UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8240077165

BIOLOGY **9700/31**

Paper 31 Advanced Practical Skills **May/June 2009**

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.
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 **all** questions.
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.
You are advised to spend one hour on each question.

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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 the work that you would like to do.

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You must record all your results and will not be penalised if these results are not as expected.

1 Yeast cells contain enzymes, which catalyse the breakdown of glucose to produce ethanol and carbon dioxide.
These products change the environment of the yeast cells and can affect their activity and survival.
The carbon dioxide when dissolved forms a weak acid so the more carbon dioxide that is released the more acid will be formed.

You are required to investigate the effect of different concentrations of ethanol on the activity of yeast cells by measuring the change in pH, using Universal Indicator paper.

You are provided with:

- five labelled tubes each containing 0.7 g of dried yeast
- at least 50 cm^3 ethanol, labelled **E**
- at least 100 cm^3 20% glucose solution, labelled **G**
- at least 100 cm^3 distilled water, labelled **W**

Ethanol is harmful and highly flammable. If any comes into contact with your skin, wash immediately under cold water.
It is recommended that you should wear eye protection.
Keep the ethanol covered when you are not using it.

It is important to find the pH of the glucose solution and the ethanol before starting the investigation.

Place a small piece of the Universal Indicator paper on a white tile.
Using a clean pipette, place a drop of glucose solution onto the paper.
Use the colour chart to identify the pH.
Repeat, after cleaning the pipette, to find the pH of ethanol.

(a) (i) Record the colour of the Universal Indicator paper and the pH for the glucose solution and the ethanol below.

[2]

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Clean and dry the tile.

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You are going to change the independent variable, the concentration of ethanol.

Table 1.1 shows how to make up two of the concentrations you should use.

Table 1.1

volume of distilled water / cm^3	volume of ethanol / cm^3	percentage concentration of ethanol
10	0	0
6	4	40

(ii) Using the information in Table 1.1, decide which other concentrations to make and complete Table 1.2 including the concentrations from Table 1.1.

Table 1.2

tube number	volume of distilled water / cm^3	volume of ethanol / cm^3	percentage concentration of ethanol

[3]

Tubes **1** to **5** each contain the same mass (0.7 g) of dried yeast.

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1. **Adding the water before the ethanol,** use the syringes provided to make up the ethanol concentrations in the correct tubes.

2. Use the beaker, or other container provided, to make a water bath with warm water between 45 °C and 50 °C.

3. Shake the tubes carefully to thoroughly mix the ethanol and water.

4. Place the tubes into the warm water and leave them for **at least** 5 minutes.

5. Use the marker pen provided to label the white tile as shown in Fig. 1.1.

6. Arrange two rows of small pieces of Universal Indicator paper on the white tile as shown in Fig. 1.2.

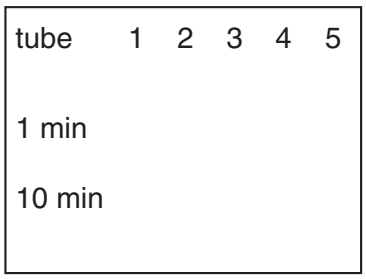


Fig. 1.1

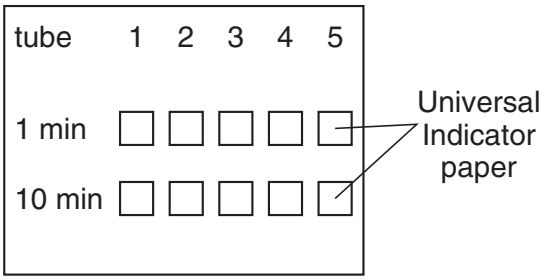


Fig. 1.2

7. After the tubes have been in the water bath for **at least five minutes** start a stopwatch or stop clock or note the time on a clock.

8. Use a clean 10 cm^3 syringe to put 10 cm^3 of the glucose solution into each tube starting with tube 1.

   Each time shake the tube well and return it to the warm water bath.

