Week 18

IGCSE Biology

Homework bundle for this week

本周作业合集

exercises.lol

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IGCSE Biology Name: _____ Score: _____

1. The central nervous system (CNS) consists of the:
   - ☐ brain and spinal cord
   - ☐ heart and lungs
   - ☐ muscles and glands
   - ☐ eyes and ears
2. A synapse is:
   - ☐ the gap between two neurones
   - ☐ a type of muscle
   - ☐ a part of the brain
   - ☐ a blood vessel
3. The part that controls the size of the pupil is the:
   - ☐ iris
   - ☐ lens
   - ☐ retina
   - ☐ cornea
4. To focus on a NEAR object, the lens becomes:
   - ☐ fatter (more curved)
   - ☐ thinner (flatter)
   - ☐ larger overall
   - ☐ opaque
5. A hormone is a chemical messenger carried in the:
   - ☐ blood
   - ☐ nerves
   - ☐ air
   - ☐ lymph only
6. A reflex action is fast and automatic, not consciously controlled.

   ☐ True ☐ False

7. The neurone carrying impulses from a receptor to the CNS is the _____ neurone.

   _____

8. Synapses allow impulses to travel in one direction only.

   ☐ True ☐ False

9. The image formed on the retina is upside down.

   ☐ True ☐ False

10. Cones detect colour and work best in bright light.

    ☐ True ☐ False

IGCSE Biology

1. **brain and spinal cord**

   The CNS is the brain and spinal cord.

2. **the gap between two neurones**

   A synapse is the junction between neurones.

3. **iris**

   The iris adjusts the pupil size.

4. **fatter (more curved)**

   A fatter lens bends light more for near objects.

5. **blood**

   Hormones travel in the blood to target organs.

6. **True**

   Reflexes protect the body before conscious thought.

7. **sensory**

   Sensory neurones carry signals into the CNS.

8. **True**

   Neurotransmitter is released on one side only.

9. **True**

   The brain interprets it the right way up.

10. **True**

    Cones need bright light; rods handle dim light.

IGCSE BIOLOGY • EXERCISE SHEET

14.1 Coordination and response

Name: _____ Class: _____ Date: _____ **Total: 8 marks**

KEY WORDS synapse 突触 • receptor 感受器 • effector 效应器 • neurones 神经元 • response 反应

Objective

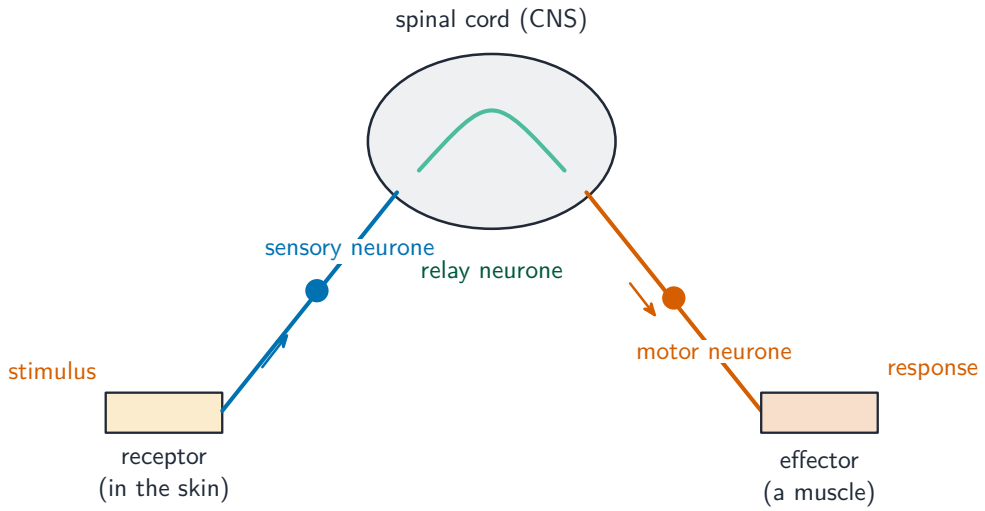
Build the skills to answer exam questions on **coordination and response** 协调与反应 — the **nervous system** 神经系统, the **reflex arc** 反射弧, and **synapses** 突触.

You must be able to:

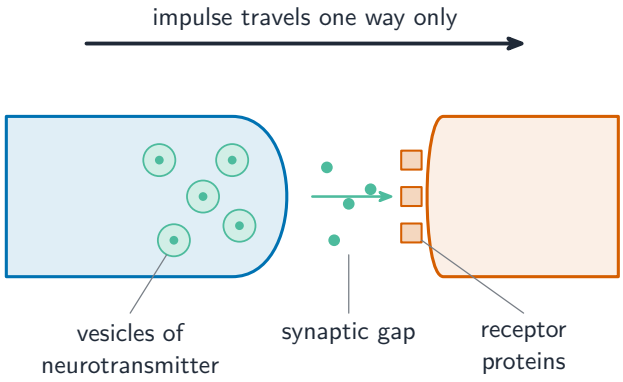
- name the parts of the nervous system and the three neurones
- describe a reflex arc in order
- describe how a synapse works and why impulses go one way

1 Worked examples

Reflex arc and synapse



Reflex arc: receptor → sensory neurone → relay neurone → motor neurone → effector



Neurotransmitter diffuses across the gap and binds receptors — impulses go one way only

- **CNS** = brain + spinal cord; **PNS** = the nerves.

2 Practice

2.1 Name the two parts of the central nervous system. [2]

2.2 State the job of a motor neurone. [1]

3 Exam-style questions

3.1 The correct order of a reflex arc is: [1]

- **A** receptor → motor → relay → sensory → effector
- **B** receptor → sensory → relay → motor → effector
- **C** effector → motor → relay → sensory → receptor
- **D** receptor → relay → sensory → motor → effector

3.2 A synapse joins two neurones.

(a) Describe how an impulse crosses a synapse. [3]

(b) Explain why a synapse makes impulses travel in one direction only. [1]

Solutions

2.1 the brain; the spinal cord.

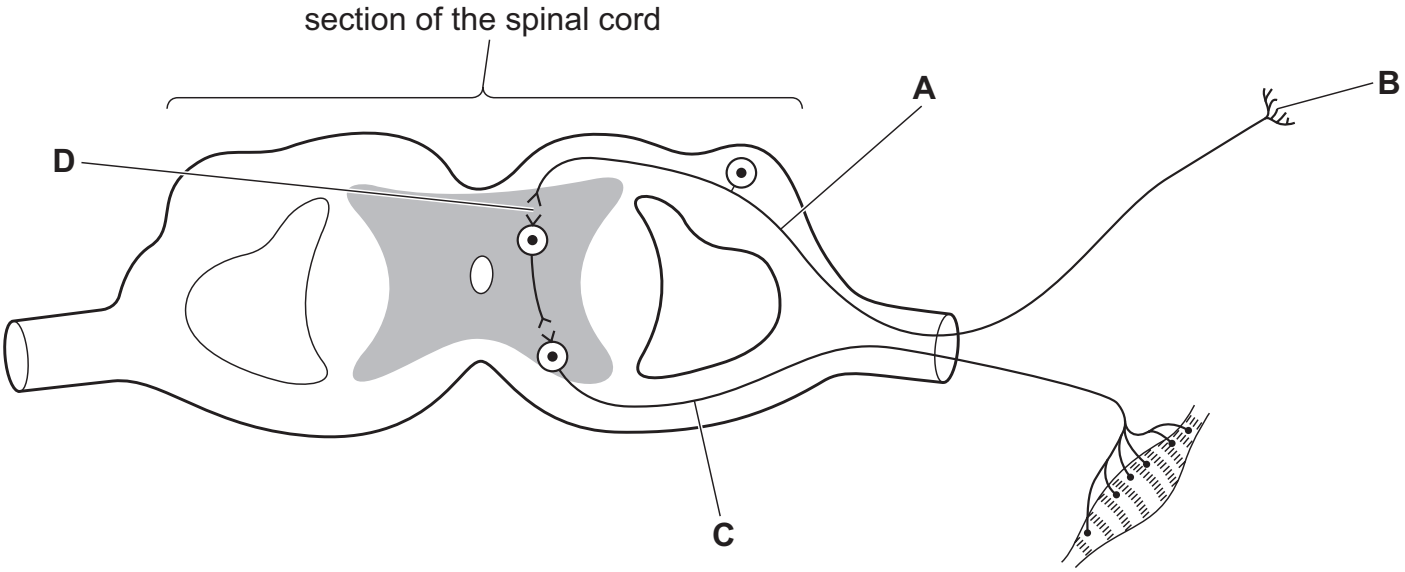
2.2 to carry impulses from the CNS to an effector.

