

Exercise walk-through

14.2

Sense organs

IGCSE Biology

Two halves of one nervous system

What it does

The nervous system coordinates and **regulates** the body's functions, using fast electrical impulses.

Central nervous system

The brain and the spinal cord – where decisions are made.

Peripheral nervous system

The **peripheral nervous system** (PNS): every nerve outside the brain and spinal cord, carrying impulses in and out.

Sense organs

Sense organs are groups of receptor cells that respond to a particular stimulus – light, sound, chemicals, touch, temperature.

Receptor → sensory neurone → CNS → motor neurone → effector. Every nervous answer is somewhere on that line.

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

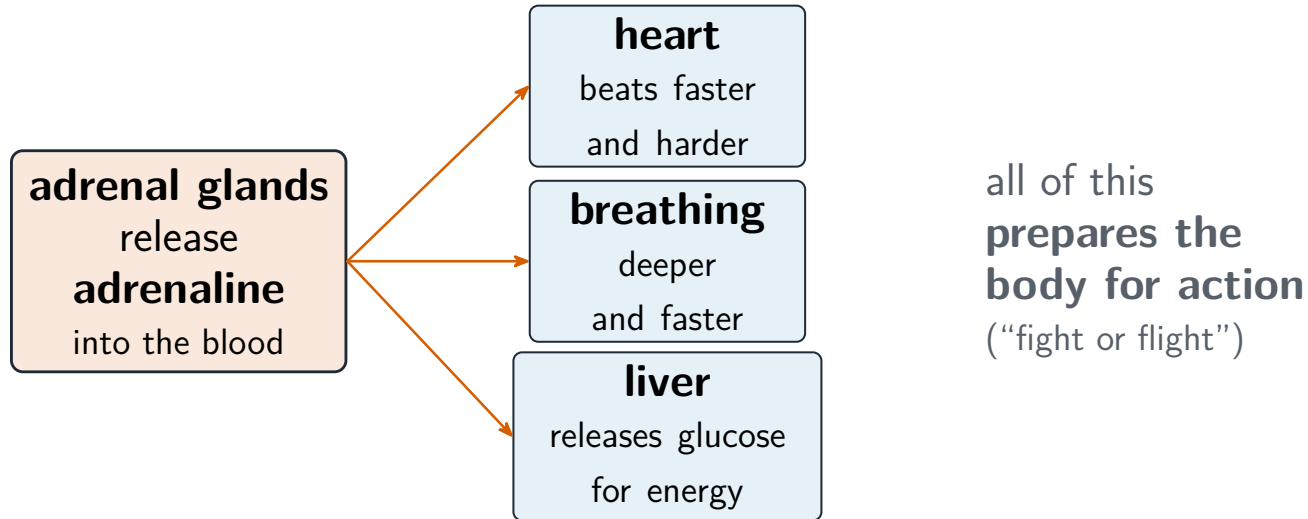
widen (**vasodilation**) so more blood flows near the surface and more heat is lost

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.

Hormones, continued



Adrenaline prepares the body for action by acting on several target organs

Exercises 2.1-2.3

2.1 State the function of the retina.

[1]

2.2 State what happens to the pupil in bright light.

[1]

2.3 Name the part of the eye that does most of the focusing.

[1]

Exercises 2.1·2.3

2.1 State the function of the retina.

[1]

2.1

- the retina contains **light receptors** that detect light
-

2.2 State what happens to the pupil in bright light.

[1]

2.2

- in bright light the pupil **gets smaller** (narrows)
-

2.3 Name the part of the eye that does most of the focusing.

[1]

2.3

- most focusing is done by the **cornea**

Exercises 2.4-2.5

2.4 State which muscles of the iris contract in dim light, and the effect on the pupil. [2]

2.5 State what happens to the lens when the eye focuses on a near object. [2]

Exercises 2.4-2.5

2.4 State which muscles of the iris contract in dim light, and the effect on the pupil. [2]

2.4

- **radial** muscles contract and **circular** muscles relax
- the pupil becomes **wider**, so more light enters