9. When the clock shows one minute, use the glass rod to remove a drop from the contents of tube 1 and place the drop onto the correct piece of Universal Indicator paper.

10. Clean the glass rod and use it to remove a drop as described in step 9 from the other four tubes.

11. When the clock shows 10 minutes, use the glass rod to take further drops as described in step 9.

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(iii) Prepare the space below, to record both the colour of each piece of Universal Indicator paper and the pH.

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[4]

(b) (i) Identify a significant source of error in this investigation.

.....

..... [1]

(ii) You used syringes to measure the volumes of ethanol and water.

State the volume of the smallest division on the syringe ……

State the degree of uncertainty …… [1]

A student decided to investigate the effect of temperature on the activity of enzymes in yeast. The student measured the activity of the enzymes by counting the number of bubbles of carbon dioxide, which were released in three minutes.

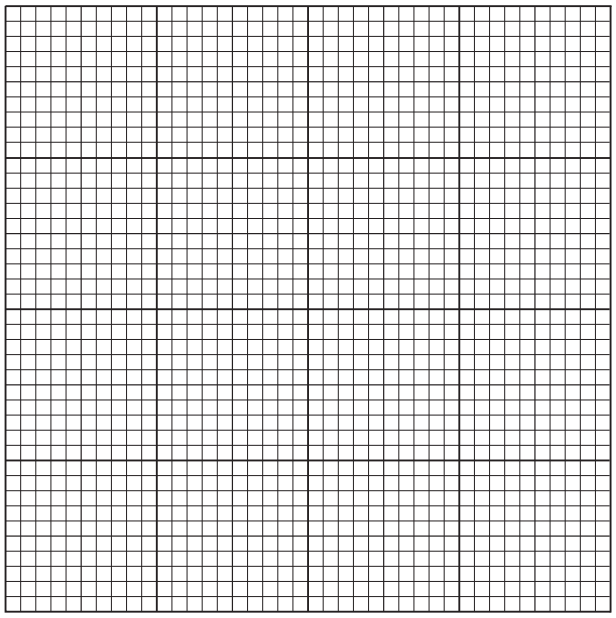
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The results of the student's investigation are shown in Table 1.3.

Table 1.3

temperature / °C	enzyme activity / mean number of carbon dioxide bubbles released per minute
15	5
20	7
30	11
35	15
40	18

(c) (i) Plot a graph of the data shown in Table 1.3.



[4]

(ii) From the graph, estimate the enzyme activity at 25 °C.

..... [1]

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(iii) Suggest how the student should make sure that the results of this investigation are as accurate as possible,

.....

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.....

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as reliable as possible.

.....

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.....

..... [3]

In carrying out this investigation the student made the hypothesis that:

The activity of the enzymes in yeast increases as temperature increases.

(d) State whether you think that this hypothesis is supported by the student's results.

Explain your answer.

.....

.....

.....

..... [2]

[Total: 21]

2 **J1** is a slide of a stained transverse section of a plant organ.

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(a) Draw a large, low power, plan diagram of a quarter of the specimen as shown in Fig. 2.1.

