

Exercise walk-through

15.2

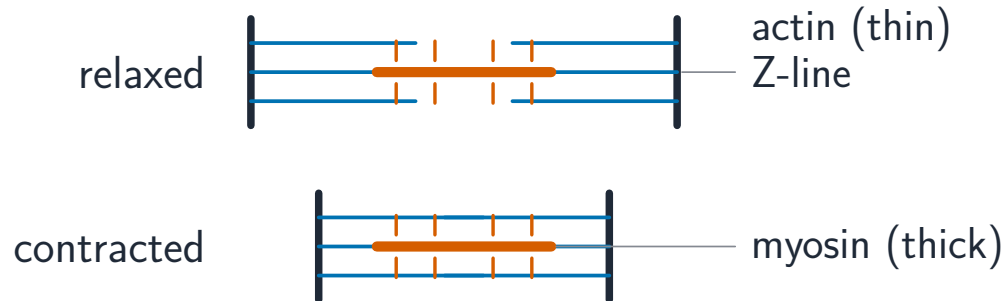
Control and coordination in plants

A-Level Biology

Muscle contraction

The **sliding filament model** :

- Ca^{2+} uncovers binding sites on **actin**
- **myosin** heads pull it in (using ATP)
- the **sarcomere** shortens



the filaments slide over each other, so the sarcomere shortens

How a muscle actually shortens

striated muscle

long fibres divided into repeating units called **sarcomeres**

the filaments

thick **myosin** and thin **actin**, overlapping

1. calcium released

an impulse triggers Ca^{2+} release from the sarcoplasmic reticulum

2. the switch

calcium binds **troponin**, which moves **tropomyosin** and **uncovers the binding sites** on actin

3. the stroke

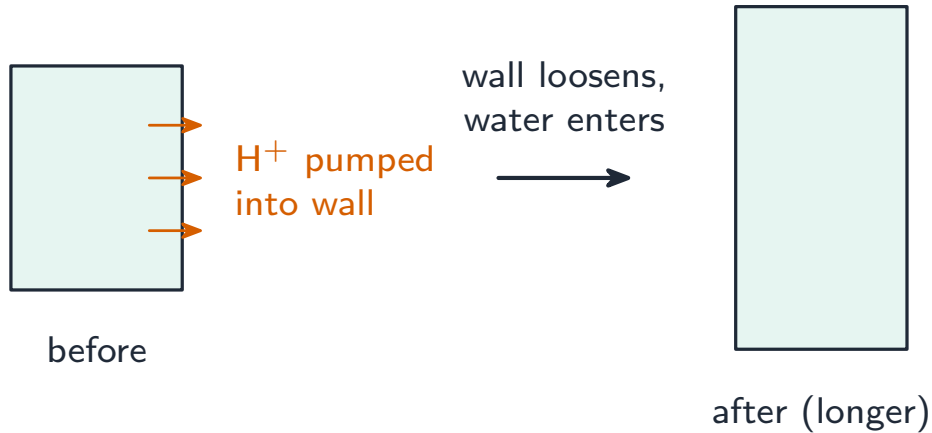
myosin heads bind, pull the actin past, then detach using ATP and reset

the result

the sarcomere **shortens**, though neither filament changes length

The sliding filament model: the filaments *slide*, they do not contract. Saying that explicitly is the marked point.

Plant coordination



Auxin causes “acid growth”: it pumps H⁺ into the wall, loosening it so the cell stretches longer.

Gibberellin switches on amylase for **germination** ; the Venus fly trap uses fast electrical signals.

How auxin makes a cell longer

Auxin

Auxin elongation

is a plant hormone that makes cells grow longer – growth.

Pump the protons

It makes the cell pump **protons** (hydrogen ions) out into the cell wall .

Acid loosens the wall

That **acidifies** the wall, which loosens the links between its fibres.

Water does the rest

Water enters by osmosis and the loosened wall lets the cell stretch – so the shoot bends towards the light.

“Acid growth”: the hormone does not push the cell open, it makes the wall weak enough for turgor pressure to do it.

Two systems for control

nervous system
electrical impulses
along nerves — fast, short

endocrine system
chemical hormones
in the blood — slow, lasting

Nervous control is fast and electrical; hormonal control is slow and chemical

Exercises 2.1-3.1

2.1 Name the plant hormone responsible for elongation growth.

[1]

2.2 State what gibberellin causes to be made during the germination of barley.

[1]

3.1 How does auxin loosen a plant cell wall?

[1]

☐

A by pumping protons (H^+) into the wall, acidifying it

B by removing water from the cell

C by adding cellulose to the wall

D by closing the stomata

Exercises 2.1-3.1

2.1 Name the plant hormone responsible for elongation growth.

[1]

2.1

- auxin

2.2 State what gibberellin causes to be made during the germination of barley.

[1]

2.2

- amylase

3.1 How does auxin loosen a plant cell wall?

[1]

☐

A by pumping protons (H^+) into the wall, acidifying it

B by removing water from the cell

C by adding cellulose to the wall

D by closing the stomata

3.1 A

- Auxin pumps H^+ into the wall, acidifying and loosening it

Exercises 3.2-3.3

3.2 In germinating barley, gibberellin switches on the gene for:

[1]

☐

A amylase

B auxin

C chlorophyll

D rubisco

3.3 Explain how auxin causes a plant cell to grow longer.

[3]

Exercises 3.2-3.3

3.2 In germinating barley, gibberellin switches on the gene for:

[1]

☐

A amylase

B auxin

C chlorophyll

D rubisco

3.2 A

- Gibberellin switches on the amylase gene

3.3 Explain how auxin causes a plant cell to grow longer.

[3]

3.3

- auxin makes the cell pump protons (H^+) into the cell wall; the acidified wall is loosened; so the cell stretches/elongates as water enters by osmosis

Exercise 3.4 (a)

3.4 A seedling is given gibberellin and grows much taller than an untreated one.

(a) Suggest why the untreated seedling grew less.

[2]

Exercise 3.4 (a)

3.4 A seedling is given gibberellin and grows much taller than an untreated one.

(a) Suggest why the untreated seedling grew less. [2]

(a)

- the untreated seedling may make less gibberellin itself, so less starch is broken down / less elongation occurs

Exercise 3.4 (b)

3.4 A seedling is given gibberellin and grows much taller than an untreated one.

(b) Suggest **one** control the experimenter should include.

[1]

Exercise 3.4 (b)

3.4 A seedling is given gibberellin and grows much taller than an untreated one.

(b) Suggest **one** control the experimenter should include.

[1]

(b)

- e.g. treat with water only / same conditions otherwise