2.5 State what happens to the lens when the eye focuses on a near object. [2]

2.5

- the lens becomes **fatter** / more curved
- so it **refracts the light more**

Exercise 3.1

3.1 The part of the eye that focuses light onto the retina is the:

[1]

☐

A iris

B cornea only

C lens

D optic nerve

Exercise 3.1

3.1 The part of the eye that focuses light onto the retina is the:

[1]

☐

A iris

B cornea only

C lens

D optic nerve

3.1 C

- the **lens** focuses light onto the retina
- A controls pupil size; B is most of the focusing but not the named part here; D carries impulses

Exercise 3.2 (a)

3.2 The pupil changes size in different light.

(a) Explain how the pupil narrows in bright light.

[2]

Exercise 3.2 (a)

3.2 The pupil changes size in different light.

(a) Explain how the pupil narrows in bright light.

[2]

(a)

- **circular** muscles of the iris contract
- **radial** muscles relax, so the pupil **narrows**

Exercise 3.2 (b)

3.2 The pupil changes size in different light.

(b) State the difference between rods and cones.

[2]

Exercise 3.2 (b)

3.2 The pupil changes size in different light.

(b) State the difference between rods and cones.

[2]

(b)

- **rods:** dim light, no colour
- **cones:** colour vision, work best in bright light

Exercise 3.3 (a)

3.3 A student walks from a dark room into bright sunlight and then reads a sign in the distance.

(a) Complete the table by naming the part of the eye that performs each function. [4]

Function	Part
contains the light receptors	
controls how much light enters	
carries impulses to the brain	
changes shape to fine-focus the light	

Exercise 3.3 (a)

3.3 A student walks from a dark room into bright sunlight and then reads a sign in the distance.

(a) Complete the table by naming the part of the eye that performs each function. [4]

Function	Part
contains the light receptors	
controls how much light enters	
carries impulses to the brain	
changes shape to fine-focus the light	

(a)

- retina; iris; optic nerve; lens

Exercise 3.3 (b)

3.3 A student walks from a dark room into bright sunlight and then reads a sign in the distance.

(b) Describe the pupil reflex that occurs as the student enters the sunlight, naming the muscles involved. [3]

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3.3 A student walks from a dark room into bright sunlight and then reads a sign in the distance.

(b) Describe the pupil reflex that occurs as the student enters the sunlight, naming the muscles involved. [3]

(b)

- circular muscles **contract**; radial muscles **relax**
- the pupil becomes **smaller**, so less light enters

Exercise 3.3 (c)

3.3 A student walks from a dark room into bright sunlight and then reads a sign in the distance.

(c) Explain the advantage of this reflex.

[1]

Exercise 3.3 (c)

3.3 A student walks from a dark room into bright sunlight and then reads a sign in the distance.

(c) Explain the advantage of this reflex.

[1]

(c)

- it **protects the retina** from very bright light

Exercise 3.3 (d)

3.3 A student walks from a dark room into bright sunlight and then reads a sign in the distance.

(d) Describe the changes in the ciliary muscle, the suspensory ligaments and the lens as the student focuses on the distant sign. [3]

Exercise 3.3 (d)

3.3 A student walks from a dark room into bright sunlight and then reads a sign in the distance.

(d) Describe the changes in the ciliary muscle, the suspensory ligaments and the lens as the student focuses on the distant sign. [3]

(d)

- the **ciliary muscle relaxes**
- suspensory ligaments are pulled **tight**
- the lens is pulled **thinner**, so it refracts less

Exercise 3.3 (e)

3.3 A student walks from a dark room into bright sunlight and then reads a sign in the distance.

(e) The student then looks down at a book. State how the lens changes and explain why that change is needed. [2]

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3.3 A student walks from a dark room into bright sunlight and then reads a sign in the distance.

(e) The student then looks down at a book. State how the lens changes and explain why that change is needed. [2]

(e)

- the lens becomes **fatter** / more curved
- a near object needs the light **refracted more** to focus on the retina