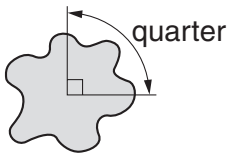


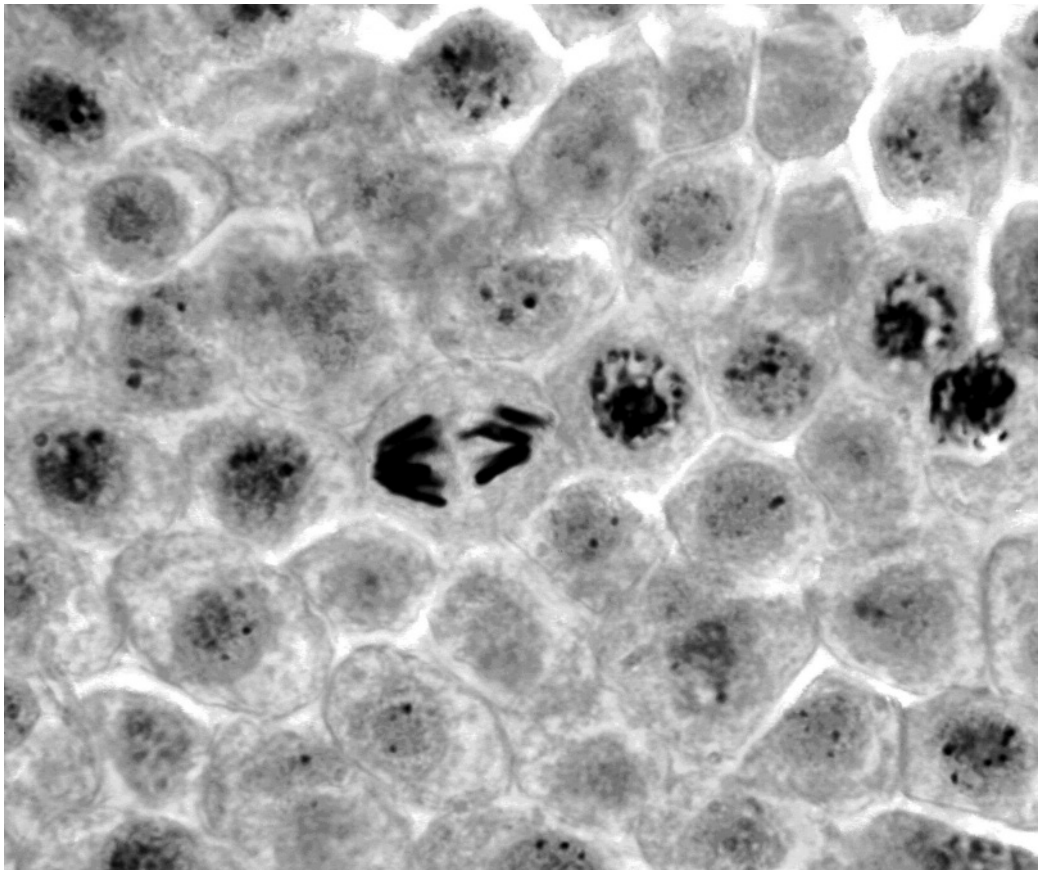
Fig. 2.1

Label the phloem and xylem in a vascular bundle.

[5]

(b) Fig. 2.2 is a photomicrograph showing some cells from a transverse section of a root viewed under high-power.

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magnification ×400

Fig. 2.2

(i) Calculate the mean width of the cells shown in Fig. 2.2 in micrometres (μm).

Mark clearly on Fig. 2.2 the cells which you used in your calculation.

Show your working.

..... μm [4]

(ii) Fig. 2.3 is an outline of a longitudinal section of a root.

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Label with a label line and the letter **X**, the area on Fig. 2.3 from which the section shown in Fig. 2.2 may have been cut.

