# Purposeful Practicals

# Microscopy (onion cells)

This Practical Pack is part of OCR's Purposeful Practicals. This resource can be used to contribute to PAG B1 and is referenced in the Practical Menu (B5). There are also accompanying Integrated Instructions for students to use.

## Aim

To prepare and observe an onion cell slide and produce a biological drawing of the cells observed. Students will use iodine solution to stain structures in the onion cells and use a light microscope to observe the visible structures.

Time required for activity: 60 minutes.

## Introduction

Light microscopes can be used to observe some of the cellular structures of plant cells. In this activity, students will prepare a temporary mount of a piece of onion epidermal tissue. They will use iodine solution as a stain, which will make the structures that they are observing clearer. Students will then use the light microscope to view the epidermal tissue and produce a biological drawing which will be labelled to identify the cellular structures that you can see.

## Specification theory content links

**Biology A J247**: B1.1a B1.1b

## Health and safety

| Hazards | Mitigations |
| --- | --- |
| Safety goggles iconDilute solutions of iodine will stain skin. | Use eye protection. |
| Hazard iconCuts from sharps/tweezers/mounted needle | Care should be taken when tweezers/mounted needle to transfer epidermis. |
| Hazard iconBright light source can damage eyes. | Always make sure there is a slide on the stage of a microscope before looking down the microscope. Do not look down the microscope without a slide on the stage. |
| Hazard iconCorners of slides/broken/damaged glass slides are sharp and can cut skin easily. | Corners of slides/broken/damaged glass slides are sharp and can cut skin easily. |

## Technician notes

Dilute iodine solutions below 1 M should be used. One onion per class should be sufficient.

## Equipment

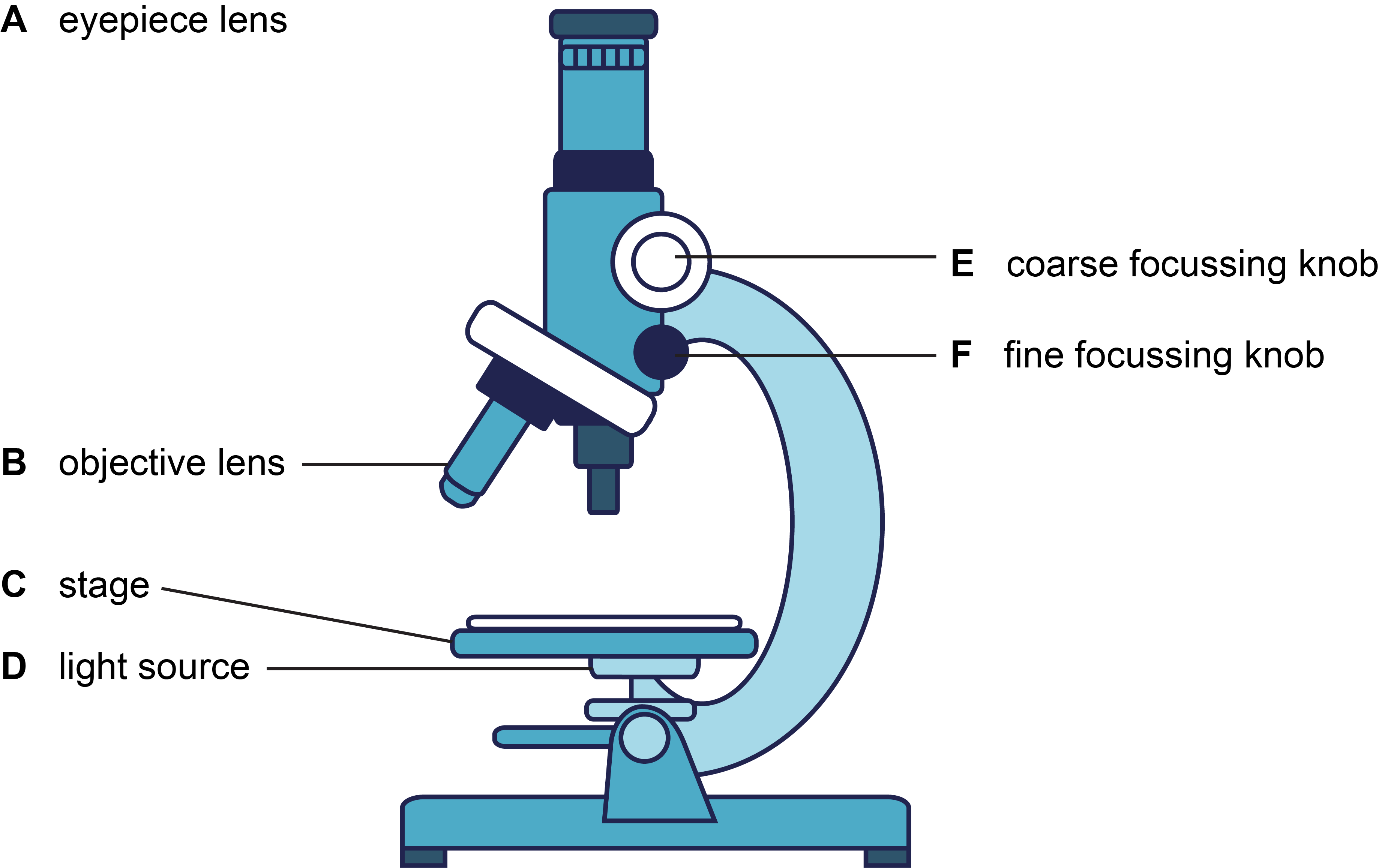
* light microscope with light source
* onion
* tweezers or mounted needles (a sharp pencil could also be used)
* microscope slide
* cover slip
* dilute iodine solution (less than 1 M)



