

# Observing Cells

Answer the questions below.

1. State the equation to calculate the magnification of an image.

$$\text{Magnification} = \frac{\text{Size of image}}{\text{Size of real object}}$$

2. Explain why electron microscopes are useful.

**They have greater magnification and resolution than light microscopes, allowing imaging of sub-cellular structures.**

3. Name the part of the microscope where the magnification is adjusted.

**The objective lens**

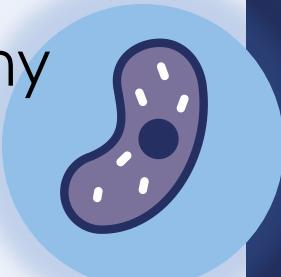
4. Describe similarities and differences between plant and animal cells.

**Plant and animal cells are both eukaryotic. They both contain a nucleus as well as a cell membrane, cytoplasm, mitochondria and ribosomes.**

**Plant cells only also contain chloroplasts, vacuole and cell wall.**

5. Name a type of plant cell that you would not expect to see many chloroplasts in.

**Root hair cell**



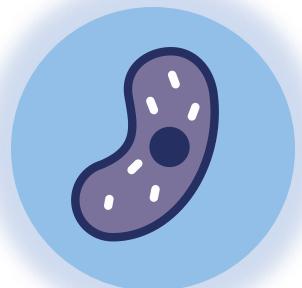
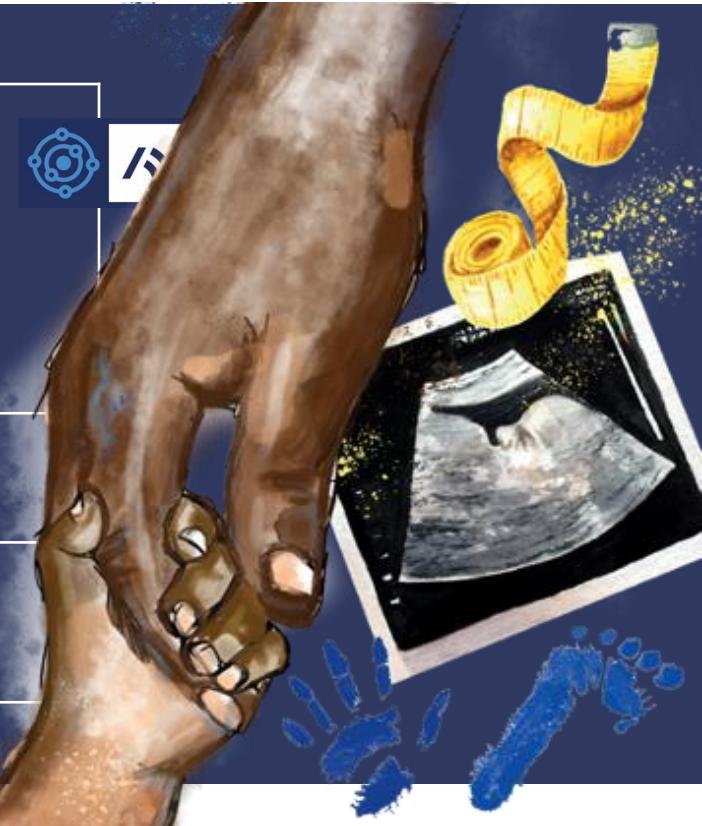
# Observing Cells

B3.1.6

Science  
**Mastery**

- B3.1.1 Prior Knowledge Review
- B3.1.2 Eukaryotic and Prokaryotic Cells
- B3.1.3 Aseptic Technique
- B3.1.4 Growth of Bacteria
- B3.1.5 Microscopes
- **B3.1.6 Observing Cells**
- B3.1.7 Diffusion

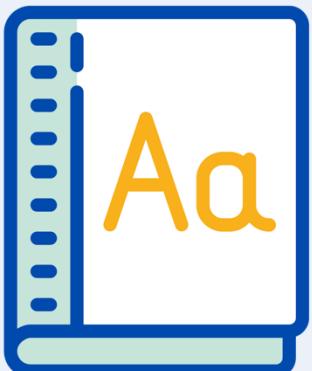
- B3.1.8 Diffusion in Living Things
- B3.1.9 Osmosis
- B3.1.10 Osmosis Investigation
- B3.1.11 Active Transport
- B3.1.12 Cell Division
- B3.1.13 Cancer
- B3.1.14 Stem Cells