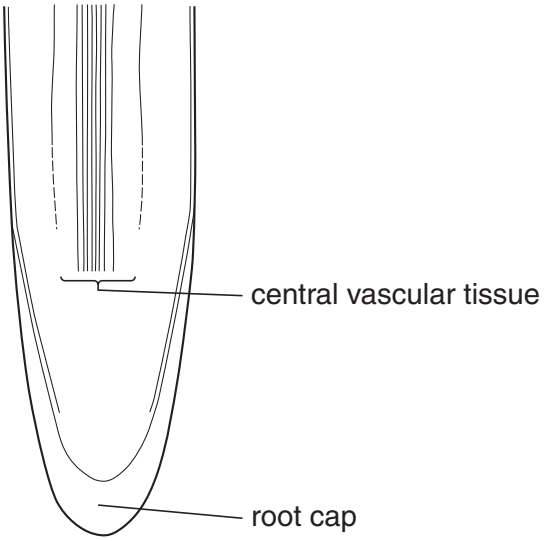
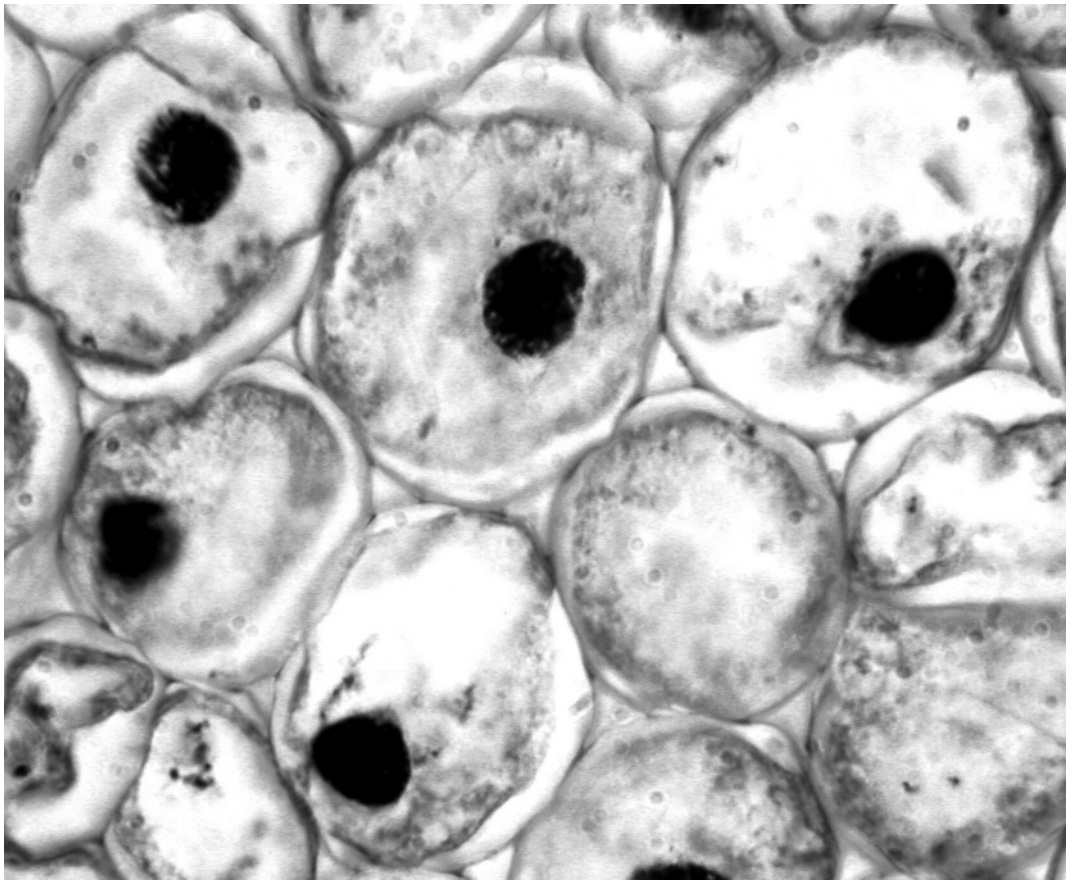


Fig. 2.3 [1]

Fig. 2.4 is a photomicrograph showing some cells from a transverse section from another part of the same root taken under high-power.



magnification ×400

Fig. 2.4

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(c) From Fig. 2.4 make a large, labelled drawing of three complete cells which are touching and include at least one cell with a nucleus.

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Show clearly on Fig. 2.4 the three cells, which you have drawn.

[5]

(d) Prepare the space below so that it is suitable for you to show the differences between the cells shown in Fig. 2.2 and Fig. 2.4.

Record your observations in the space which you have prepared.

[4]

[Total: 19]

[Paper total: 40]

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General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4059874836

BIOLOGY **9700/32**

Paper 32 Advanced Practical Skills **May/June 2009**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

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You must record all your results and will not be penalised if these results are not as expected.

1 Yeast cells contain enzymes, which catalyse the breakdown of glucose to produce carbon dioxide.

You are required to investigate the effect of different concentrations of salt on the activity of yeast cells.