## Procedure and procedural understanding

|  |  |
| --- | --- |
| **Procedure: Preparing a slide** | **Understanding** |
| 1. Using tweezers carefully peel off a thin layer of epidermis from the onion. |  |
| 1. Using a pipette, add one drop of water to the centre of the slide. Lay the thin layer of epidermis on the microscope slide in a single flat layer. | Why is a thin layer of epidermis needed?  What would be observed if the layer was thick? |
| 1. Place 2 small drops of iodine on to the layer of epidermis. | Why is a small amount of iodine used?  What would happen if the amount of iodine used was too much or too little?  Which cell structures will the iodine stain and make visible? |
| 1. Carefully lower a cover slip on top of the layer of epidermis, taking care to make sure there are no air bubbles. | Why is a cover slip placed over the specimen and stain? |
| 1. Make sure that hands are washed with soap and water. |  |

**Fig. 1.1 A light microscope**



|  |  |
| --- | --- |
| **Procedure: Using a light microscope to observe cells** | **Understanding** |
| 1. Place the slide on the stage of the light microscope. |  |
| 1. Select the lowest power objective lens and make sure the specimen on the slide is directly beneath the objective lens. |  |
| 1. Looking from the side of the microscope, use the coarse focusing knob to raise the stage so the specimen and slide are just below the objective lens. Do not allow the lens to touch the slide. |  |
| 1. Look through the eye piece lens and carefully use the coarse focusing knob to focus the image. | When you turn the coarse focusing knob how does this help to focus the image? |
| 1. If further focusing is required use the fine focusing knob to make the image clearer. |  |
| 1. To see the image in more detail select a higher power objective lens and refocus using the focusing knobs if necessary (coarse then fine). | Which cell structures can you observe using the light microscope?  Why is the cell membrane not visible?  Why is the cell vacuole not visible?  Do onion epidermal cells have chloroplasts? |

