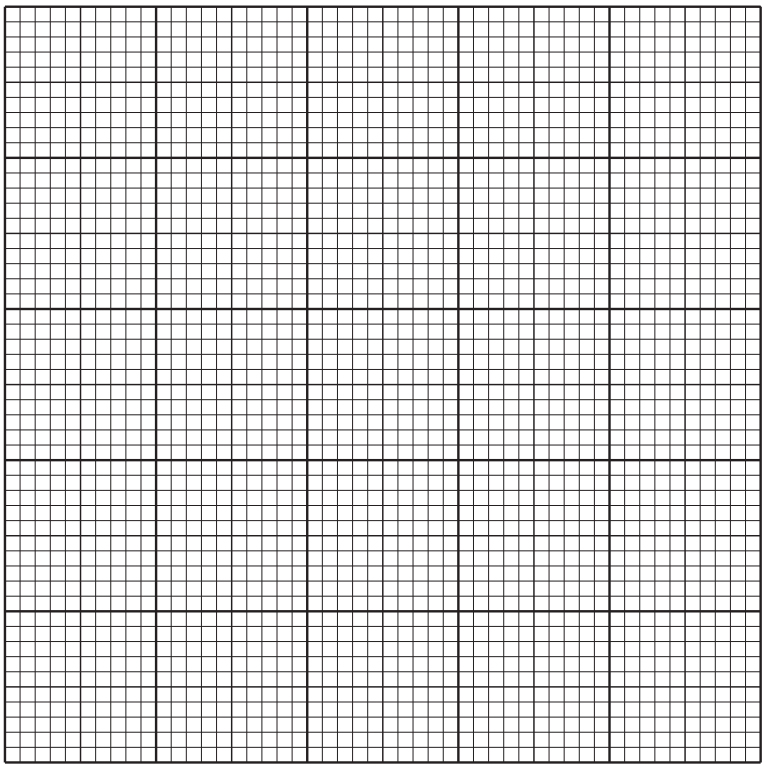
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Table 1.1

	percentage plasmolysis of cells				
sodium chloride concentration / mol dm^{-3}	batch 1	batch 2	batch 3	batch 4	mean
0	0	0	0	0	0
0.2	2	4	1	1	2
0.4	5	77	7	5	
0.6	27	25	30	28	27
0.8	76	82	84	35	
1.0	99	100	98	100	99

(i) Complete Table 1.1 by calculating the missing values taking into account any anomalous values. [1]

(ii) Plot a graph of concentration of the sodium chloride solution against the percentage plasmolysis of the cells.



[3]

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[Turn over

(iii) State the concentration at which there is 50% plasmolysis of the cells represented in Table 1.1 and your graph on Page 5.

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..... [1]

(d) The student's hypothesis was:

The more concentrated the solution the more plasmolysed the cells become.

Draw an appropriate conclusion to the student's experiment.

You should include in your conclusion whether the experimental data support the hypothesis and produce a revised hypothesis if necessary.

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..... [2]

[Total : 21]

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2 Fig. 2.1 is a photomicrograph of a transverse section of a tubular structure from an animal.

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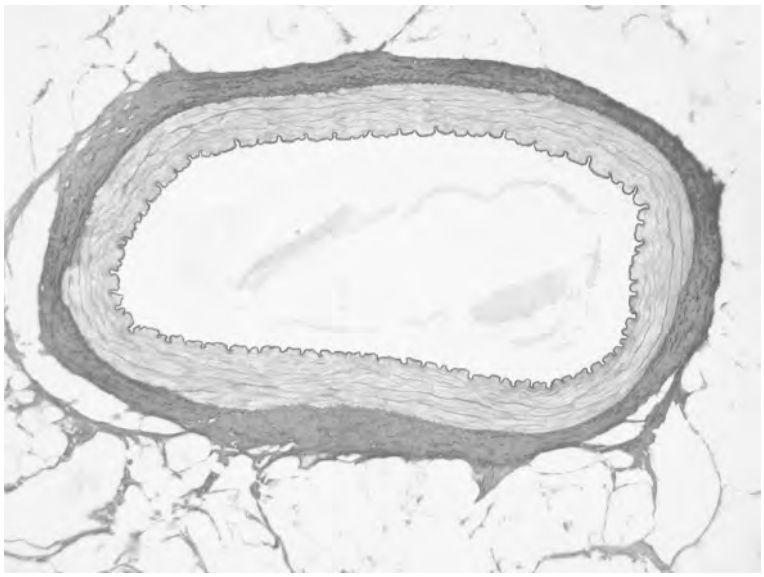


Fig. 2.1

(a) (i) Draw a large low-power plan diagram of the specimen in photomicrograph Fig. 2.1.

[4]

(ii) **Fig. 2.2** shows the same specimen as **Fig. 2.1** but it is a longitudinal section. It includes the image of an eyepiece graticule.

Fig. 2.3 shows a photomicrograph of a stage micrometer scale using the same lenses as **Fig. 2.2** and includes an image of the same eye piece graticule.