You are provided with:

- at least 50 cm^3 10% salt solution, labelled **S**
- at least 100 cm^3 of an active yeast suspension in a glucose solution, labelled **Y**
- at least 100 cm^3 distilled water, labelled **W**
- 10 cm^3 syringe
- plastic pipette
- five beakers

You are going to change the independent variable, the salt concentration.

10 cm^3 of each salt concentration is mixed with 10 cm^3 of yeast suspension so this will halve the concentration of the salt when mixed with the yeast.

Table 1.1 shows how to make up two of the salt concentrations you should use.

Table 1.1

volume of distilled water / cm^3	volume of 10% salt solution / cm^3	percentage concentration of salt	percentage concentration of salt when mixed with yeast
10	0	0	0.0
5	5	5	2.5

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(a) (i) Using the information in Table 1.1, decide which other concentrations to make and complete Table 1.2 including the concentrations from Table 1.1.

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Table 1.2

beaker	volume of distilled water / cm^3	volume of 10% salt solution / cm^3	percentage concentration of salt	percentage concentration of salt when mixed with yeast

[3]

1. Use the syringe to make up the salt concentrations in the beakers.
2. Stir the yeast suspension in **Y**.
3. Clean the syringe.
4. Use the syringe to slowly pull up 10 cm^3 of the yeast suspension **Y** from below the froth.
5. Add 10 cm^3 yeast suspension to a beaker.
6. Stir well.
7. Repeat steps 2 to 6 with the other beakers.

Leave for 5 minutes.

While you are waiting, continue with steps 8 to 10.

8. Clean the syringe.

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[Turn over

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9. Use the plastic pipette to make a nozzle to fit the syringe by measuring and cutting off 3.5 cm from the end of the pipette.
The syringe, with the nozzle attached, needs to hang into a tube as shown in Fig. 1.1.

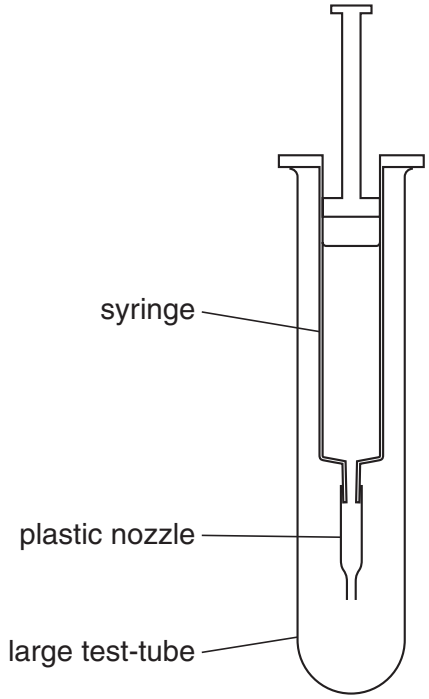


Fig. 1.1

10. Remove the nozzle.

11. Use the syringe to pull up 9 cm^3 of the mixture in the first beaker.

12. Remove the syringe from the mixture and pull the plunger up to the 10 cm^3 mark.

13. Attach the plastic nozzle firmly to the syringe and, pointing it downwards over the first beaker, push the plunger gently so that the liquid fills the nozzle.

14. Hang the syringe in the tube as shown in Fig. 1.1. Drops of yeast suspension should form at the end of the nozzle and drip into the tube.

15. Wait for two minutes.

16. After two minutes count the number of drops over a suitable time.

17. Clean the syringe.

18. Repeat steps 10 to 17 with the contents of the other beakers.

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(ii) Prepare the space below and record your results.

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[4]

(iii) Identify two of the most significant errors in the experiment.

1. .....

.....

2. .....

..... [2]

(iv) The nozzle was measured using a ruler.

State the smallest division on the ruler ……

State the degree of uncertainty in using the ruler …… [1]

(v) Suggest how you would make sure your results are

as accurate as possible,

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as reliable as possible.