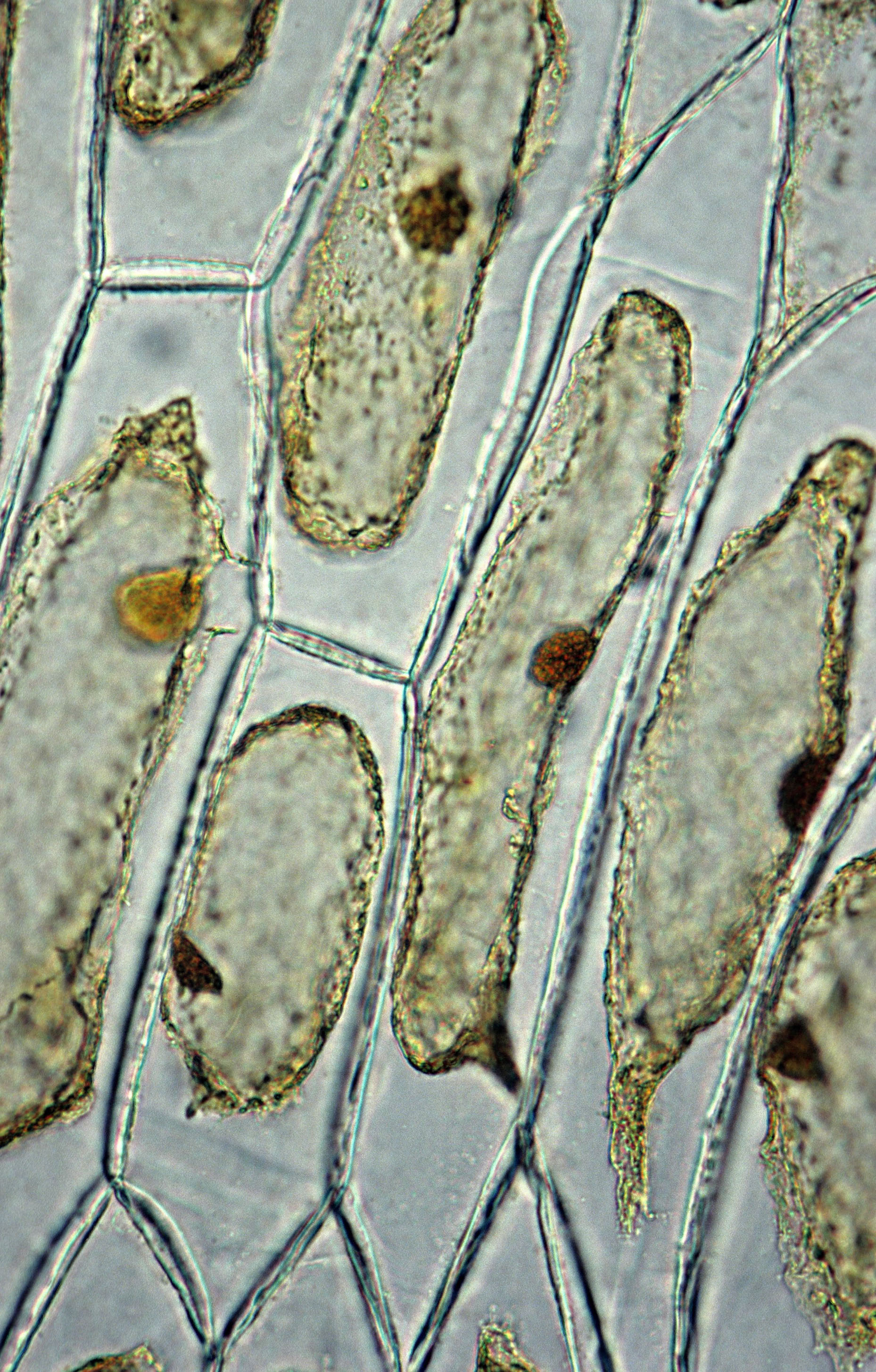
|  |  |
| --- | --- |
| **Procedure: Biological drawings** | **Understanding** |
| 1. Select one cell from your field of view to draw. | What are the criteria for producing a good biological drawing? |
| 1. Produce a biological drawing of a single onion epidermal cell in the space below. 2. Label your drawing. | What are the criteria for producing a good biological drawing? |

Students can use this box for their draw their biological drawing.

## Further questions

A student placed a section of onion epidermis in a concentrated sugar solution. They left the onion tissue in the solution for several hours.

They then used a light microscope to observe the onion tissue. The image shows the cells they observed.



1. Describe how the onion cells look different from the onion cells you observed.
2. Which cell structure is now visible?
3. When producing a biological drawing, a total magnification factor must be included on the diagram. How is total magnification calculated?

## Answers

1. Two lines around the outside of the cell are now visible.
2. The cell membrane is now visible (water left the onion cells and this caused the cell membrane to move away from the cell wall – this is called plasmolysis)
3. Total magnification = eyepiece lens magnification × objective lens magnification.

### Practical skills, apparatus and techniques assessed

|  |  |  |
| --- | --- | --- |
| a | **Reference** | **Description of skill/technique** |
|  | 1- i | Use a **microscope** to make observations of biological specimens and produce **labelled scientific drawings**. |

## Scientific and practical understanding

### Light microscope

A type of microscope that uses light to produce an image

### Magnification

Use of a lens to make an object look larger

### Resolution

This is the ability to distinguish two parts that are close together.

### Epidermal tissue (onion)

Single layer of simple, transparent cells that provide a protective layer.

### Cell wall

Rigid outer layer that maintains the shape of the cells and provides strength and support.

### Nucleus

Large cell structure that contains the organisms genome and provides the instructions for protein synthesis

## Notes and references

Before carrying out any experiment or demonstration based on this guidance, it is the responsibility of teachers to make sure that they have undertaken a risk assessment in accordance with their employer’s requirements, making use of up-to-date information and taking account of their own particular circumstances. Any local rules or restrictions issued by the employer must always be followed. [CLEAPSS](http://science.cleapss.org.uk) resources are useful for carrying out risk-assessments. Centres should trial experiments in advance of giving them to students. Centres may choose to make adaptations to this practical activity. They should be aware that this may affect the apparatus and techniques covered by the student.

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