3.1 B. receptor → sensory → relay → motor → effector.

3.2 (a) the impulse makes vesicles release neurotransmitter into the gap; the neurotransmitter diffuses across; it binds receptors on the next neurone, starting a new impulse.
(b) only the first neurone releases neurotransmitter and only the second has receptors.

18 The diagram shows the parts of the nervous system involved in a reflex arc.

Which letter identifies a synapse?



21 Events that occur at a synapse are listed.

They are **not** in the correct order.

1 An impulse is stimulated in the next neurone.

2 An impulse stimulates the release of neurotransmitter molecules from vesicles into the synaptic gap.

3 Neurotransmitter molecules bind with receptor proteins on the next neurone.

4 The neurotransmitter molecules diffuse across the gap.

What is the actual sequence of events?

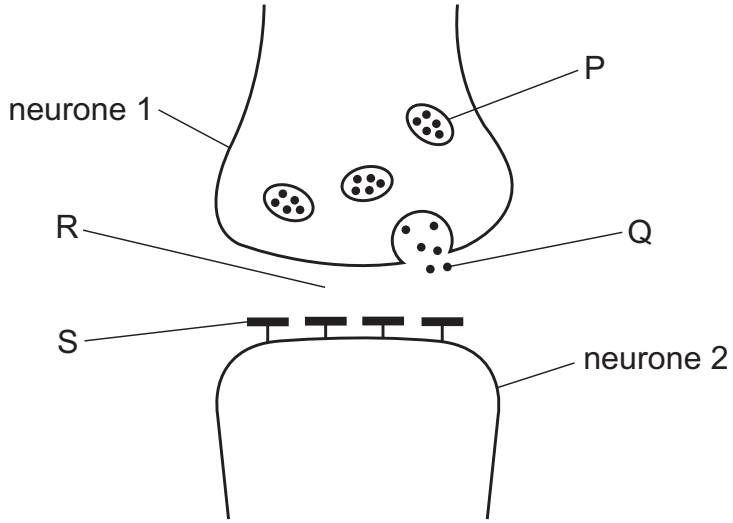
A $2 \rightarrow 4 \rightarrow 1 \rightarrow 3$

B $2 \rightarrow 4 \rightarrow 3 \rightarrow 1$

C $4 \rightarrow 2 \rightarrow 1 \rightarrow 3$

D $4 \rightarrow 2 \rightarrow 3 \rightarrow 1$

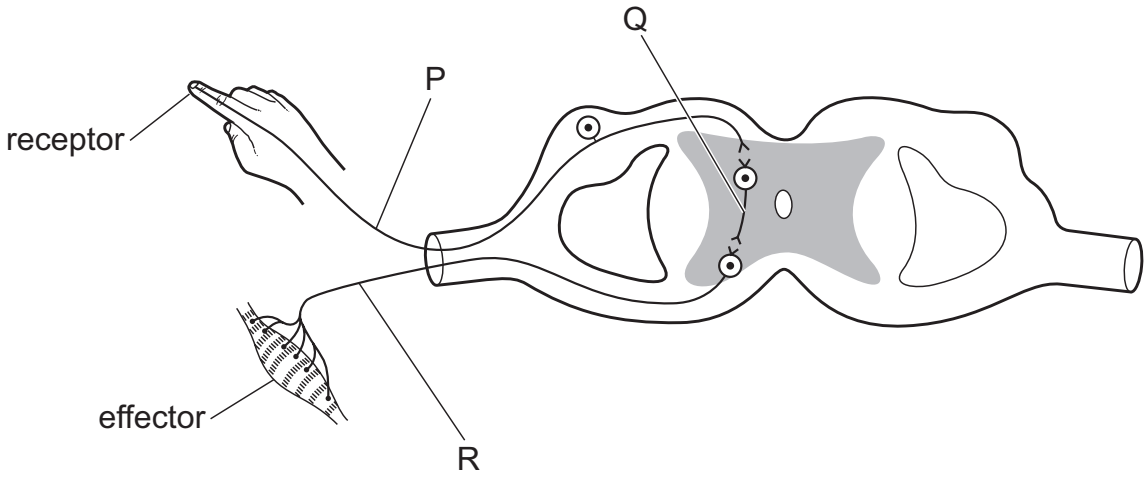
21 The diagram shows a synapse.



What are the labelled parts?

	P	Q	R	S
A	synaptic gap	neurotransmitter	vesicle	receptor
B	synaptic gap	receptor	vesicle	neurotransmitter
C	vesicle	neurotransmitter	synaptic gap	receptor
D	vesicle	receptor	synaptic gap	neurotransmitter

23 The diagram shows a simple reflex arc.



What are the names of the structures labelled P, Q and R?

	P	Q	R
A	motor neurone	relay neurone	sensory neurone
B	motor neurone	sensory neurone	relay neurone
C	sensory neurone	motor neurone	relay neurone
D	sensory neurone	relay neurone	motor neurone

2 **(a)** The human retina contains receptor cells called rods and cones.

Fig. 2.1 shows the distribution of receptor cells in a human retina.

