

# EB Education Revision Guide



## How to work with Microscopes

# What is a microscope

## What is it?

We use microscopes to make small images look bigger. Lenses of different **magnifications** are used to increase size.

Microscopes also increase the resolution of images. **Resolution** is the ability to distinguish between two points. The higher the resolution is, the clearer and more detailed the image will be.

## Different types of microscope

- Light microscopes

These are the microscopes you use in school. They use light and lenses to magnify the specimen. You can see individual cells and organelles such as nuclei and chloroplasts. They can also be used to observe living specimens.

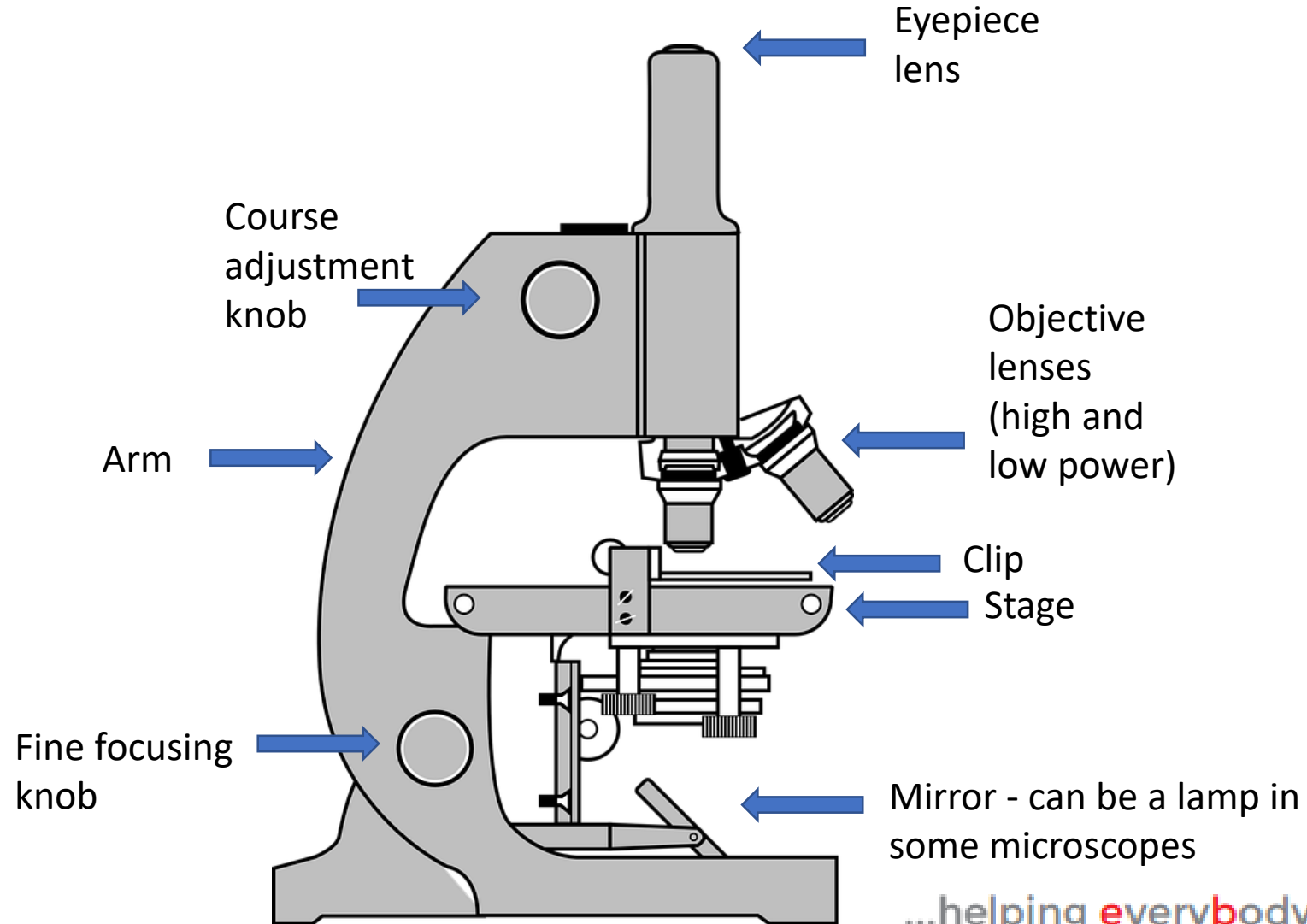
- Electron microscopes

These are much larger and use electrons to form images. They have a much higher magnification and resolution than light microscopes. This means much smaller sub-cellular structures can be seen in detail. However they cannot be used to observe living specimens.



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# Light Microscope



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# How to use a Light Microscope

## How to set up your slide

- Use a thin slice of your specimen to allow light to get through.
- Using a pipette, place a drop of water onto a slide to keep the specimen in position and then place the specimen onto the slide using tweezers.
