

GCSE Biology B (Twenty First Century Science)
J257/04 Depth in biology (Higher Tier)

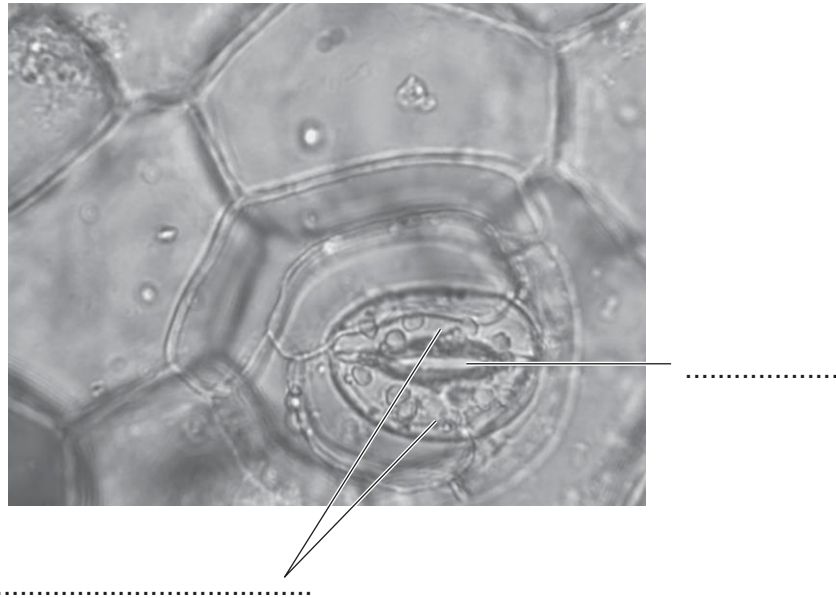
Question Set 9

1 Ling and Kai are investigating the stomata of plant leaves.

(a) (i) Ling wants to work out the size of one stoma (one of the stomata of a leaf).

She uses a light microscope to look at the underside of a leaf.

She uses a camera attached to the microscope to take a photograph.



Complete the labelling of the photograph.

[1]

(ii) The length of the stoma in Ling's photograph is 15 mm.

The photograph has a magnification of $\times 400$.

Calculate the length of the original stoma.

Give your answer in standard form.

Length = mm [2]

(b) Kai wants to work out how many stomata are found in each mm² of the leaf's surface.

- He paints clear nail varnish onto a small area of the underside of a leaf.
- When the varnish has dried he peels it off using clear sticky tape.
- He sticks the tape onto a microscope slide.

Kai will use a light microscope to count the impressions of stomata in the varnish. Here is his planned method.

1. Clip the slide on the stage.
2. Rotate the objective lens until it clicks into position above the slide.
3. Place the microscope in direct sunlight and look into the eyepiece lens. Adjust the mirror until the image is as bright as possible.
4. Look into the eyepiece lens and use the coarse focus to move the objective lens towards the slide until the image is in focus.
5. Use the fine focus to move the objective lens away from the slide until the image is as sharp as possible.

Fig. 4.1 shows the light microscope Kai uses.

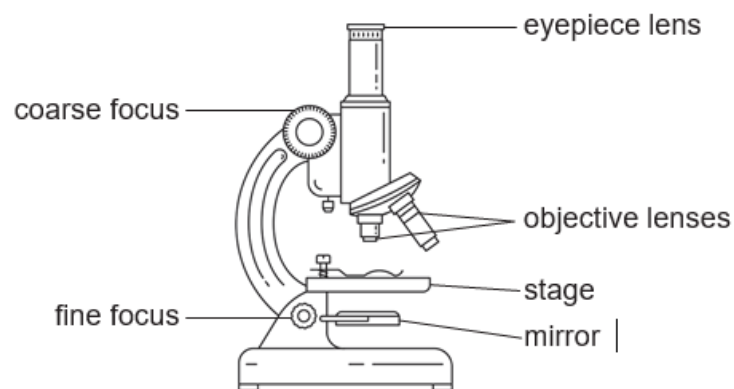


Fig. 4.1

(i) Write down the numbers of **two** steps in Kai's method that have a high risk of causing damage to Kai or the apparatus.

For each of these steps, explain why it is dangerous **and** suggest how to reduce the risk.

[4]

(ii) Kai sets up the microscope using a safer method provided by his teacher.

He puts a clear plastic ruler on the stage.

He uses the microscope to look at the millimetre markings on the ruler.

Fig. 4.2 shows what he sees.

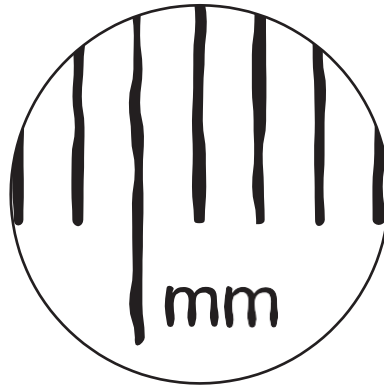


Fig. 4.2

In **Fig. 4.2** the distance between each marking is 1 mm.

Calculate the area of the field of view.

In your calculation, assume $\pi = 3.14$.

Give your answer to **3** significant figures.

Area = mm²

[3]

- (iii) Kai removes the ruler from the stage and replaces it with the slide showing stomata.

He makes no other changes to the microscope. **Fig. 4.3** shows what he sees.

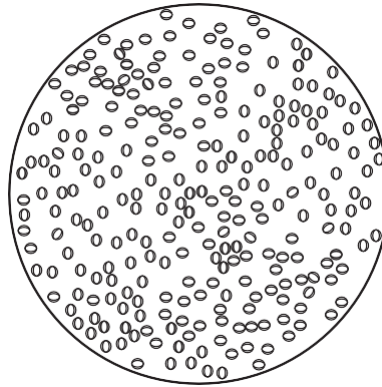


Fig. 4.3

Kai counts 255 stomata in the field of view.

Estimate the density of stomata (how many are found in each mm^2) in this field of view.

Density = stomata per mm^2 [1]

- (iv) Suggest why the density of stomata in this field of view may **not** be the same as the density of stomata over the whole leaf surface.

- (c) Explain the advantages **and** disadvantages for a plant of opening its stomata. [2]
[4]

Total Marks for Question Set 9: 16

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