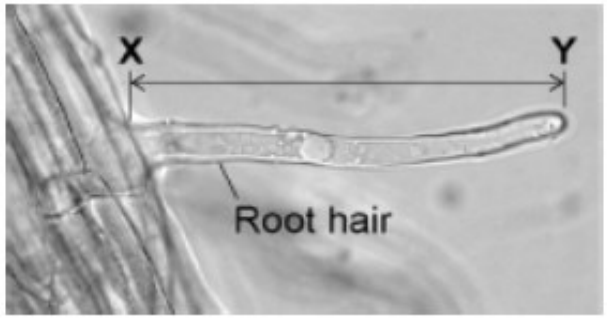
Cell Biology: Magnification Calculation

Exam Question:

The diagram below shows a root hair viewed using a microscope.:



The root hair was viewed at a magnification of ×50

The image length of the root hair **X–Y** is 43 mm

Calculate the real length of the root hair in micrometres (µm).

[4 marks]

So what do we know from reading the question?

Magnification = x50

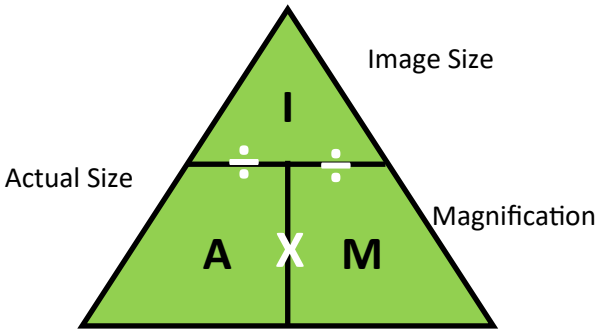
Image size = 43mm

We need to calculate the real length (the actual size)

We will need to make sure our answer is given in µm

Now, what do we need to know?

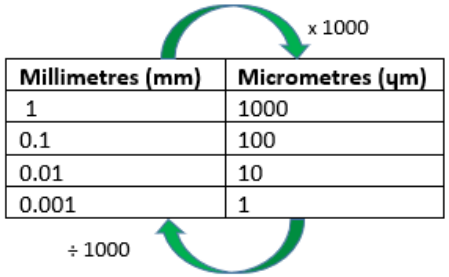
The microscopy calculation



Magnification = image size / actual size

Image size = actual size X magnification

Actual size = image size / magnification



Millimetres (mm)	Micrometres (µm)
1	1000
0.1	100
0.01	10
0.001	1

1 millimetre (mm) = 1/1000 m or 10^{-3} m

1 micrometre (µm) = 1/1000 mm or 10^{-3} mm or 10^{-6} m

1 nanometre (nm) = 1/1000 µm or 10^{-3} µm or 10^{-9} m

Model Answer

Step One: Place the given values into the equation:

$50 \times \frac{43}{\text{actual size}}$ [1 mark]

Step Two: re-arrange the formula to make *'actual size'* the focus of the equation:

$\text{Actual size} = \frac{43}{50}$ [1 mark]

$= 0.86\text{mm}$ [1 mark]

Step Three: convert the units from mm to µm by multiplying by 1000: $0.86 \times 1000 = 860\ \mu m$

[1 mark]

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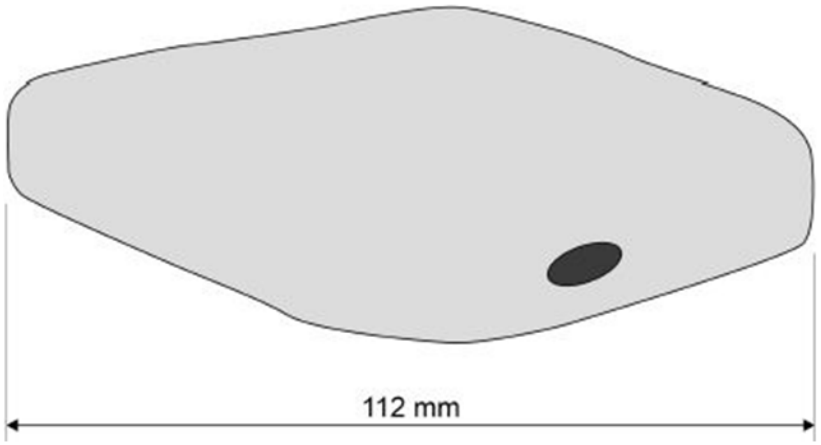
Exam Question

The figure below shows a drawing of a cell observed under a light microscope.

Figure 3



The real length of the cell was 280 micrometres (μm).

Calculate the magnification of the drawing.

[3 marks]