- To make the specimen easier to see, add a drop of coloured stain to it.
- Place a cover slip carefully onto the slide, making sure no air bubbles are trapped underneath, and secure the slide on the stage with a clip.

## How to use the microscope?

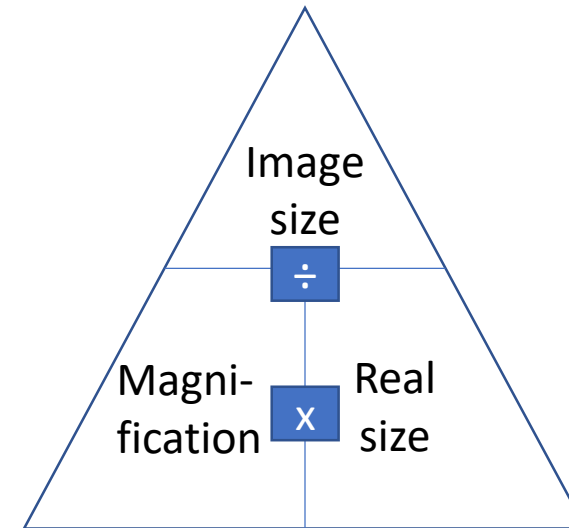
- Using the lowest-powered objective lens, move the stage up to just below the lens using the course adjustment knob.
- Look through the eyepiece, and move the stage down carefully until the specimen is almost in focus.
- Using the fine adjustment knob focus until you can see a clear image.
- To see your specimen at a higher magnification, change to a higher-powered magnification lens.

# Magnification

## Using the formula

$$\text{Magnification} = \frac{\text{image size}}{\text{real size}}$$

To rearrange the formula – put your thumb over what you are trying to find – and you will see the formula you need to use.

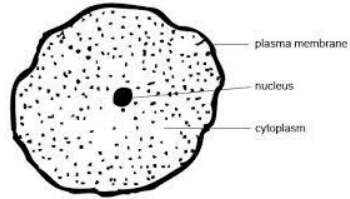






# Your turn:

3a) The diagram below shows an animal cell. This image is using a 10x eye piece and a 50x objective lens. Calculate the total magnification



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b) A cell was observed using an electron microscope. Magnification was x 100 000. The image size was 35mm.

Calculate the actual size of the cell, and give your answer in micrometres

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4a) Explain what resolution means

