

# Microscopy Magnification

GCSE Biology · Written to the shared content for AQA, Edexcel and OCR

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

## 1. Worked example

**A microscope has a  $\times 10$  eyepiece lens and a  $\times 40$  objective lens. Calculate the total magnification. (1 mark)**

Step 1 · Multiply the two lenses

$$10 \times 40 = 400$$

**Answer:  $\times 400$**

Check: Lens magnifications multiply; they do not add.

## 2. Now try one with the steps

**A cell is  $50 \mu\text{m}$  long. Its image in a textbook is  $25 \text{ mm}$  long. Calculate the magnification. (2 marks)**

Step 1 · Same units

Step 2 ·  $M = I \div R$

**Answer:**

## 3. Practice

Show your working. The marks tell you how much is expected.

**1.** Write the equation that links magnification, image size and real size. [1]

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**2.** Calculate the total magnification with a  $\times 10$  eyepiece and a  $\times 10$  objective lens. [1]

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**3.** Name the stain used to make onion cell nuclei easier to see. [1]

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**4.** State which type of microscope has the higher resolution. [1]

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5. An image is 40 mm long. The real object is 0.1 mm long. Calculate the magnification. [2]

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6. Define the term resolution. [1]

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7. An image is 18 mm long at a magnification of  $\times 300$ . Calculate the real size in  $\mu\text{m}$ . [3]

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8. A cell is 8  $\mu\text{m}$  wide and is viewed at  $\times 1500$ . Calculate the image width in mm. [2]

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9. A scale bar labelled 10  $\mu\text{m}$  is 20 mm long on a photo. Calculate the magnification of the photo. [2]

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10. Explain how electron microscopes have increased our understanding of cells. [2]

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11. Give one disadvantage of an electron microscope compared with a light microscope. [1]

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12. An image is  $3.6 \times 10^{-2}$  m long and the real object is  $1.2 \times 10^{-5}$  m long. Calculate the magnification. [2]

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13. A structure is magnified  $2.5 \times 10^3$  times and its image is 5 mm long. Calculate its real length in  $\mu\text{m}$ . [2]

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14. Describe how to prepare a slide of onion epidermis cells to view under a light microscope. [4]

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15. Explain why you should start with the lowest-power objective lens when focusing.

[2]

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#### 4. Before you hand it in

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##### **Dividing 25 mm by 50 $\mu\text{m}$ and getting $\times 0.5$**

Convert both lengths to the same unit (usually  $\mu\text{m}$ ) BEFORE dividing. 1 mm = 1000  $\mu\text{m}$ .

##### **Adding lens powers: $\times 10$ and $\times 40$ gives $\times 50$**

Total magnification = eyepiece  $\times$  objective =  $10 \times 40 = \times 400$ .

##### **"An electron microscope magnifies more, so it has better resolution."**

Resolution is the ability to see two close points You can magnify a blurry image like without gaining detail.

##### **Giving magnification a unit, e.g. '500 mm'**

Magnification has no units. Write  $\times 500$ .