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..... [3]

(b) In a similar investigation, a student made up different masses of dried yeast into a suspension with 10% glucose solution and measured the percentage of light absorbed by the suspension (absorbance %).

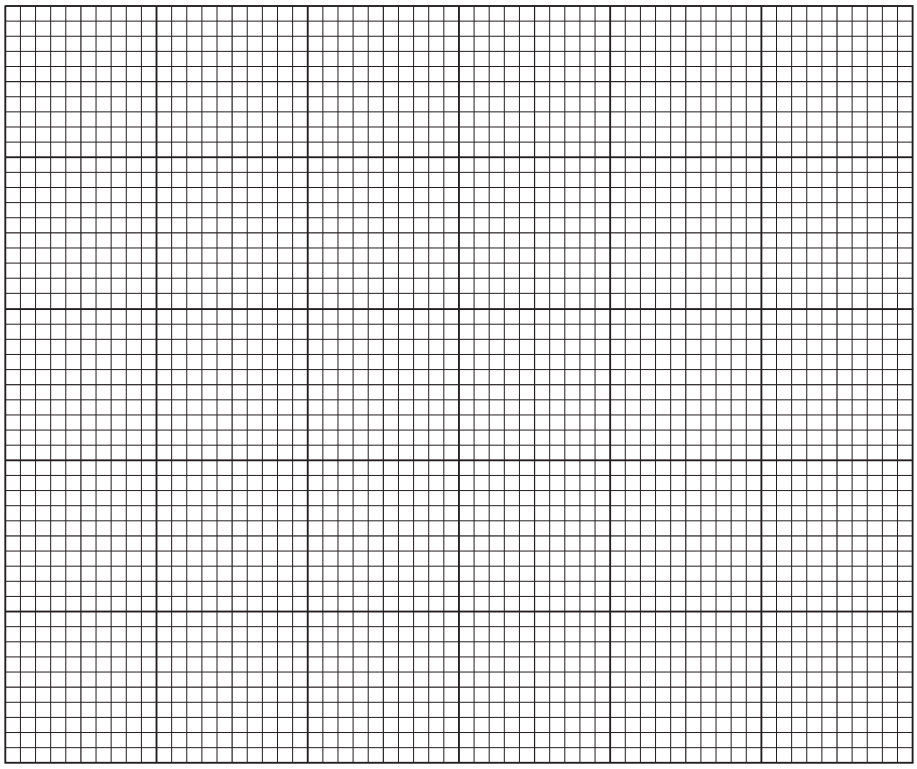
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The results of the student's investigation are shown in Table 1.3.

Table 1.3

mass of dried yeast / g $100\,cm^{-3}$ glucose solution	mean percentage absorbance
1.00	9
1.50	17
2.00	39
2.25	53
3.00	94

(i) Plot a graph of the data in Table 1.3.



[4]

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A student investigated the growth of yeast. The dry mass of 1.50 g of yeast in 100 cm^3 glucose solution has an absorbance of 17%, as shown in Table 1.3. The student measured the percentage absorbance after one day and after three days.

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The first result is shown in Table 1.4.

Table 1.4

time/ days	mean percentage absorbance	mass of dried yeast / g 100 cm^{-3} glucose solution
0	17	1.50
1	60	
3	25	

(ii) Complete Table 1.4 using the graph. [1]

(iii) Show clearly **on the graph** how you obtained the mass of dried yeast after one day and after three days.

Put your answer on the graph that you plotted. [1]

(iv) In carrying out this investigation the student made the hypothesis that:

There will be a higher mass of dried yeast after two days.

State whether you think that this hypothesis is supported by the student's results.

Explain your answer.

.....

.....

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..... [2]

[Total: 21]

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2 **K1** is a slide of a stained transverse section of a plant organ.

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(a) **(i)** Draw a large, low power plan diagram of one end of the specimen on **K1** as shown in Fig. 2.1.