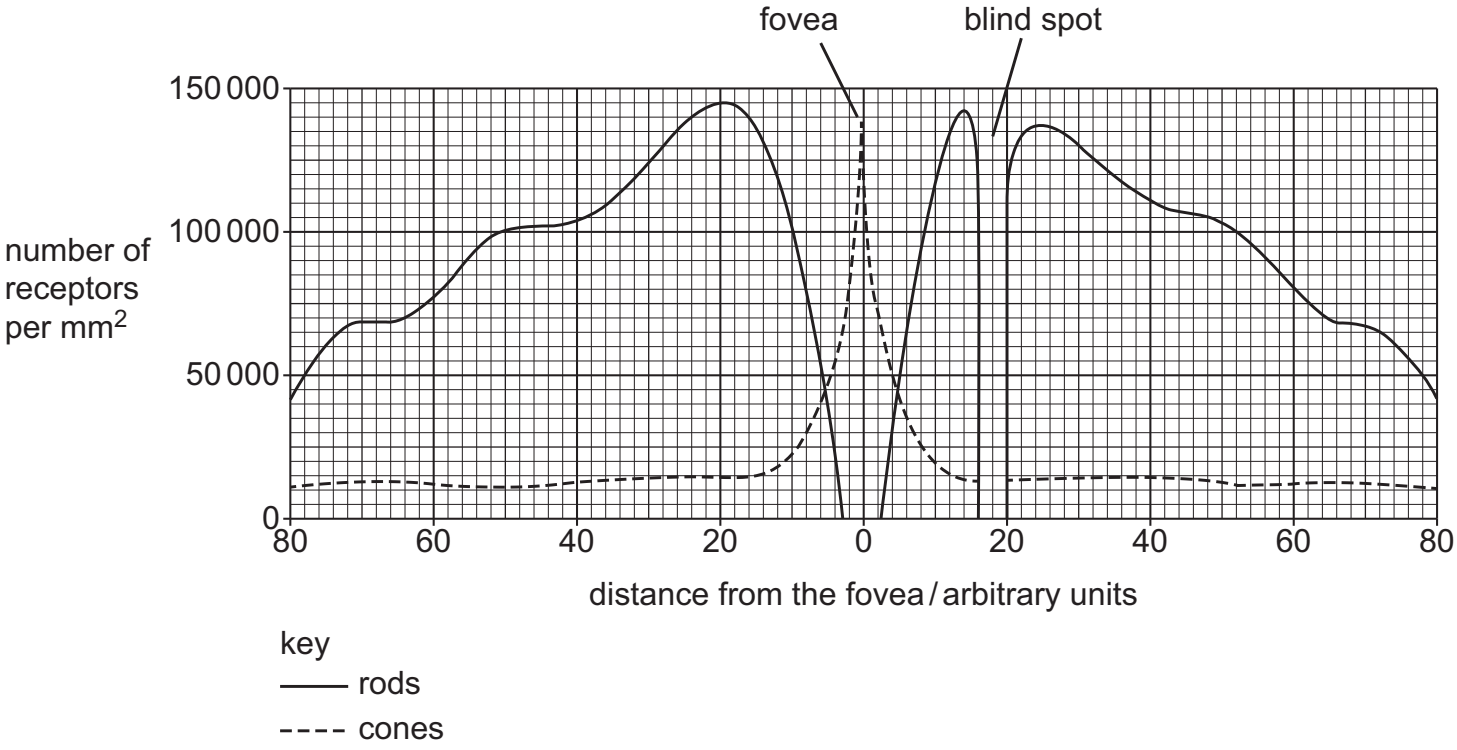


Fig. 2.1

Using the information in Fig. 2.1, describe the differences in the distribution of rods and cones.

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..... [4]

(b) Nocturnal animals are active at night.

Suggest how the number of receptor cells in the retina of a nocturnal animal differs from those in the retina of an animal that is active in the day.

Explain your suggestion.

.....

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.....

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..... [2]

(c) In humans, the size of the iris increases in bright light conditions.

During this response one effector in the iris contracts and one effector relaxes.

(i) State the name of this response.

..... [1]

(ii) State the name of the effector that contracts in this response.

..... [1]

(iii) State the name of the type of action shown by the paired effectors during this response.

..... [1]

(d) The optic nerve contains many neurones.

Fig. 2.2 shows a synapse between two neurones.

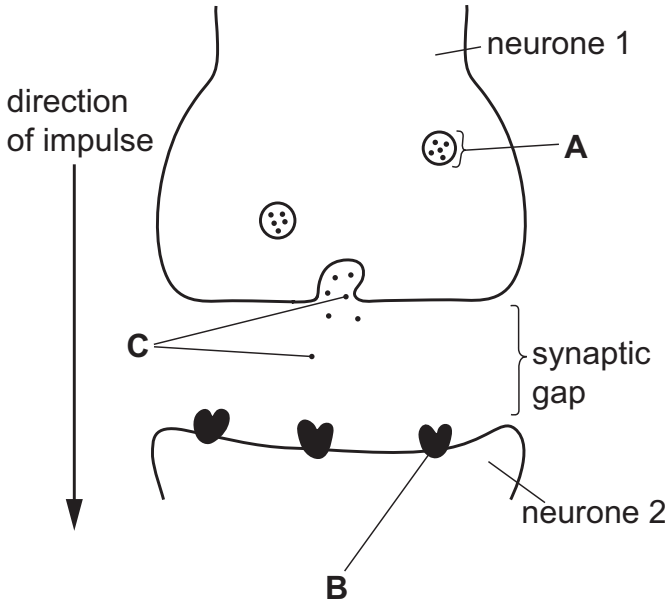

Fig. 2.2

(i) State the names of the parts labelled **A**, **B** and **C** in Fig. 2.2.

A .....

B .....

C .....

[3]

(ii) Explain how part **C** in Fig. 2.2 moves across the synaptic gap.

.....

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.....

.....

..... [2]

[Total: 14]

IGCSE BIOLOGY • EXERCISE SHEET

14.2 Sense organs

Name: _____ Class: _____ Date: _____ **Total: 7 marks**

KEY WORDS retina 视网膜 • eye 眼 • iris 虹膜 • cones 视锥细胞 • rods 视杆细胞

Objective

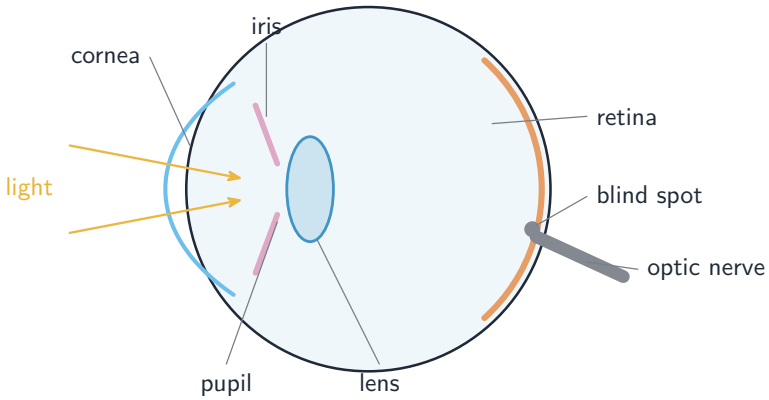
Build the skills to answer exam questions on **sense organs** 感觉器官 — the parts of the **eye** 眼, the **pupil reflex** 瞳孔反射, **accommodation** 视觉调节, and rods and cones.

You must be able to:

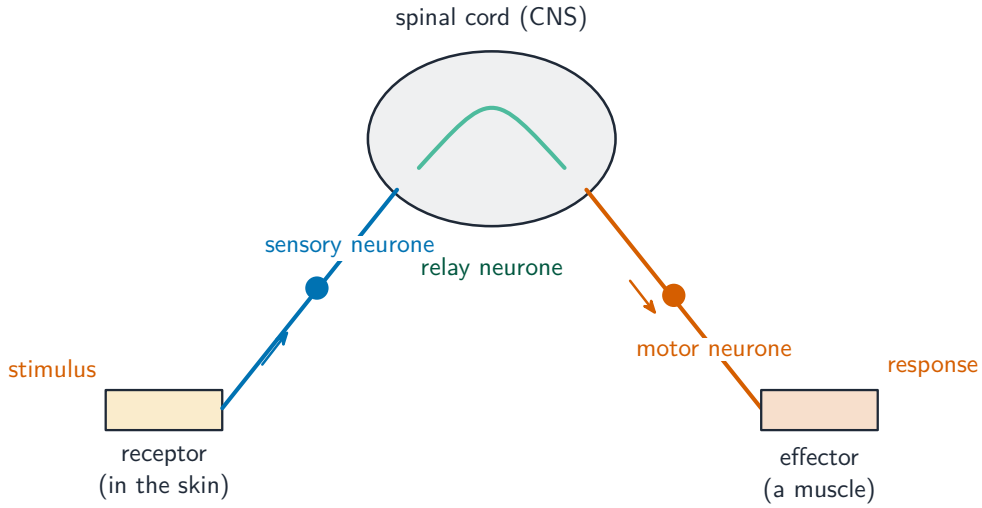
- name the parts of the eye and their functions
- explain the pupil reflex (antagonistic muscles)
- describe accommodation and the roles of rods and cones

1 Worked examples

The eye



Cornea and lens refract light onto the retina; impulses leave by the optic nerve



Sense organs feed the reflex arc

- **pupil reflex:** bright light → circular muscles contract → pupil narrows.
- **accommodation:** near object → ciliary muscles contract → lens fatter.
- **rods:** dim light (no colour); **cones:** colour, bright light.

2 Practice

2.1 State the function of the retina. [1]

2.2 State what happens to the pupil in bright light. [1]

3 Exam-style questions

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

3.2 The pupil changes size in different light.

(a) Explain how the pupil narrows in bright light. [2]

(b) State the difference between rods and cones. [2]

Solutions

2.1 it contains light receptors that detect light.

2.2 it gets smaller (narrows).

