WJEC England Biology A Level

SP C2 02a: Scientific drawing from slides of root tip to show stages of mitosis

Practical notes

Introduction

Mitosis is a form of **cell division** that produces two genetically **identical** daughter cells. It is important for **growth**, **repair** and **replacement** as well as **asexual reproduction**.

Root tip cells are a **good specimen** to study mitosis. They contain **meristematic stem cells** (in the apical meristem) which are continuously dividing to form **specialised** cells.

Equipment

- Onion (*Allium* sp.) with developing roots
- 1 M hydrochloric acid
- Acetic-orcein stain
- Light microscope
- Microscope slide
- Coverslip
- Scalpel
- Mounted needle
- Fine forceps
- 2× pipettes
- Watch glass
- Paper towel
- Bunsen burner

Risk assessment

Hazard	Risk	Precaution	Emergency
Broken glass	Cuts	Keep glassware away from the edge of the desk; handle microscope slides carefully	Dispose of broken glassware carefully; elevate cuts and apply pressure; do not remove glass from cuts; seek medical assistance
Mounted needle	Pricking skin	Hold with pointed end downwards; keep away from the edge of the desk	Seek medical advice
Biohazard	Contamination	Cover any cuts; wash hands after handling onion; use disinfectant	Seek medical advice

Scalpel	Cuts	Direction of cut away from the body; do not attempt to change blade; keep scalpel away from the edge of the desk	Elevate cuts and apply pressure; wash minor cuts in cold water; seek medical assistance
Bunsen burner	Burns	Act sensibly around the Bunsen burner; leave to cool before handling; wear safety goggles	Run burn under cold water; seek medical assistance
Hydrochloric acid	Irritation to skin	Wear gloves when handling HCl	Remove contaminated clothing; run the affected area under cold water; seek medical assistance
	Irritation to eyes	Wear safety goggles	Flood eye(s) with tap water; seek medical assistance
Acetic orcein	Skin burns	Wear gloves when handling acetic orcein	Remove contaminated clothing; run the affected area under cold water; seek medical assistance
	Irritation to eyes	Wear safety goggles	Flood eye(s) with tap water; seek medical assistance

Method

Preparing the microscope slide

1. Using a scalpel, cut **1 cm** from the tip of an onion root
2. Use a pipette to add **2 drops** of **1 M hydrochloric acid** into the centre of a watch glass. *HCl separates the plant cells in a process known as maceration.*
3. Add **20 drops** of **acetic-orcein** stain into the watch glass centre using a second pipette. *This is used to stain the cell DNA.*
4. Transfer the root tip to the centre of the watch glass, placing down **tip first**. Allow to soak for approximately **6 to 7 minutes**.

5. Using the scalpel, remove **2 to 3 mm** from the root tip. Place it in the centre of a microscope slide.
6. Use a pipette to add **2 to 3 drops** of acetic orcein stain onto the root tip
7. Use the Bunsen burner to gently **warm** the slide for approximately **5 seconds**
8. **Break up** the tissue using a mounted needle, before applying a **cover slip**. *Lower the cover slip at an angle to prevent the formation of bubbles.*
9. Squash and spread the plant tissue by applying vertical thumb pressure
10. Use a paper towel to absorb any **excess** stain on the microscope slide

Observing the microscope slide

1. Place the microscope slide under the clips on the microscope stage
2. Turn the **lowest power objective lens** on the nose piece
3. Turn the **coarse adjustment knob** to move the stage close to the lens
4. Look down the microscope and turn the **coarse adjustment knob** to **focus** the image. Turn the **fine adjustment knob** until the best image is obtained
5. Rotate to the medium power objective lens and focus using the **fine adjustment knob**
6. Locate the apical meristem (square shaped cells with large nuclei)
7. Rotate to the high power objective lens and focus using the **fine adjustment knob**
8. Observe and draw cells at **interphase**, **prophase**, **metaphase**, **anaphase** and **telophase**

Tips for high-power plan drawings

- Drawing should fill at least half of the provided space
- Only draw what you can see
- Use a **sharp pencil**
- Ensure lines are **single**, **complete** and **non-overlapping**
- Do **not** use shading or colour
- Create **straight lines** for labels using a ruler
- Lines should **not** intersect
- Label lines should **not** have arrow heads
- Include a scale in terms of **eyepiece units**
- Include a title and objective lens power
- Include a **magnification**

Example

Root tip cell of an onion *(allium sp.)* in anaphase (×400)