## Following this lesson, students will be able to:

- State that light microscopes are used to look at the overall structure and size of cells
- Describe how to look at a specimen under a light microscope
- Explain how to ensure that your slide does not contain any bubbles or artefacts

### Key Words:



magnification

image

objective lens

coverslip

eyepiece

slide

# This is the fix-it portion of the lesson

The **fix-it** is an opportunity to respond to gaps in knowledge, especially those identified by the previous lesson's exit ticket.

- The teacher should customise this slide as needed, to facilitate
  - **reteach, explanation, demonstration or modelling** of ideas and concepts that students have not yet grasped or have misunderstood.
  - **practise** answering specific questions or of key
  - **redrafting** or **improving** previous work.

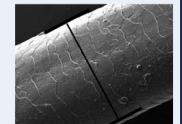
**Exit ticket**

1. Which statement is correct?  
 A. Both light microscopes and electron microscopes allow us to look at large objects that are far away on a much smaller scale.  
 B. Light microscopes have the greatest magnification and allow us to look at sub-cellular structures  
 C. Electron microscopes have greater magnification than light microscopes and have enhanced understanding of sub-cellular structures.

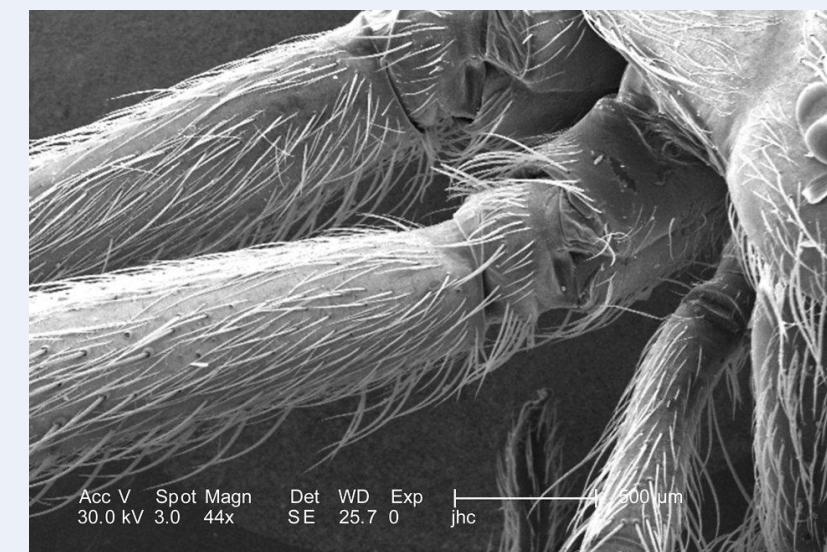
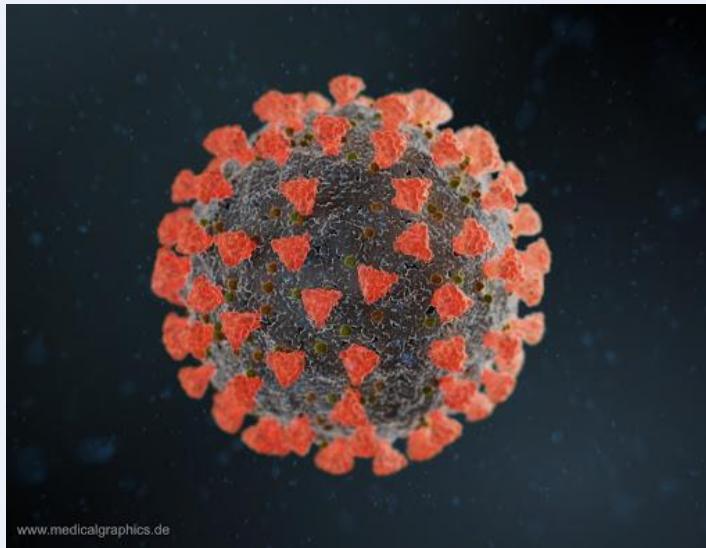
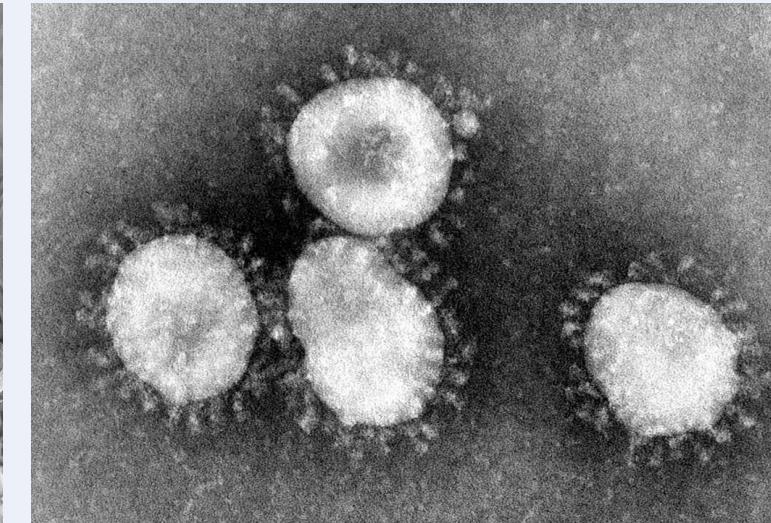
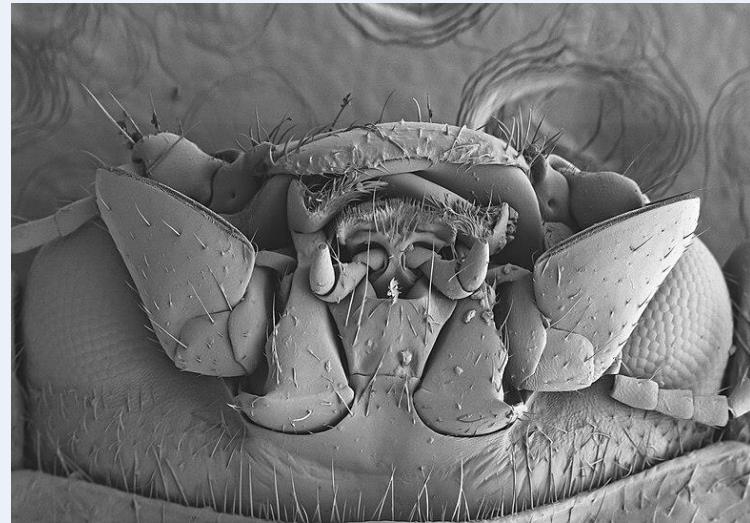
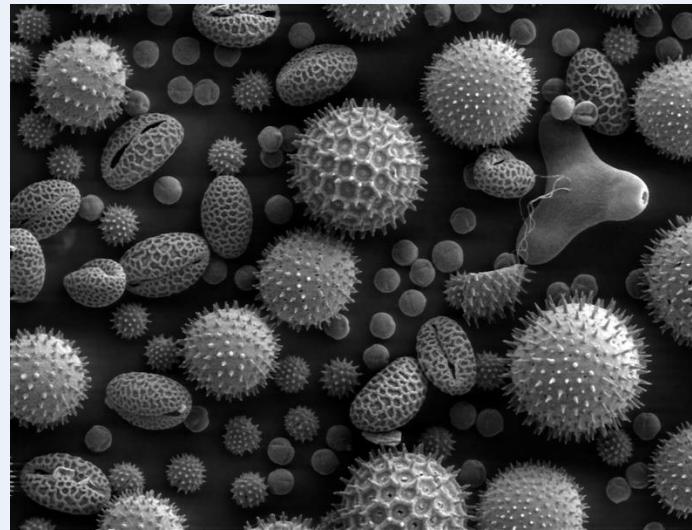
**Exit ticket**

2. The image on the right shows a strand of human hair. The diameter bar measures 20 mm and the width of the hair is 0.001 mm. Which statement is correct?  
 A. Image size is 20 mm, actual size of object is 0.001 mm.  
 B. Image size is 0.001 mm, actual size of object is 20 mm.  
 C. Magnification is 20 times, actual size of object is 0.001 mm.