3.1 C. The lens focuses light onto the retina.

3.2 (a) the circular muscles of the iris contract; the radial muscles relax, so the pupil narrows.
(b) rods are sensitive in dim light but detect no colour; cones give colour vision and work best in bright light.

21 When moving from an area with low light intensity to an area with high light intensity, how do the circular and radial muscles of the iris react?

	circular muscles	radial muscles
A	contract	no change
B	contract	relax
C	relax	contract
D	relax	no change

19 A person looks at a distant object in a dark area. The person then moves to a bright area and looks at a near object.

Which statement describes some of the changes that take place in the person's eyes?

A The circular muscles of the iris contract, the pupil constricts, the ciliary muscles relax and the lens gets thicker.

B The radial muscles of the iris relax, the circular muscles of the iris contract, the pupil constricts and the lens gets thinner.

C The radial muscles of the iris relax, the pupil constricts, the ciliary muscles contract and the lens gets thicker.

D The radial muscles of the iris relax, the pupil dilates, the ciliary muscles relax and the lens gets thicker.

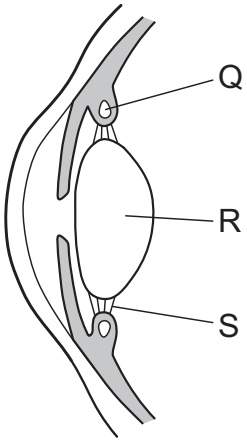
20 Which row shows the state of the ciliary muscles and suspensory ligaments when the eye is focusing on a near object?

	ciliary muscles	suspensory ligaments
A	contracted	slack
B	contracted	tense
C	relaxed	slack
D	relaxed	tense

22 Which row shows the function of rod cells?

	night vision	colour vision
A	yes	yes
B	yes	no
C	no	yes
D	no	no

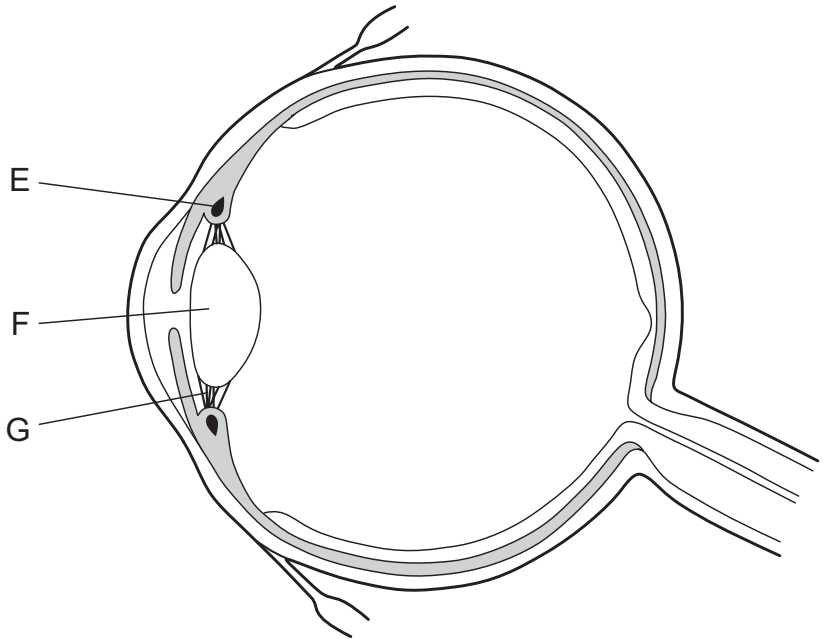
24 The diagram shows a vertical section through part of a human eye. A fly is coming nearer to the eye. The eye begins to focus the image of the fly on the retina.



How do the labelled parts of the diagram change?

	Q	R	S
A	contracts	becomes thinner	becomes tighter
B	relaxes	becomes fatter	becomes slacker
C	contracts	becomes fatter	becomes slacker
D	relaxes	becomes thinner	becomes tighter

24 The diagram shows a cross-section of an eye.



Which row is correct when a person views a near object?

	E	F	G	refraction
A	contracts	becomes thinner	pulled less	more
B	contracts	becomes thicker	pulled less	more
C	relaxes	becomes thinner	pulled less	less
D	relaxes	becomes thicker	pulled more	less

2 **(a)** The human retina contains receptor cells called rods and cones.

Fig. 2.1 shows the distribution of receptor cells in a human retina.

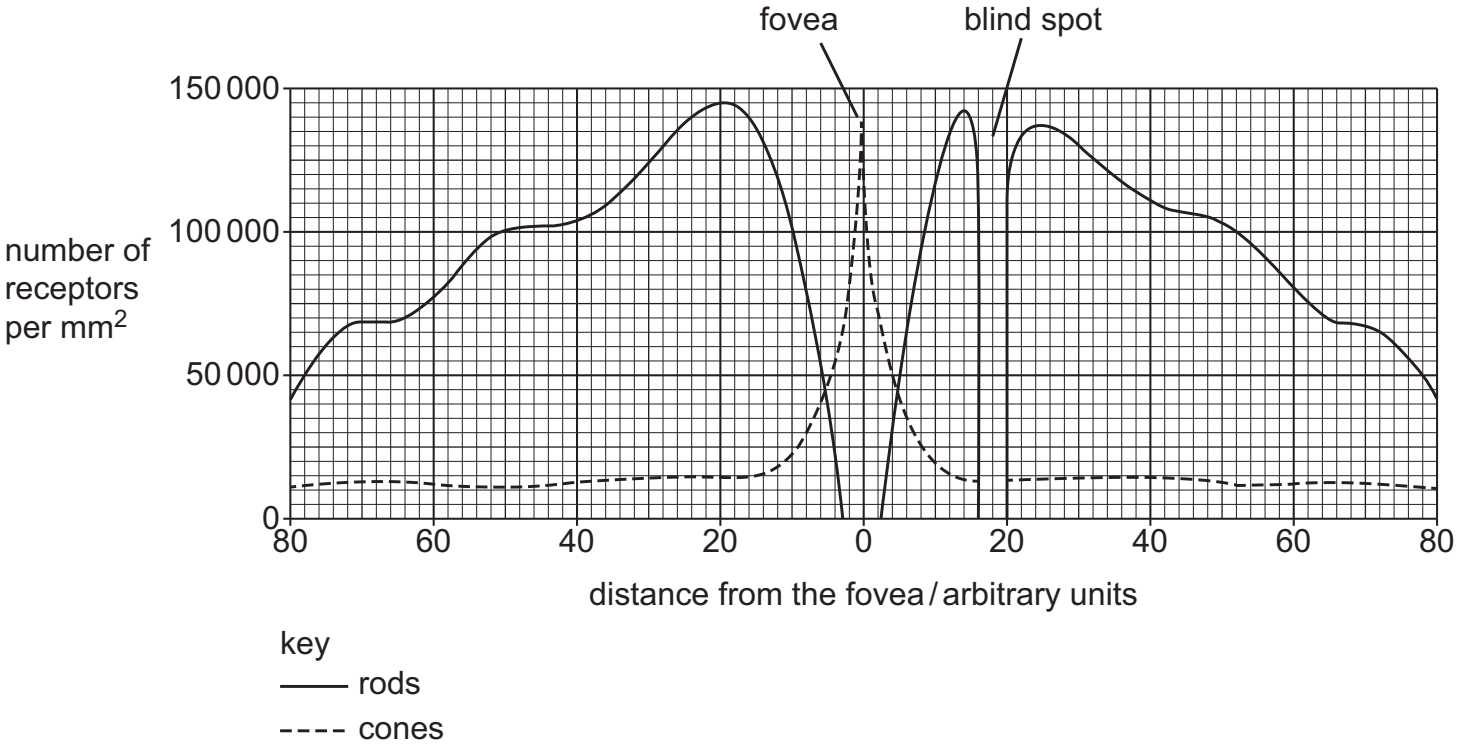


Fig. 2.1

Using the information in Fig. 2.1, describe the differences in the distribution of rods and cones.

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..... [4]

(b) Nocturnal animals are active at night.

