Combined Science - Biology - KS4
Cell Biology

Microscopes, Magnification and Resolution

(Downloadable student document)

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Quick recap: millimetres and micrometres

Quick concept check:

Express the following in standard form.

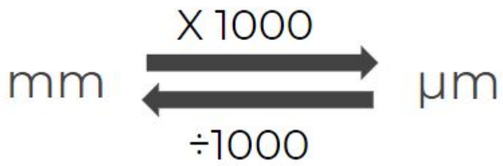
1. 10mm = 1×10^{4} **µm**

1. 60µm = 6×10^{-2} **mm**

Quick concept check:

Express the following in standard form.

1. 10mm = __?__ µm



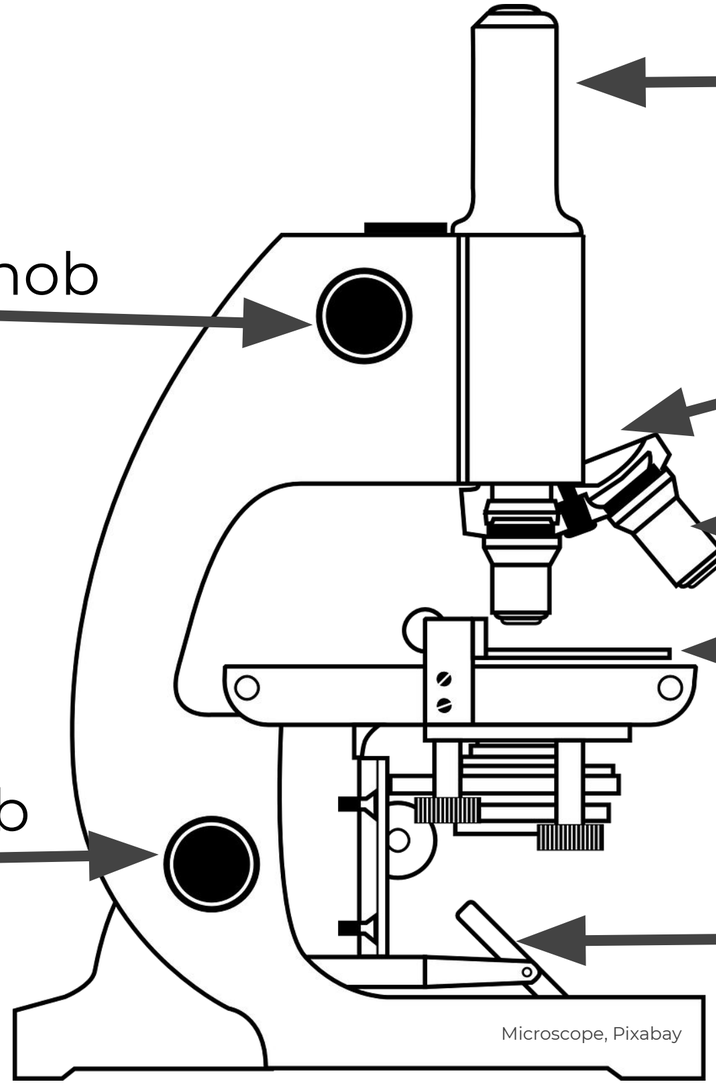
1. 60µm = __?__ mm

Observing cells using a microscope

The need for microscopes

Why do we need to wash our hands using soap often?

Structure of a microscope



Eyepiece lens (10x)

Coarse focus knob

Nosepiece

Objective lens (10x, 20x, 40x)

Stage

fine focus knob

Mirror/ light

Remember the structures and their functions.

How to view a specimen using a microscope?

Make sure the objective lens with the lowest magnification is in use.

Put the specimen on the stage.

Turn the coarse focus knob to manually focus the image.

Switch to an objective lens with a higher magnification.

Use the fine focus knob to focus the image under the microscope.

Multiple choice quiz on the parts of microscopes

Pick the best answer for each of the questions below.

Multiple choice quiz

Where do we place the specimen onto the microscope?

- Coarse focus knob
- Stage
- Fine focus knob
- Objective lens

Multiple choice quiz

Where do we place the specimen onto the microscope?

Coarse focus knob

Stage

Fine focus knob

Objective lens

Multiple choice quiz

Which of the below should I use to focus the image at a low magnification?

Coarse focus knob

Stage

Fine focus knob

Objective lens

Multiple choice quiz

Which of the below should I use to focus the image at a low magnification?