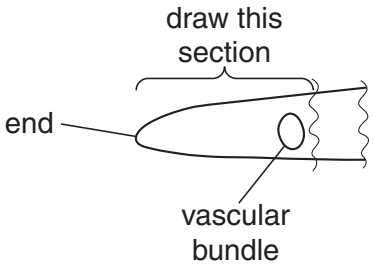


Fig. 2.1

Annotate your drawing to describe the visible appearance of **two** tissues.

[6]

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(ii) Make a large, labelled, high-power drawing of two epidermal cells and the cells which form the layer inside touching these two cells.

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You should draw the epidermal cells from the region shown in Fig. 2.2.

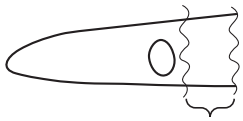


Fig. 2.2

[5]

(b) Fig. 2.3 shows a stage micrometer viewed through a microscope on a power of ×40 with an eyepiece graticule.

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Each division on the stage micrometer is 100 μm (0.1 mm).

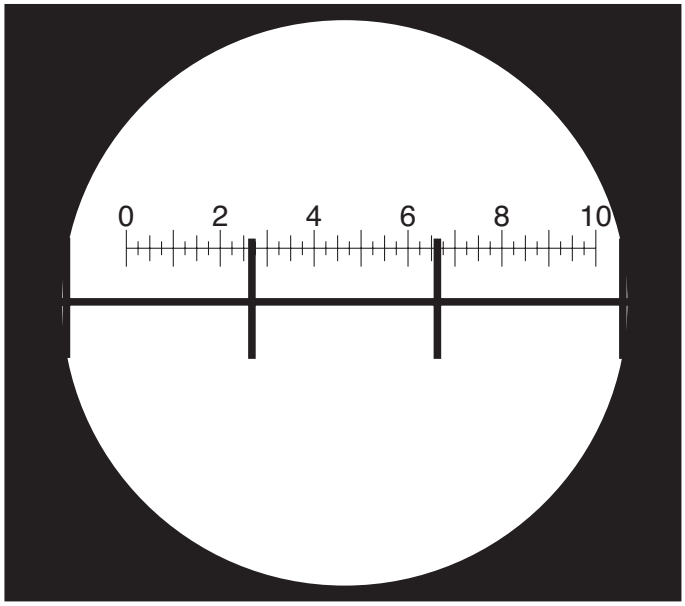


Fig. 2.3

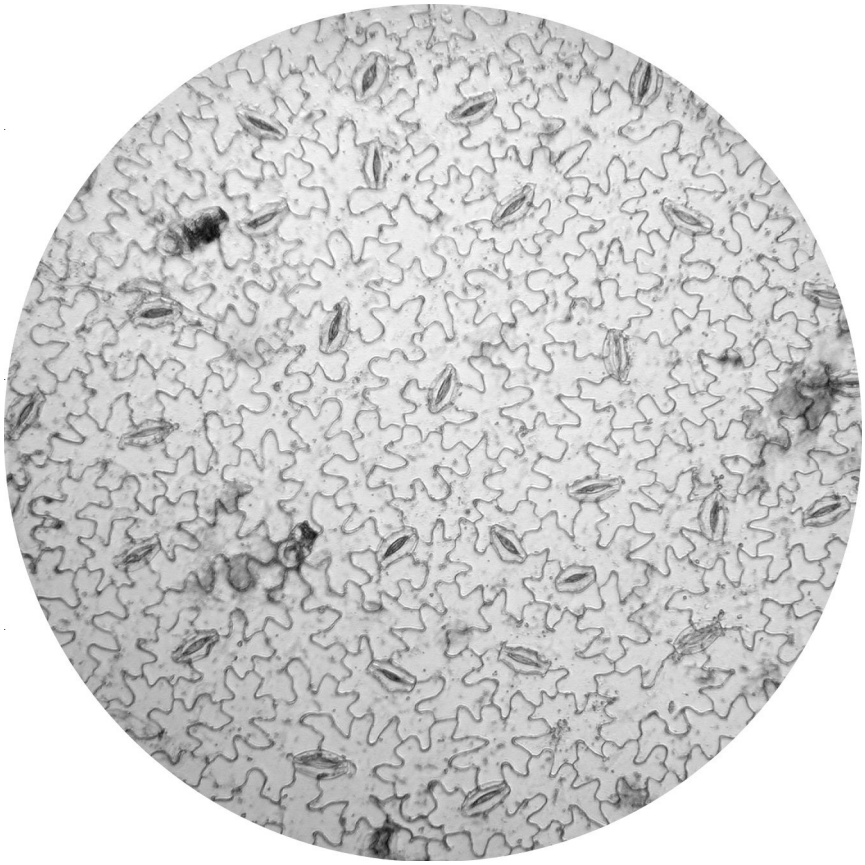
Using the formula for the area of a circle πr^2 where $\pi = 3.14$ and r is the radius of the field of view, calculate the area of the field of view. Show your working.