Suggest how the number of receptor cells in the retina of a nocturnal animal differs from those in the retina of an animal that is active in the day.

Explain your suggestion.

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..... [2]

(c) In humans, the size of the iris increases in bright light conditions.

During this response one effector in the iris contracts and one effector relaxes.

(i) State the name of this response.

..... [1]

(ii) State the name of the effector that contracts in this response.

..... [1]

(iii) State the name of the type of action shown by the paired effectors during this response.

..... [1]

(d) The optic nerve contains many neurones.

Fig. 2.2 shows a synapse between two neurones.

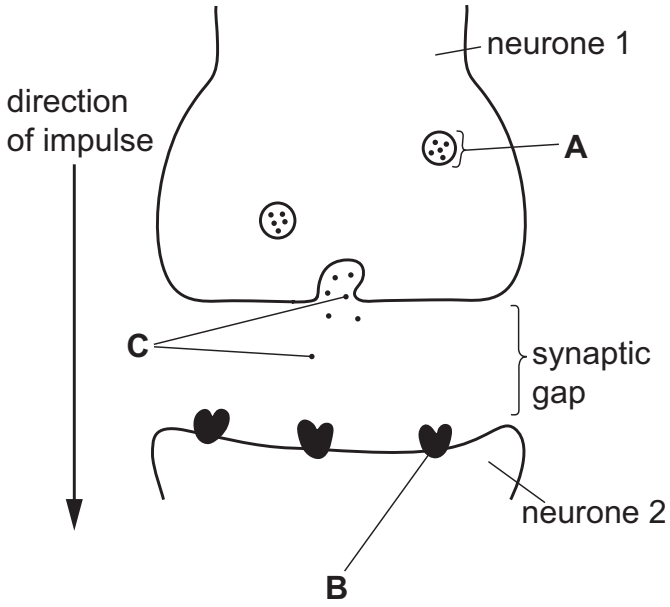

Fig. 2.2

(i) State the names of the parts labelled **A**, **B** and **C** in Fig. 2.2.

A .....

B .....

C .....

[3]

(ii) Explain how part **C** in Fig. 2.2 moves across the synaptic gap.

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..... [2]

[Total: 14]

IGCSE BIOLOGY • EXERCISE SHEET

14.3 Hormones

Name: _____ Class: _____ Date: _____ **Total: 7 marks**

KEY WORDS hormone 激素 • glucose 葡萄糖 • adrenaline 肾上腺素 • heart rate 心率 • glucagon 胰高血糖素

Objective

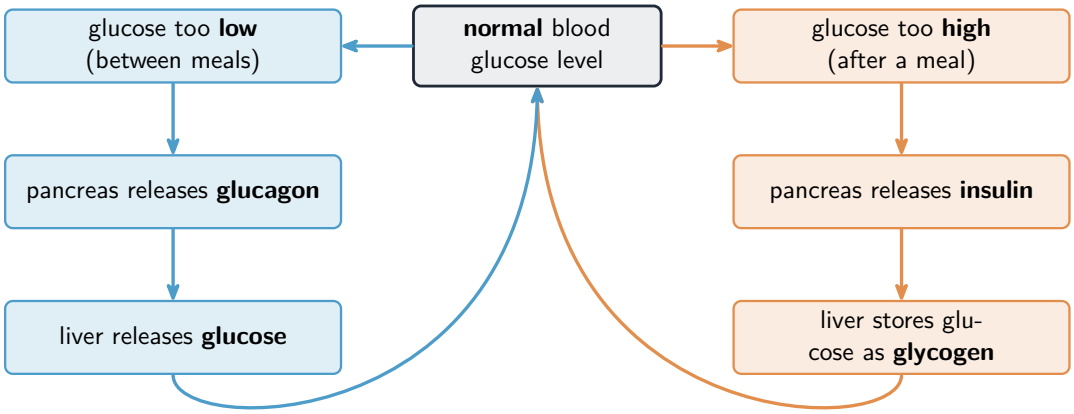
Build the skills to answer exam questions on **hormones** 激素 — what they are, the main glands and hormones, **adrenaline** 肾上腺素, and nervous vs hormonal control.

You must be able to:

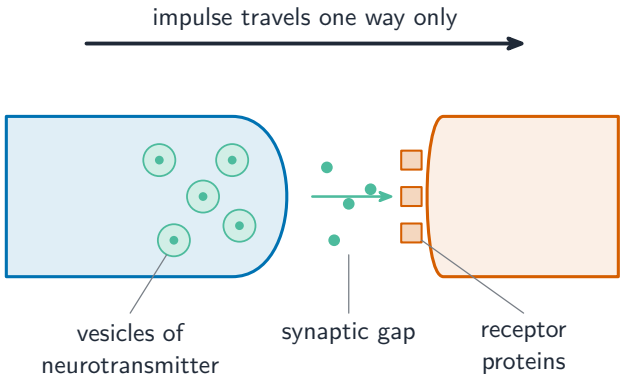
- define a hormone and name the main glands and their hormones
- describe the effects of adrenaline
- compare nervous and hormonal control

1 Worked examples

Hormones



Hormones are chemicals made by glands, carried in the blood, acting on target organs



Hormonal control compared with nervous (synapse) control

Gland	Hormone
adrenal	adrenaline
pancreas	insulin (and glucagon)
ovaries / testes	oestrogen / testosterone

2 Practice

2.1 Define a hormone. [2]

2.2 Name the gland that releases adrenaline. [1]

3 Exam-style questions

3.1 Compared with nervous control, hormonal control is: [1]

- **A** faster and shorter-lived
- **B** slower and longer-lasting
- **C** electrical
- **D** instant

3.2 Adrenaline is released in 'fight or flight' situations.

(a) State two effects of adrenaline on the body. [2]

(b) State how a hormone travels to its target organ. [1]

Solutions

2.1 a chemical made by a gland, carried in the blood, that changes the activity of a target organ.

2.2 the adrenal gland.

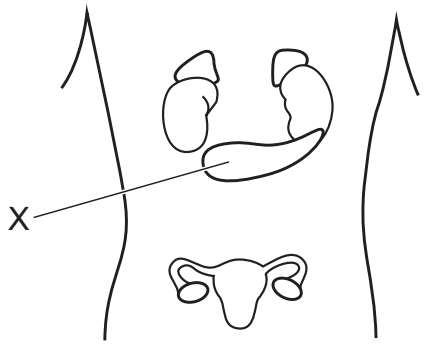
3.1 B. Hormonal control is slower but longer-lasting.

3.2 (a) any two of: increases heart rate; increases breathing rate; raises blood glucose; widens the pupils.
(b) in the blood.

20 Which effect does adrenaline have on blood glucose concentration and pulse rate?

	blood glucose concentration	pulse rate
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

23 The diagram shows the position of some of the human endocrine glands.



Which hormone is secreted by X?

A adrenaline

B insulin

C oestrogen

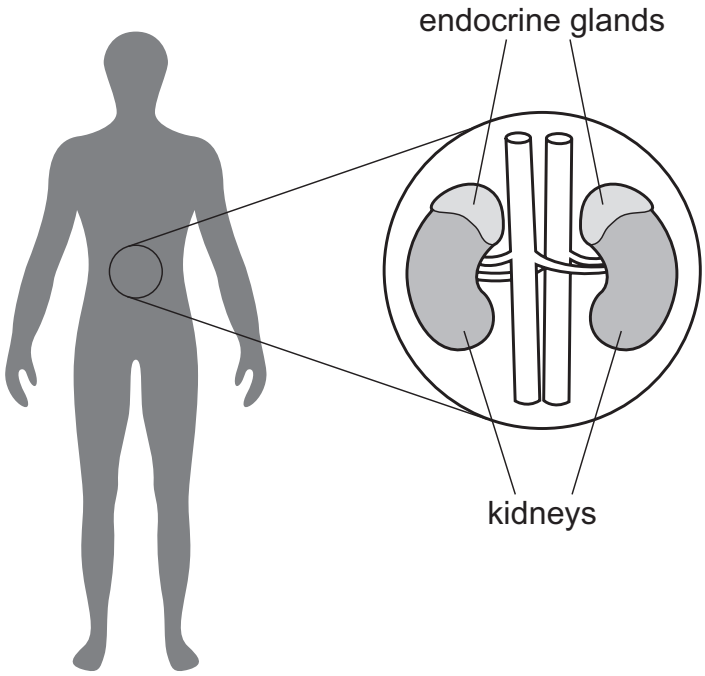
D testosterone

24 Which row shows the correct speed and duration for the type of control?

	type of control	speed of action	duration of effect
A	hormonal	fast	short
B	hormonal	slow	long
C	nervous	fast	long
D	nervous	slow	short

IGCSE Biology: **s25 21**

23 The diagram shows the positions of two endocrine glands in the human body.



What is a response of the body to the hormone released from these glands?

