

Coordination & Response

IGCSE Biology ■ Topic 14

IGCSE Biology



Coordination & Response

What we will cover

- 1 The nervous system
- 2 Reflex arc & synapses
- 3 The eye
- 4 Hormones
- 5 Homeostasis
- 6 Tropisms

1 The nervous system

Coordination & Response

↳ The nervous system

The nervous system

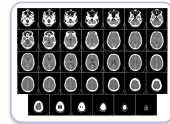
CNS 中枢神经系统

the brain 大脑 & spinal cord 脊髓

PNS 周围神经系统

all the nerves outside the CNS

Neurones 神经元 carry fast **electrical impulses 电脉冲**: **sensory** (to CNS), **relay** (within), **motor** (to effectors).

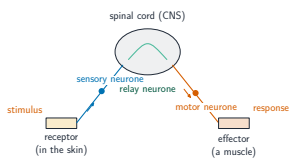


The nervous system coordinates responses

Coordination & Response

↳ The nervous system

Reflex arc



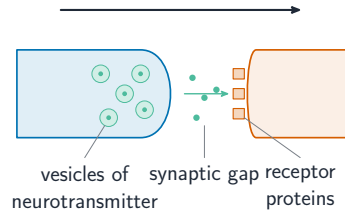
- **sensory neurones 感觉神经元** – carry impulses from receptors to the CNS.
- **relay neurones 中间神经元** – pass impulses on inside the CNS.
- **motor neurones 运动神经元** – carry impulses from the CNS to effectors.

Coordination & Response

↳ The nervous system

Synapses

impulse travels one way only

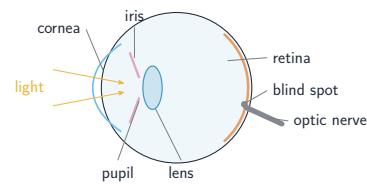


A **synapse 突触** is a tiny gap between neurones.

Neurotransmitter 神经递质 **diffuses 扩散** across & binds receptors – so impulses travel **one way only**.

2 The eye

The eye



- **cornea** 角膜 & **lens** 晶状体 – **refract** 折射 light
- **iris** 虹膜 – controls the **pupil** 瞳孔
- **retina** 视网膜 – light receptors
- **optic nerve** 视神经 – to the brain

Pupil reflex and accommodation

pupil reflex

bright light → pupil smaller;
dim light → pupil wider

accommodation 视觉调节

near → lens fatter;
far → lens thinner

3 Hormones & homeostasis

Hormones

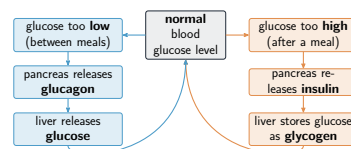
adrenaline 肾上腺素 (adrenal glands) – readies the body for 'fight or flight'

insulin 胰岛素 / **glucagon** 胰高血糖素 (pancreas) – control blood glucose

testosterone / **oestrogen** – male / female development

Hormones 激素 are chemicals in the blood: **slower** but **longer-lasting** than nerve impulses.

Homeostasis: blood glucose



Homeostasis 稳态 keeps the inside steady by **negative feedback** 负反馈.

- too high → insulin → store **glycogen** 糖原
- too low → glucagon → release glucose

Type 1 diabetes 1 型糖尿病: no insulin made.

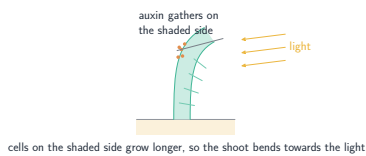
Controlling body temperature

too hot
sweating 出汗; vasodilation 血管舒张 – more blood to the skin loses heat

too cold
shivering 颤抖; vasoconstriction 血管收缩 – keeps heat in

4 Plants

Tropisms



A **tropism** 向性 is a directional growth response.

- **phototropism** 向光性 – shoots grow to light
- **gravitropism** 向地性 – roots down, shoots up

Auxin 生长素 gathers on the shaded side & makes cells elongate.

5 Recap

Worked example – a reflex arc

You touch a hot plate and pull your hand away before you feel pain. Give the pathway.

- Receptor in the skin detects the heat (the stimulus).
- Sensory neurone to the spinal cord, where a relay neurone passes it across.
- Motor neurone carries it to the effector (the muscle), which contracts.
- The brain is **not** in the loop ⇒ fast and automatic; pain comes after.

Learn the order: stimulus → receptor → sensory → relay → motor → effector → response. Skipping the brain is **why it is fast** – and that protects you.

Topic 14 – key takeaways

1 Reflex arc

receptor, sensory, relay, motor, effector

2 Synapse

neurotransmitter diffuses; one way only

3 Hormones

slower, longer-lasting; insulin lowers glucose

4 Homeostasis

negative feedback keeps the inside steady

Check yourself

- 1 What are the two parts of the CNS?
- 2 Why do impulses cross a synapse one way only?
- 3 Which hormone lowers blood glucose?
- 4 Which way does a shoot grow in phototropism?



Answers 1. the brain & spinal cord 2. neurotransmitter is on one side only 3. insulin
4. towards the light