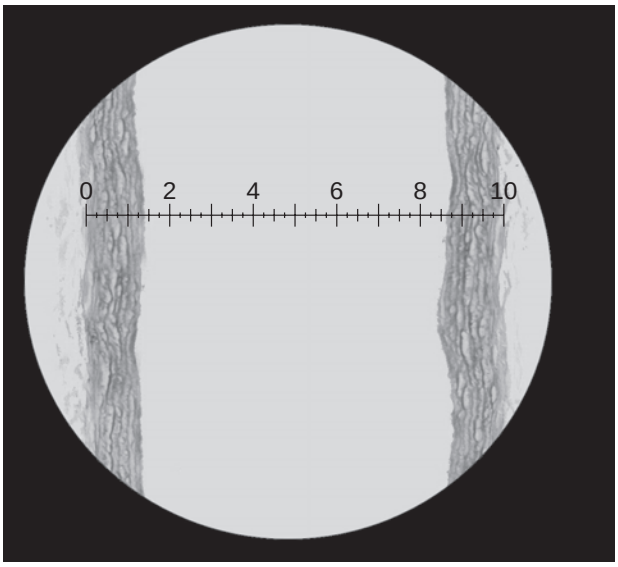


Fig. 2.2

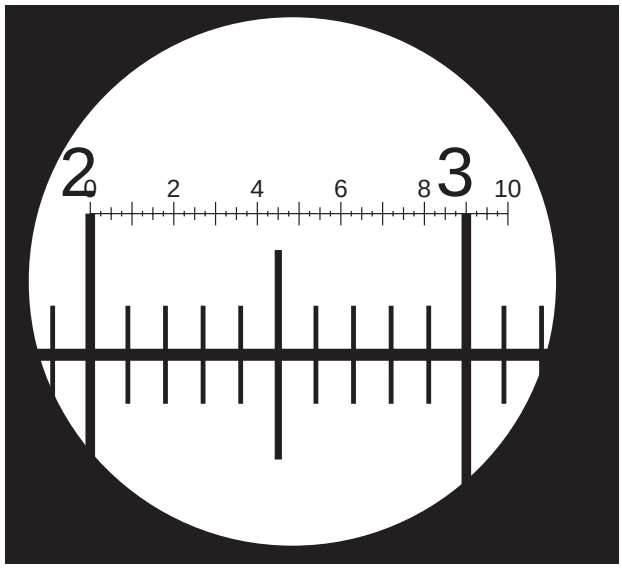


Fig. 2.3

Each division on the stage scale is 0.1 mm

Count the number of eyepiece graticule units across the lumen of the structure on Fig. 2.2.

number of eyepiece graticule units .....

Count the number of eyepiece graticule units that match an exact number of stage micrometer scale divisions.

number of eyepiece graticule units .....

number of stage micrometer scale divisions .....

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Use this information to calculate the actual width of the lumen in Fig. 2.2.

Show your working.

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actual width of the lumen on Fig. 2.2 ..... [4]

(iii) Suggest how an error in measuring the width of the lumen could occur.

.....

..... [1]

(b) The whole specimen in **Fig. 2.2** is repeated below without the graticule scale as **Fig. 2.4**.

Fig. 2.5 shows a longitudinal section of a specimen from a different type of organism. **Fig. 2.4** and **Fig. 2.5** are **not** reproduced at the same scale.

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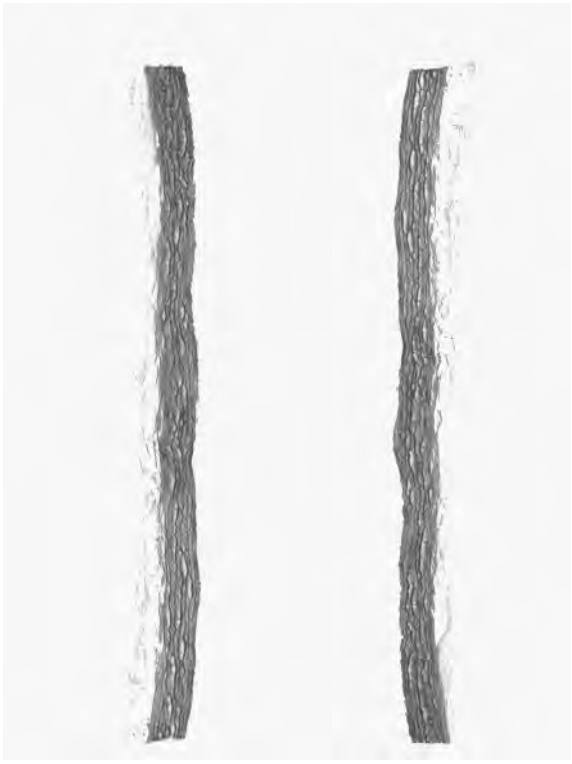


Fig. 2.4

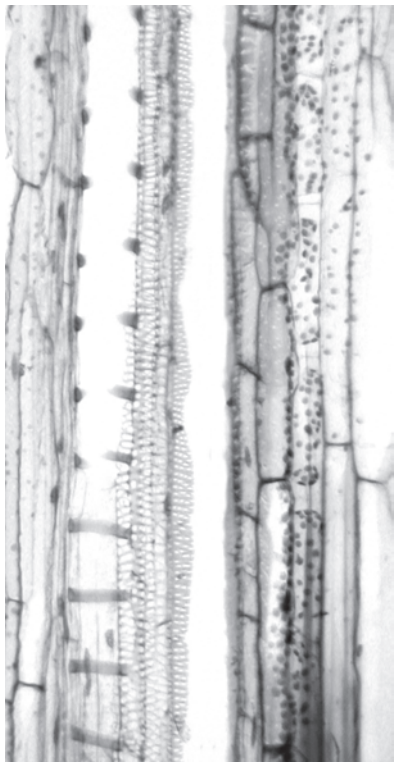


Fig. 2.5

(i) Prepare the space below so that it is suitable for you to compare and contrast the specimens in Fig. 2.4 and Fig. 2.5 and then record your observations.

[5]

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(ii) Suggest **one** feature which indicates that the specimen in Fig. 2.5 is a plant.

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.....

..... [1]

(iii) Draw **five** representative cells from Fig. 2.5 that show the diversity of cell shape and size. Please mark on Fig. 2.5 the cells that you have drawn.

[4]

[Total : 19]

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