3. What is the magnification of this image using the given information?  
 A. 20000 mm  
 B. 20000  
 C. 0.00005



# Can you guess what these electron microscope images show?

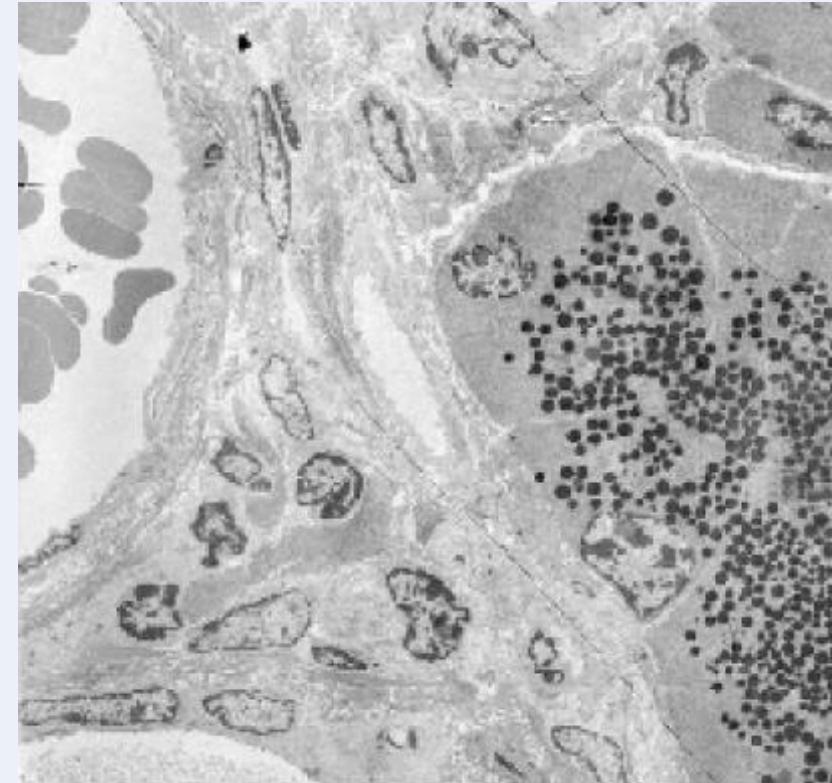


# Observing Cells

Light microscopes are very useful to look at the overall structure and size of cells.

Electron microscopes are much more **expensive** but allow scientists to look at **organelles** within the cells, and even within the organelles.

Microscopic images must always show the magnification so they can be **compared** with images from other scientists.



## Quick Quiz

Choose the correct answer for each question:

1. Which is the correct equation to calculate magnification?  
 A. Magnification = size of image/size of real object  
 B. Magnification = size of real object/size of image  
 C. Magnification = size of image x size of real object
  
2. Which is the correct first step in focusing an image using a light microscope?  
 A. Ensure the objective lens is on the highest power of magnification  
 B. Ensure the objective lens is touching the slide  
 C. Ensure the objective lens is on the lowest power of magnification

## Which statements do you agree with?

I think that making sure the specimen is thin is really important

I think that when you use a microscope you should start with the highest objective lens

I think that the fine focusing wheel is used to get the cells into the frame

I think that we add stains like iodine to our slides so that we can see sub-cellular structures more clearly

## Drill

1. Name the piece of equipment used to place a thin layer of onion onto the microscope slide
2. Name the stain used to see the onion cells more clearly under the microscope
3. What is used to move the stage up when focussing the object under the microscope?
4. The actual length of a palisade cell is 0.06mm. Convert this to  $\mu\text{m}$ .
5. Explain why it is easier to view the cells using the low power objective lens first.
6. Explain why the objective lens should not be moved towards the stage when focussing the image.
7. A student views a slide under a microscope with an eyepiece lens of  $\times 5$  and the  $\times 10$  objective lens. What is the total magnification of this image?