A a decrease in heart rate

B a decrease in blood glucose concentration

C an increase in pupil diameter

D the development of secondary sexual characteristics

IGCSE Biology: **s25 22**

25 Which organ produces glucagon?

A adrenal gland

B liver

C ovary

D pancreas

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25 Which hormones increase the blood glucose concentration in humans?

A adrenaline and glucagon

B adrenaline and insulin

C glucagon only

D insulin only

3 **(a)** Complete the sentences about the control of blood glucose concentration.

Blood glucose concentration increases after a person eats a meal containing carbohydrates.

This causes the ..... to release insulin. Insulin causes the ..... to remove glucose from the blood and convert it into ..... .

The control of blood glucose concentration is an example of ..... .

[4]

(b) Outline the treatment of type 1 diabetes.

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..... [2]

(c) A scientist investigated the effect of an injection of glucose solution on blood glucose concentration in healthy people. The injection was given at 0 minutes.

Fig. 3.1 shows the results.

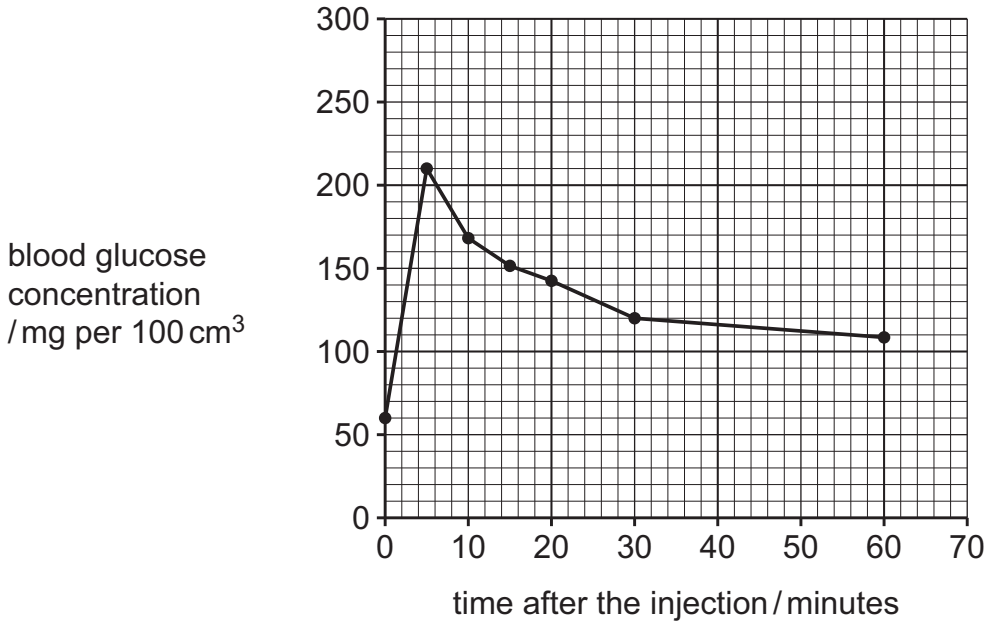

Fig. 3.1

Calculate the percentage change in the blood glucose concentration from 5 minutes after the injection to 30 minutes after the injection.

Give your answer to **two** significant figures.

Space for working.

..... % [3]

(d) Adrenaline also affects blood glucose concentration.

Suggest how this is an advantage for the “fight or flight” response.

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.....[3]

[Total: 12]

IGCSE BIOLOGY • EXERCISE SHEET

14.4 Homeostasis

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS set point 设定点 • blood glucose 血糖 • diabetes 糖尿病 • sweating 出汗 • environment 环境

Objective

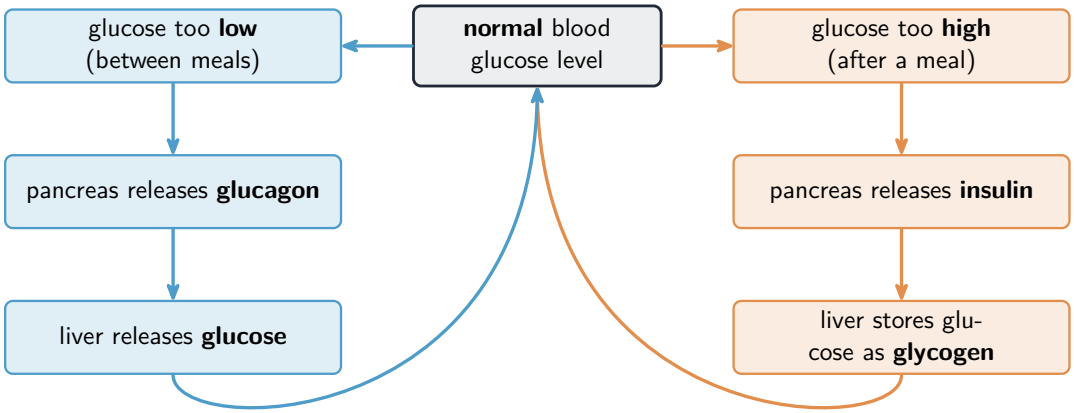
Build the skills to answer exam questions on **homeostasis** 稳态 — **negative feedback** 负反馈, controlling **blood glucose** 血糖, **diabetes** 糖尿病, and temperature control.

You must be able to:

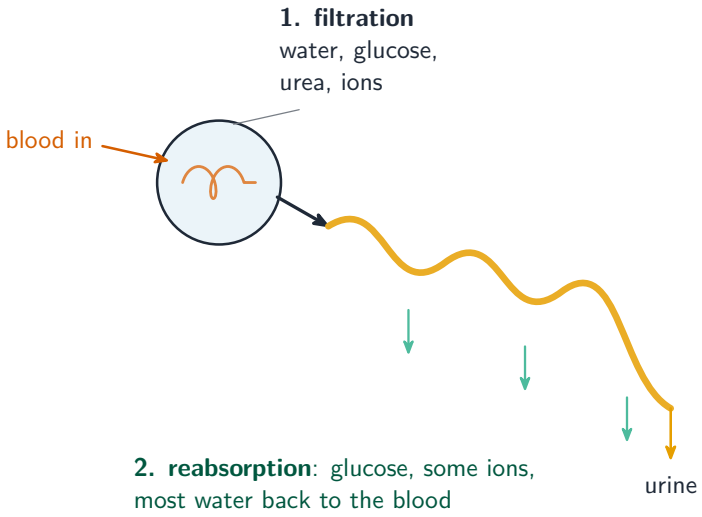
- define homeostasis and explain negative feedback
- describe how insulin and glucagon control blood glucose
- describe how the skin controls body temperature

1 Worked examples

Blood glucose control



Negative feedback keeps blood glucose near a set point



The kidney is a key homeostatic organ

- **insulin:** after a meal, liver stores glucose as glycogen (lowers glucose).
- **glucagon:** between meals, liver releases glucose (raises glucose).
- **too hot:** sweating + vasodilation; **too cold:** shivering + vasoconstriction.

