

Exercise walk-through

14.5

Tropic responses

IGCSE Biology

Endocrine glands, and how hormones differ from nerves

Endocrine glands

Hormones are made by **endocrine glands**, which release them straight into the blood – so they reach every organ, and only target cells respond.

Ovaries and testes

The **ovaries** make **oestrogen** for female development; the **testes** make **testosterone** for male development.

Adrenaline

It raises the breathing rate, the **heart rate**, the blood glucose **concentration** and the pupil diameter – and the **liver** releases glucose to fuel it.

Duration

That is the real difference: a nervous response is fast and short-lived, a hormonal one slower and **longer-lasting**.

Speed, path and **duration**: three columns that separate nervous from hormonal control in any comparison question.

Skin, blood and the set point

Too hot

You sweat, and the **arterioles** widen (**vasodilation**) so more blood flows to the skin **capillaries** and loses heat.

Too cold

Vasoconstriction narrows them, shivering releases heat from muscle, and hairs stand up to trap air.

Set point

Homeostasis keeps a constant internal **environment** by **negative feedback** : when a value moves off its **set point** , the body acts to bring it back.

Gravitropism

Plants have their own version: **gravitropism** is growth in response to **gravity** – roots down, shoots up.

The capillaries themselves do not move. It is the *arterioles* feeding them that widen or narrow.

The skin structures that control temperature (Supplement)

sweat glands

make sweat; as it **evaporates** it cools the skin

hair erector muscles

raise the hairs to **trap a layer of air**, which insulates

fatty tissue

gives **insulation** beneath the skin, reducing heat loss

arterioles

widen (**vasodilation**) so more blood flows near the surface and more heat is lost

too cold

you **shiver** – the muscles contract and **generate heat** – and the arterioles narrow (**vasoconstriction**), so less blood reaches the surface

The blood vessels themselves do **not** move up and down. It is the arterioles' *diameter* that changes, redirecting blood toward or away from the surface.

Exercises 2.1·2.2

2.1 Define phototropism.

[1]

2.2 State the direction a root grows in response to gravity.

[1]

Exercises 2.1·2.2

2.1 Define phototropism.

[1]

2.1

- phototropism is a plant's **growth response towards (or away from) light**

2.2 State the direction a root grows in response to gravity.

[1]

2.2

- a root grows **downwards** (towards gravity)

Exercise 3.1

3.1 A shoot lit from one side bends towards the light because auxin:

[1]

☐

A is destroyed by light

B gathers on the shaded side and makes those cells grow longer

C stops the shoot growing

D gathers on the lit side

Exercise 3.1

3.1 A shoot lit from one side bends towards the light because auxin:

[1]

☐

A is destroyed by light

B gathers on the shaded side and makes those cells grow longer

C stops the shoot growing

D gathers on the lit side

3.1 B

- auxin gathers on the **shaded side** and makes those cells **grow longer**
- A, C and D would not bend the shoot towards the light

Exercise 3.2 (a)

3.2 Auxin controls phototropism.

(a) State where auxin is made.

[1]

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[1]

(a)

- auxin is made in the **shoot tip**

Exercise 3.2 (b)

3.2 Auxin controls phototropism.

(b) Explain how unequal auxin makes a shoot bend towards the light.

[3]

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3.2 Auxin controls phototropism.

(b) Explain how unequal auxin makes a shoot bend towards the light.

[3]

(b)

- light makes auxin spread to the **shaded side**
- auxin makes those cells **elongate**
- the shaded side grows faster, so the shoot **bends towards the light**

Exercise 3.3 (a)

3.3 A seedling was left in a box with a hole in one side, so light reached it from one direction only. After three days the shoot had bent towards the light and the root had grown straight down.

(a) Name the response shown by the shoot and the response shown by the root, and state whether each is positive or negative.

[4]

Exercise 3.3 (a)

3.3 A seedling was left in a box with a hole in one side, so light reached it from one direction only. After three days the shoot had bent towards the light and the root had grown straight down.

(a) Name the response shown by the shoot and the response shown by the root, and state whether each is positive or negative. [4]

(a)

- shoot: **positive phototropism** – towards light
- root: **positive gravitropism** – towards gravity

Exercise 3.3 (b)

3.3 A seedling was left in a box with a hole in one side, so light reached it from one direction only. After three days the shoot had bent towards the light and the root had grown straight down.

(b) Explain, using auxin, why the shoot bends towards the light.

[4]

Exercise 3.3 (b)

3.3 A seedling was left in a box with a hole in one side, so light reached it from one direction only. After three days the shoot had bent towards the light and the root had grown straight down.

(b) Explain, using auxin, why the shoot bends towards the light.

[4]

(b)

- auxin is made in the **shoot tip**
- it moves to the **shaded** side
- auxin makes cells **elongate**, so the shaded side grows longer
- uneven growth makes the shoot **bend towards the light**

Exercise 3.3 (c)

3.3 A seedling was left in a box with a hole in one side, so light reached it from one direction only. After three days the shoot had bent towards the light and the root had grown straight down.

(c) Explain how each response helps the seedling survive.

[2]

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3.3 A seedling was left in a box with a hole in one side, so light reached it from one direction only. After three days the shoot had bent towards the light and the root had grown straight down.

(c) Explain how each response helps the seedling survive. [2]

(c)

- towards light: more light for **photosynthesis**
- downwards: **anchors** the plant and reaches water and minerals

Exercise 3.3 (d)

3.3 A seedling was left in a box with a hole in one side, so light reached it from one direction only. After three days the shoot had bent towards the light and the root had grown straight down.

(d) The tip of a second shoot was cut off before the experiment. Predict what happened to that shoot, and explain why. [2]

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(d) The tip of a second shoot was cut off before the experiment. Predict what happened to that shoot, and explain why. [2]

(d)

- it grew **straight up** without bending
- the tip makes auxin, so with it removed there is **no uneven growth**