## Drill answers

1. Forceps
2. Iodine
3. The coarse focus wheel
4. 70 µm
5. Biggest / widest field of view or easier to focus
6. To avoid damage to lens / slide
7. X50

Check for understanding

# I: Describe the process in an accurate way

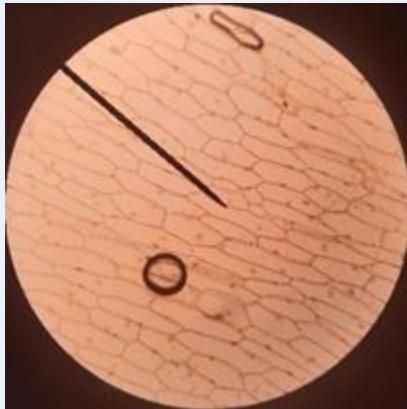
Example question:

A student observed slides of onion cells using a microscope. The image is not magnified, and the cells appear very small.

**Describe** how a student could adjust the microscope to see the onion cells more clearly.

Model answer:

- Turn the objective lens
- To a higher power lens
- To increase magnification



To 'describe', your answer should:

- Use **bullet points**.
- Include each step of the process in a **logical order**.
- Use **keywords** throughout the answer
- Stay **focused** on the question.

# We: **Describe** the process in an accurate way

Example question:

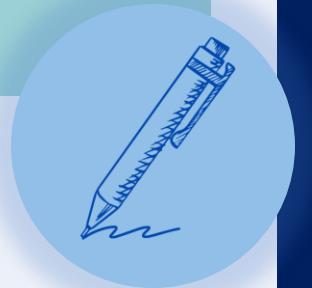
**Describe** how to prepare a slide of onion cells to look at under the microscope

Model answer:

- Peel a thin layer of tissue from the inner surface of the onion.
- Use forceps to carefully lay this thin layer of tissue on the microscope slide.
- Use the pipette to add a drop of iodine solution on top of the onion sample.
- Carefully lay a coverslip on the slide, placing one edge down first and lowering the other side slowly.
- Ensure any excess liquid is soaked up carefully using filter paper or paper towel.
- Place the slide on the stage of the microscope and secure with the stage clips.

To ‘describe’, your answer should:

- Use **bullet points**.
- Include each step of the process in a **logical order**.
- Use **keywords** throughout the answer
- Stay **focused** on the question.



# You: **Describe the process in an accurate way**

Example question:

**Describe** how to use a microscope to observe a prepared slide of onion cells at a magnification of x50 with an eyepiece lens of x5.

Model answer:

- Place slide on stage
- Ensure the objective lens is set to the lowest magnification
- Use the x5 eyepiece lens
- Look through the eyepiece and use the coarse focus wheel to bring the stage as close to the lens as possible
- Slide must not touch lens
- Turn the focus wheel the other way until the cells are more in focus
- Rotate the objective lens to x 10
- Turn the fine focus wheel to bring the cells into focus and look at the cells
- ×5 eyepiece and ×10 objective lenses (gives total magnification of ×50)

To ‘describe’, your answer should:

- Use **bullet points**.
- Include each step of the process in a **logical order**.
- Use **keywords** throughout the answer
- Stay **focused** on the question.



## Answer the questions below.

1. Which statement is correct?

- Light microscopes are able to show cell organelles in great detail
- Light microscopes are useful for looking at relative sizes of cells
- Light microscopes are useful for discovering new cell structures

2. Which is a precaution for looking at slides under a light microscope?

- Ensure that there is no stain on the slide so it does not obstruct the sample
- Ensure that the cover slip is carried and applied from the middle
- Ensure that the sample of cells is a very thin layer

3. Which states the correct functions of the focusing wheels?

- The fine focusing wheel is used to get the cells into the frame and the coarse focusing wheel is used to focus closely
- The coarse focusing wheel is used to get the slide into the right position and the fine focusing wheel is used to get the cells into the frame
- The coarse focusing wheel is used to get the cells into the frame and the fine focusing wheel is used to sharpen the image

## Lesson B3.1.6

What was good about this lesson?

What can we do to improve this lesson?

[Send us your feedback by clicking this link](#)  
or by emailing [sciencemastery@arkonline.org](mailto:sciencemastery@arkonline.org)  
Thank you!