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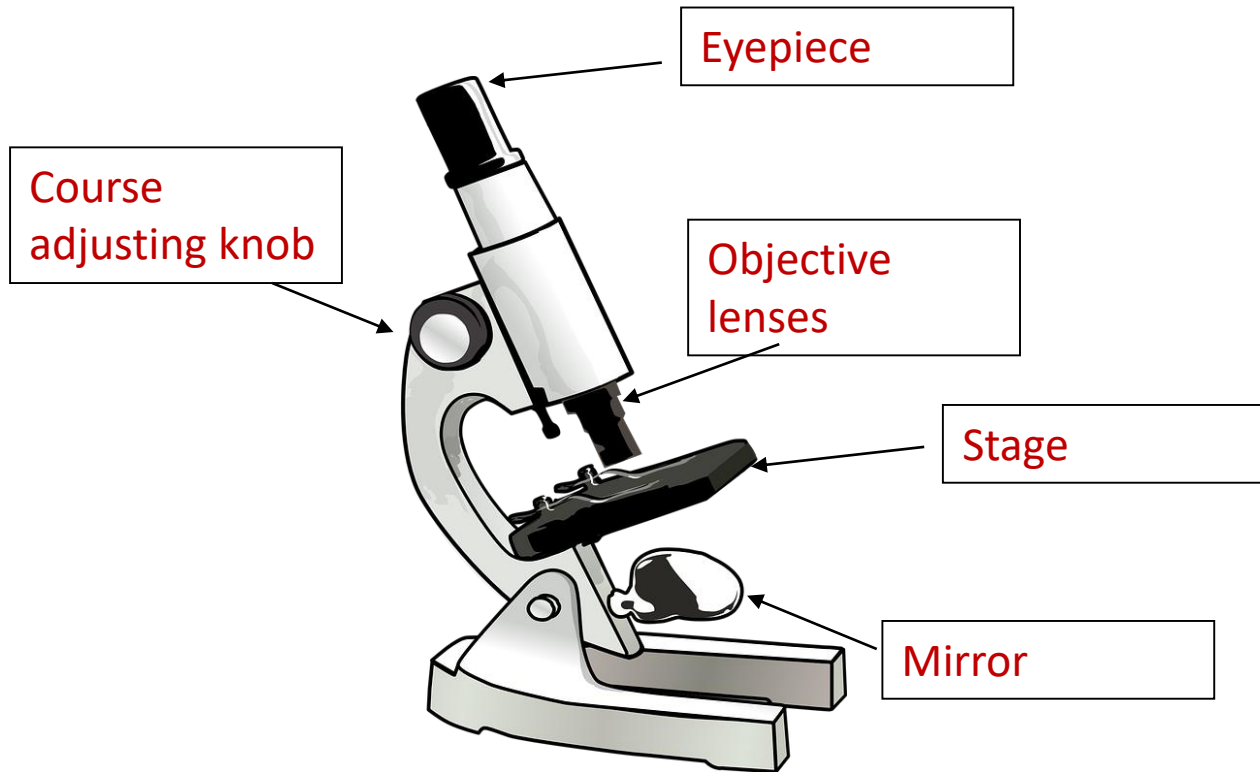
b) Why has the development of the electron microscope provided us with a better understanding of the function of subcellular structures?

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# Answers:

1. Label the light microscope below.



2. Discuss the advantages of light and electron microscopes.

Electron microscopes have

- Higher resolution
- Higher magnification
- Can be used to examine sub-cellular structures in more detail

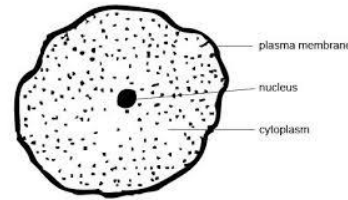
Light microscopes

- Can be used to examine living cells
- Are cheaper and can be transported easily



# Answers:

3a) The diagram below shows an animal cell. This image is using a 10x eye piece and a 50x objective lens. Calculate the total magnification



$10 \times 50 = 500$

b) A cell was observed using an electron microscope. Magnification was x 100 000. The image size was 35mm.

Calculate the actual size of the cell, and give your answer in micrometres

$Real\ size = 35 / 100\ 000 = 0.00035$

$0.00035\ mm \times 1000 = 0.35\ \mu m$

4a) Explain what resolution means

Resolution is the ability to distinguish between two separate points

b) Why has the development of the electron microscope provided us with a better understanding of the function of subcellular structures?

Electron microscopes have a higher magnification and a higher resolution which means structures can be seen in more detail. Smaller organelles and cross sections of cells can be seen more clearly

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