area of field of view ..... mm^2

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Fig. 2.4 is a photomicrograph of the lower surface of a leaf, with the same field of view as in Fig. 2.3.

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magnification ×100

Fig. 2.4

Count and record the number of stomata in the field of view.

Mark on Fig. 2.4 the stomata counted.

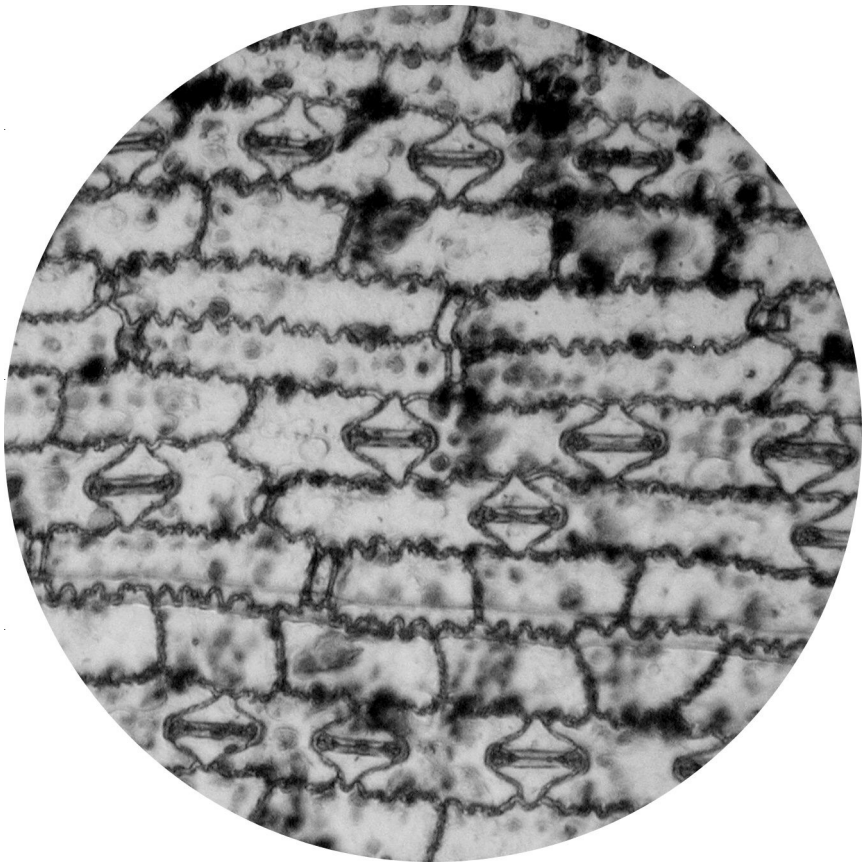
Calculate the number of stomata per mm^2.

..... mm^{-2} [5]

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(c) Fig. 2.5 is a photomicrograph of the lower surface of a different leaf.

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magnification ×100

Fig. 2.5

Prepare the space below so that it is suitable for you to show the difference between the surfaces of the leaves shown in Fig. 2.4 and Fig. 2.5.

Record your observations in the space which you have prepared.

[3]

[Total: 19]

[Paper total: 40]

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