2 Practice

2.1 Define homeostasis. [1]

2.2 Name the hormone that lowers blood glucose. [1]

3 Exam-style questions

3.1 When you are too hot, the blood vessels near the skin surface: [1]

- **A** narrow (vasoconstriction)
- **B** widen (vasodilation)
- **C** disappear
- **D** stop carrying blood

3.2 Blood glucose is kept steady by negative feedback.

(a) Describe what happens after a meal raises blood glucose. [3]

(b) State what causes Type 1 diabetes. [1]

3.3 Explain how sweating helps cool the body. [2]

Solutions

2.1 keeping a constant internal environment inside the body.

2.2 insulin.

3.1 B. When too hot, the vessels widen (vasodilation) to lose more heat.

3.2 (a) the pancreas releases insulin; the liver takes up glucose and stores it as glycogen; so blood glucose falls back to normal.
(b) the pancreas cannot make insulin.

3.3 sweat evaporates from the skin; evaporation takes heat from the body, cooling it.

Name:

IGCSE Biology: **w25 23**

22 Which actions can prevent a mammal's internal body temperature falling too low?

A shivering and vasoconstriction

B shivering and vasodilation

C sweating and vasoconstriction

D sweating and vasodilation

IGCSE Biology: **s25 21**

24 What is a response of the human body to overheating?

A vasoconstriction of arterioles

B vasoconstriction of veins

C vasodilation of arterioles

D vasodilation of veins

IGCSE Biology: **s25 43**

3 **(a)** Complete the sentences about the control of blood glucose concentration.

Blood glucose concentration increases after a person eats a meal containing carbohydrates.

This causes the ..... to release insulin. Insulin causes the ..... to remove glucose from the blood and convert it into ..... .

The control of blood glucose concentration is an example of ..... .

[4]

(b) Outline the treatment of type 1 diabetes.

.....

.....

.....

.....

..... [2]

(c) A scientist investigated the effect of an injection of glucose solution on blood glucose concentration in healthy people. The injection was given at 0 minutes.

Fig. 3.1 shows the results.

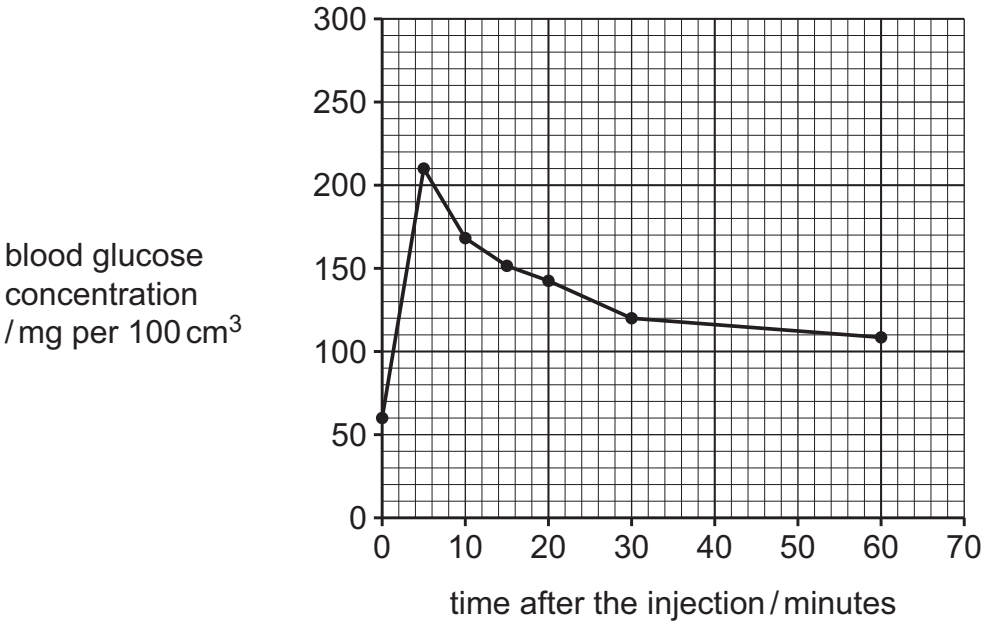


Fig. 3.1

Calculate the percentage change in the blood glucose concentration from 5 minutes after the injection to 30 minutes after the injection.

Give your answer to **two** significant figures.

Space for working.

..... % [3]

(d) Adrenaline also affects blood glucose concentration.

Suggest how this is an advantage for the “fight or flight” response.

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 12]

22 The liver and the pancreas work together to control the concentration of glucose in the blood.

Which statement is correct?

A The liver converts the small molecule glucose into the large molecule glucagon.

B The liver releases the hormone insulin when blood glucose concentration is too high.

C The pancreas does **not** respond to an increase in blood glucose concentration.

D The pancreas responds to a fall in the blood glucose concentration by increasing the release of the hormone glucagon.

2 **(a)** The internal body temperature of a person was recorded.

Fig. 2.1 shows the results.

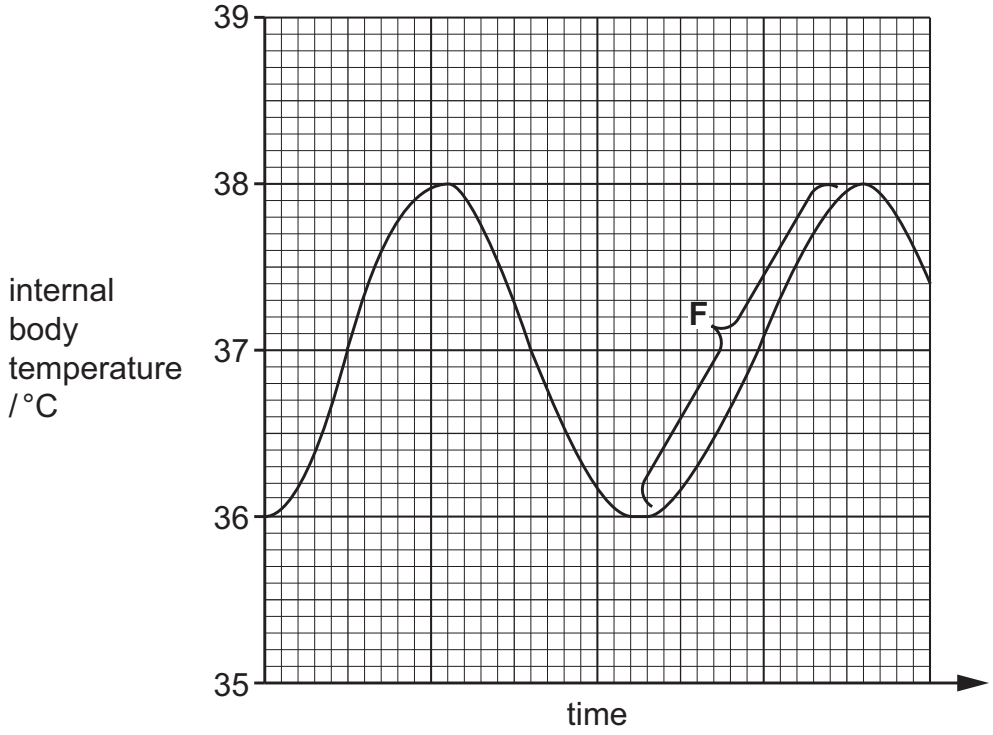


Fig. 2.1

(i) Using the information in Fig. 2.1, calculate the temperature range for the internal body temperature of the person.

State the units.

..... [1]

(ii) On Fig. 2.1, draw a line to show the set point for the internal body temperature of the person. [1]

(iii) The maintenance of internal body temperature is an example of homeostatic control.

State the name of the mechanism for homeostatic control.

..... [1]

(iv) On Fig. 2.1, region **F** shows a change in body temperature.

Explain how the body causes the change in body temperature shown.

.....

.....

.....

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.....

.....

..... [5]

(b) Fig. 2.2 shows a cross-section of human skin.