Coarse focus knob

Stage

Fine focus knob

Objective lens

Multiple choice quiz

Which of the below should I use to focus the image at a high magnification?

- Coarse focus knob
- Stage
- Fine focus knob
- Objective lens

Multiple choice quiz

Which of the below should I use to focus the image at a high magnification?

Coarse focus knob

Stage

Fine focus knob

Objective lens

Multiple choice quiz

Which of the below comes in three different magnification on the microscope?

Coarse focus knob

Eyepiece lens

Fine focus knob

Objective lens

Multiple choice quiz

Which of the below comes in three different magnification on the microscope?

Coarse focus knob

Eyepiece lens

Fine focus knob

Objective lens

Multiple choice quiz

Which of the below comes in only one magnification on the microscope?

- Coarse focus knob
- Eyepiece lens
- Fine focus knob
- Objective lens

Multiple choice quiz

Which of the below comes in only one magnification on the microscope?

Coarse focus knob

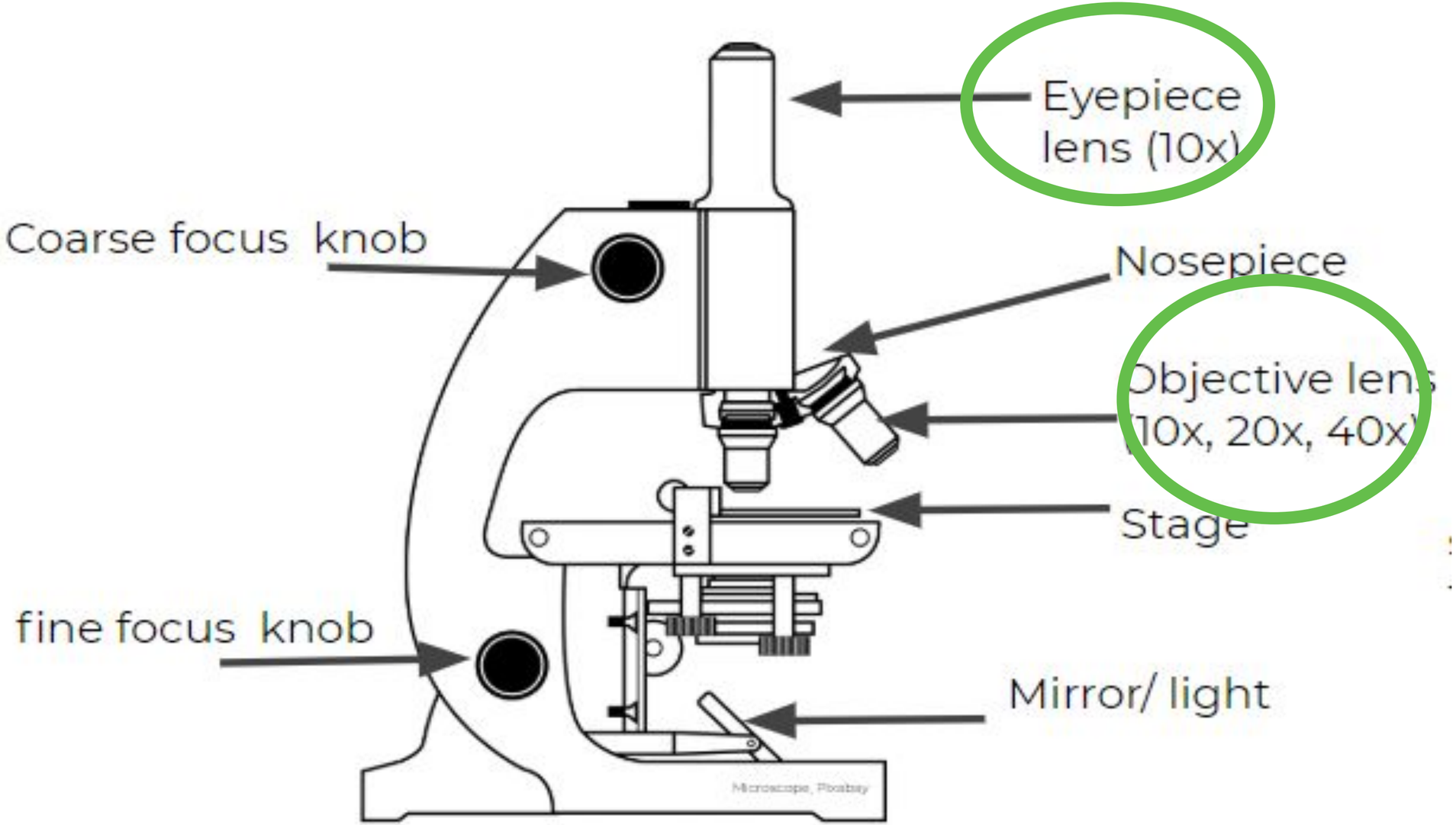
Eyepiece lens

Fine focus knob

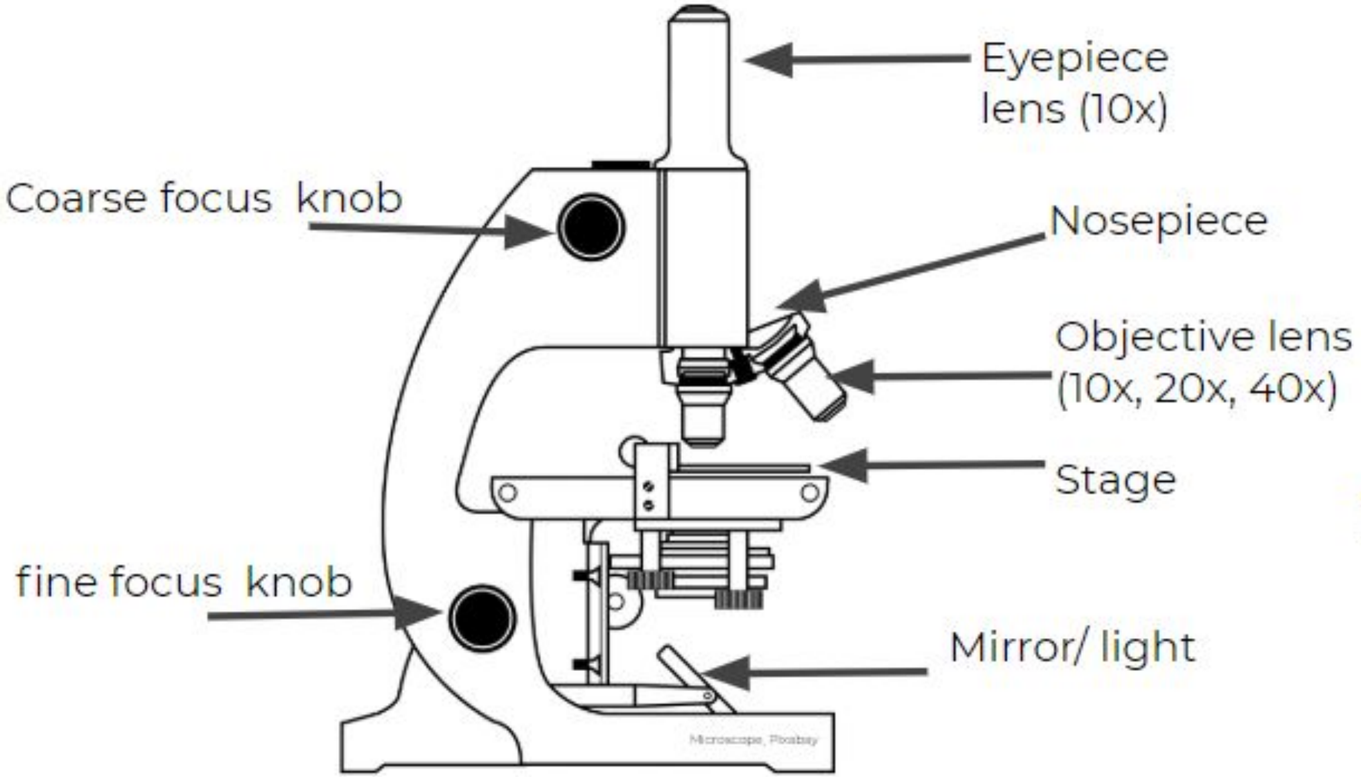
Objective lens

Finding the magnification

The two lenses that magnifies the cell



Finding the total magnification

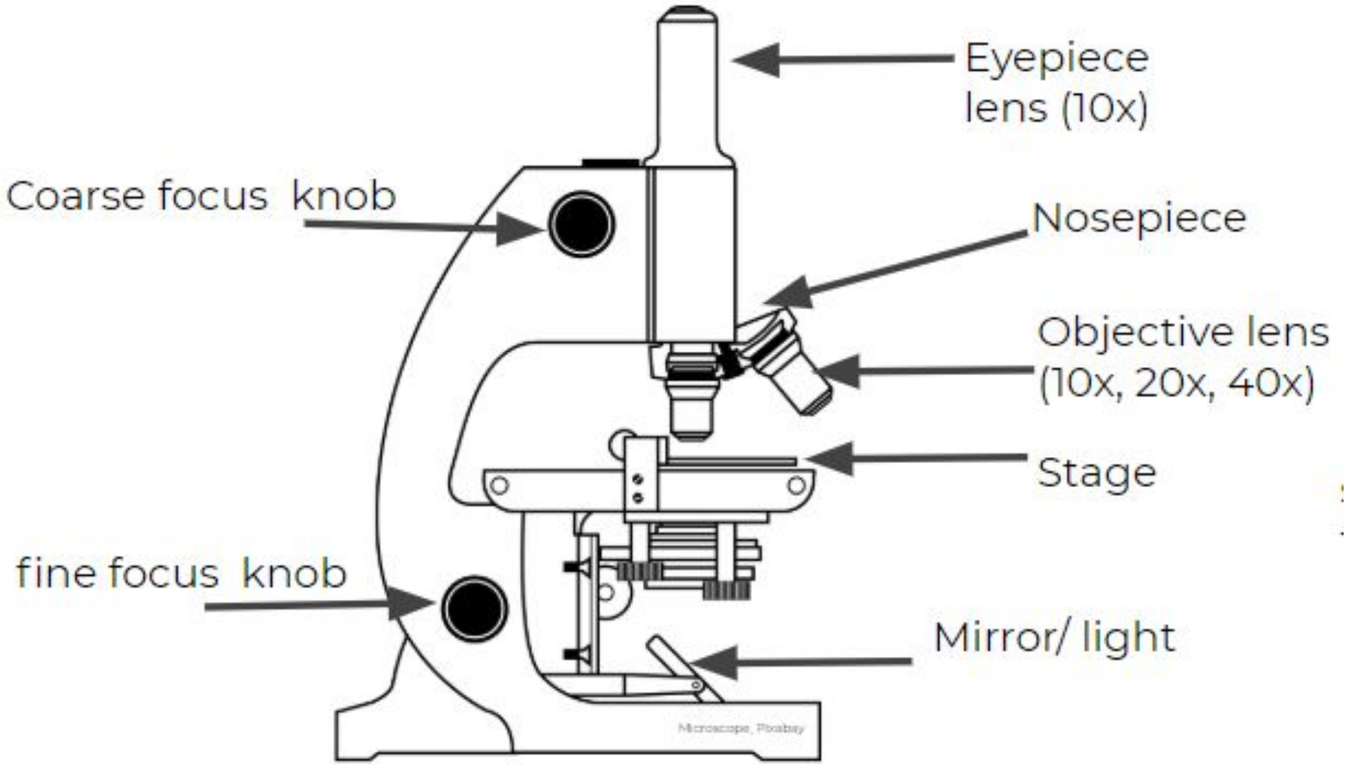


For example,

When the objective lens of 10x magnification is in use, the total magnification will be:

10 x10
=100x

Finding the total magnification

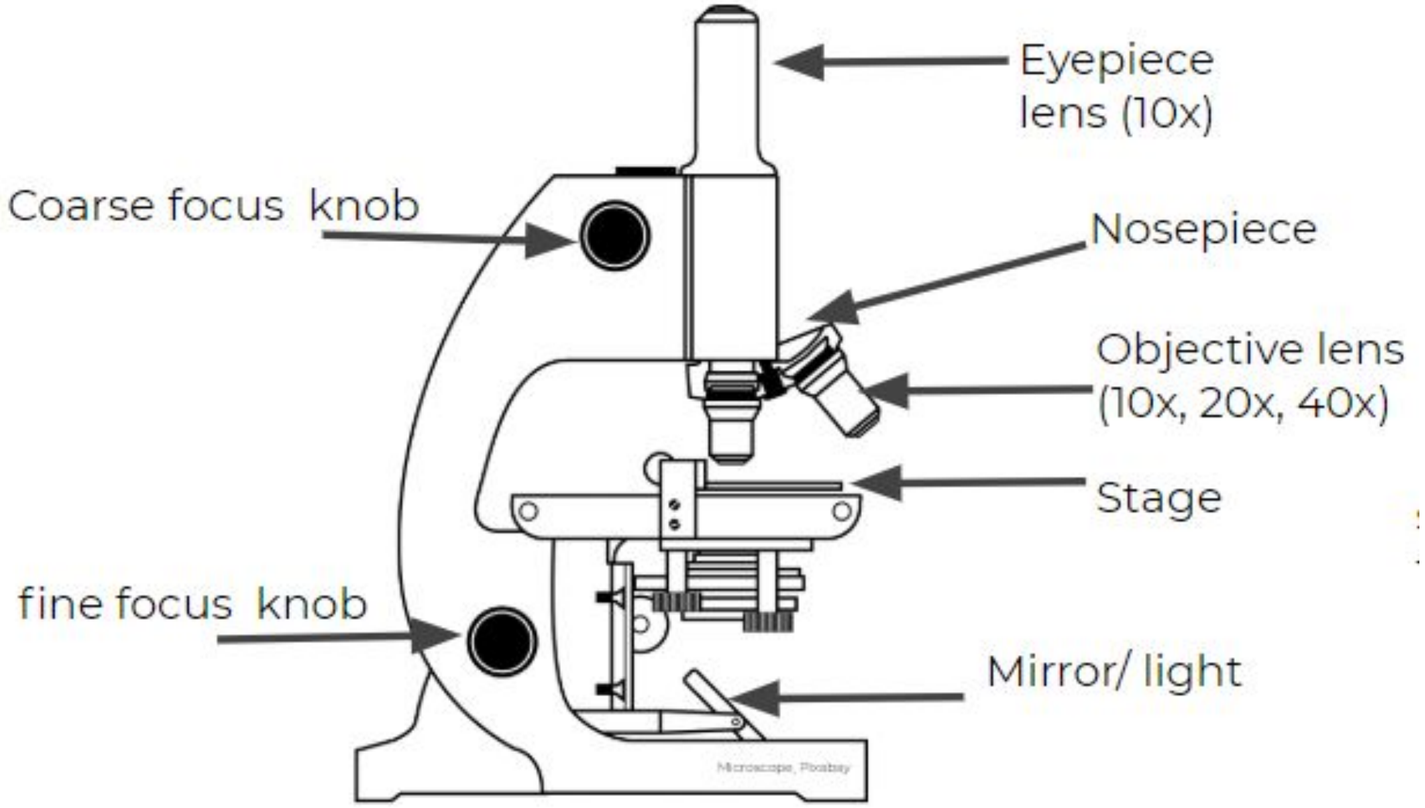


Let’s try this one

When the objective lens of 20x magnification is in use, what is the total magnification?

10 x 20
=200x

Finding the total magnification



When the objective lens of 40x magnification is in use, what is the total magnification?

10 x 40
= 400x

What is the total magnification?

There is a microscope. The eyepiece lens has a magnification of 5x.
A student was using the objective lens of the highest power at 40x. What is the total magnification?

What is the total magnification?

There is a microscope. The eyepiece lens has a magnification of 5x.
A student was using the objective lens of the highest power at 40x. What is the total magnification?

5 x 40 = 200x

Types of microscopes and their differences

Resolution

Resolution is the ability to distinguish between two points on an image, i.e. the amount of detail.

Comparison of electron and light microscope

Resolution	Colour	Magnification
The electron microscope image shows more details so it has a higher resolution.	Light microscope has colour but the electron microscope is monochromatic.	Electron microscope images are more highly magnified.

Answer the true or false questions below.

1. **True or false: the higher the magnification, the higher the resolution.**
2. **True or false: the light microscope provide images of cells with colours.**
3. **True or false: turning the fine focus on the light microscope can increase the resolution.**

Answer the true or false questions below.

1. **True or false: the higher the magnification, the higher the resolution.** **False**
2. **True or false: the light microscope provide images of cells with colours.** **True**
3. **True or false: turning the fine focus on the light microscope can increase the resolution.** **False**

Independent practise

Independent practice

1. What does the word ‘magnify’ mean?
2. What are the two parts that magnify cells in a light microscope?
3. Define the term resolution.
4. Why is micrometers or nanometers commonly used when measuring the width of cells?
5. Calculate the magnification for the following combinations on the right.

Objective lens	Eyepiece lens	Total magnification
20x	10x	
250x	10x	
	10x	450x
	5x	75x
5x		900x

Answers to independent practice

1. To enlarge.
2. The objective lenses and the eyepiece lens
3. Resolution is the ability to distinguish between two points on an image, i.e. the amount of detail.
4. The cells are very small in size. Smaller units are more appropriate.
5. Calculate the magnification for the following combinations:

Objective lens	Eyepiece lens	Total magnification
20x	10x	**200x**
250x	10x	**250x**
45x	10x	450x
15x	5x	75x
5x	**180x**	900x