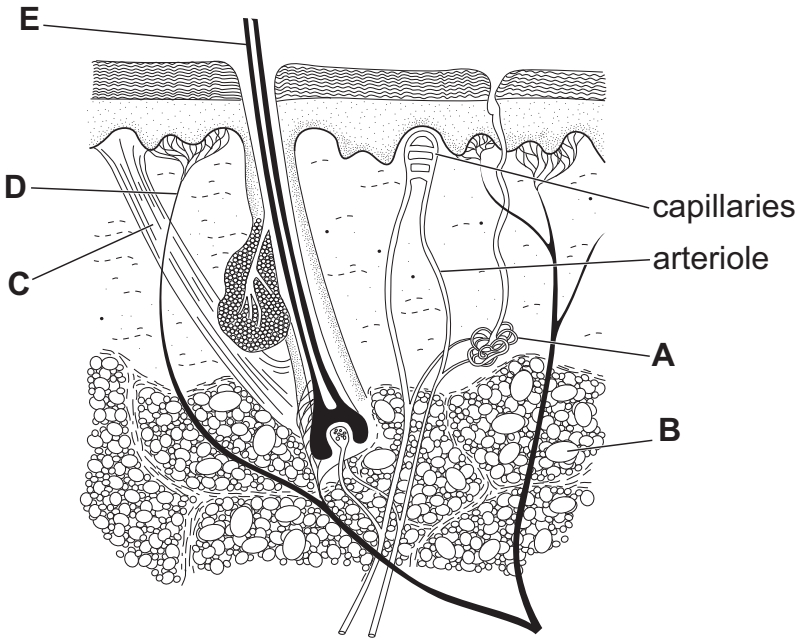


Fig. 2.2

(i) State the letter of the structure shown in Fig. 2.2 that produces sweat.

..... [1]

(ii) State the names of structures **C** and **D** shown in Fig. 2.2.

C .....

D .....
[2]

[Total: 11]

IGCSE BIOLOGY • EXERCISE SHEET

14.5 Tropic responses

Name: _____ Class: _____ Date: _____ **Total: 7 marks**

KEY WORDS shoot 嫩枝 • auxin 生长素 • tropism 向性 • phototropism 向光性 • gravitropism 向地性

Objective

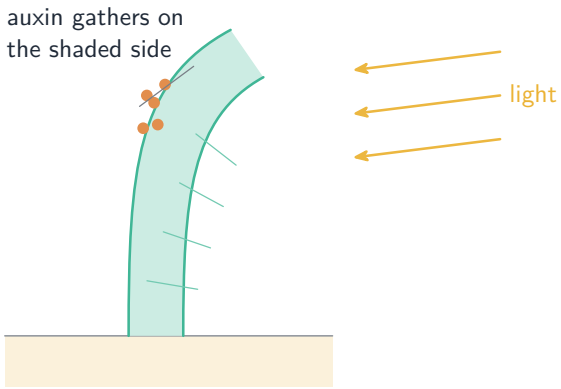
Build the skills to answer exam questions on **tropic responses** 向性反应 — **phototropism** 向光性 and **gravitropism** 向地性, and the role of **auxin** 生长素.

You must be able to:

- define phototropism and gravitropism
- describe how auxin controls a shoot's response to light
- predict the direction of growth

1 Worked examples

■ Phototropism and auxin



cells on the shaded side grow longer, so the shoot bends towards the light

Auxin from the tip gathers on the shaded side; those cells grow longer, so the shoot bends to the light

- **phototropism:** growth towards light (shoots positive). **gravitropism:** roots down, shoots up.
- auxin made in the shoot tip; it makes cells elongate.

2 Practice

2.1 Define phototropism. [1]

2.2 State the direction a root grows in response to gravity. [1]

3 Exam-style questions

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

3.2 Auxin controls phototropism.

(a) State where auxin is made. [1]

(b) Explain how unequal auxin makes a shoot bend towards the light. [3]

Solutions

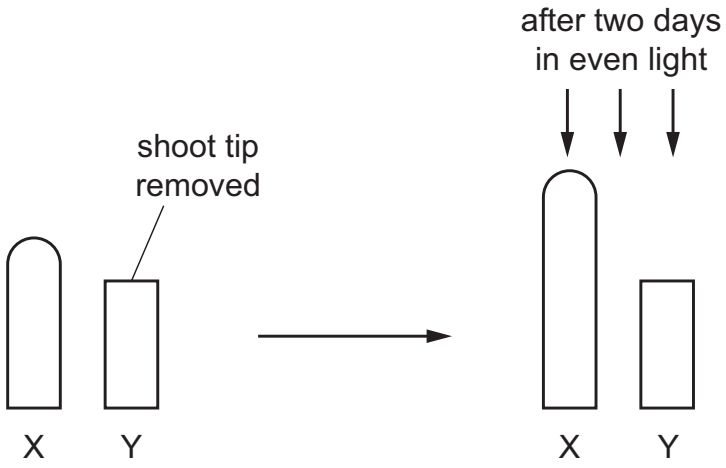
2.1 a plant's growth response towards (or away from) the direction of light.

2.2 downwards (towards gravity).

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

3.2 (a) in the shoot tip.
(b) light makes auxin spread to the shaded side; auxin makes those cells elongate (grow longer); so the shaded side grows faster and the shoot bends towards the light.

21 The diagram shows an experiment using two wheat shoot tips, X and Y.



Which statement is supported by the evidence provided by this experiment?

A Auxin moves through the plant by osmosis.

B Auxin is made in the shoot tip.

C Auxin is unequally distributed in response to light.

D Auxin inhibits cell elongation.

25 A student writes four statements about auxin.

1 Auxin becomes more concentrated on the lower side of a horizontal stem.

2 Auxin becomes more concentrated on the side of the shoot that has more light.

3 Auxin is made in the shoot tip.

4 Auxin prevents cell elongation in the shoot.

Which statements describe what happens during chemical control of plant growth?

A 1, 2 and 4 **B** 1 and 2 only **C** 1 and 3 **D** 2, 3 and 4

25 What is an example of phototropism?

A the growth of a root in the direction of gravity

B the growth of a shoot towards light

C the release of energy from glucose using light

D the synthesis of glucose using light

26 A young seedling is growing underground.

The shoot grows towards the surface of the ground.

The root grows away from the surface of the ground.

Which row describes the responses involved?

	gravitropism		phototropism	
	root	shoot	root	shoot
A	yes	yes	no	no
B	yes	no	no	yes
C	no	yes	yes	no
D	no	no	yes	yes

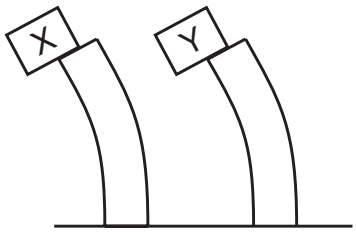
26 A shoot tip was placed on an agar block. Substances can diffuse through agar.

Light was shone on the shoot tip from one direction.

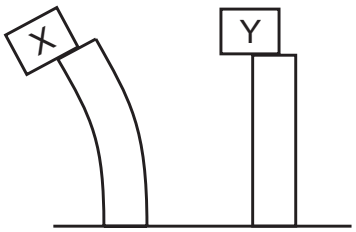
After three days, the agar was cut in half to form blocks X and Y. Blocks X and Y were placed on the stems of shoots that had the tips cut off. The agar blocks were kept on the shoot stems for one week.

Which set of shoots represents the results after one week?

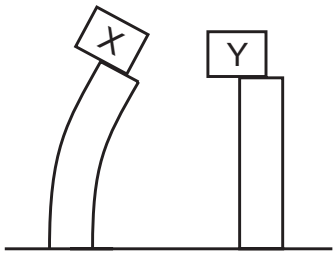
A



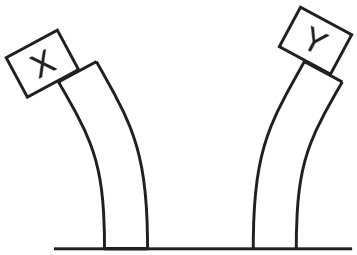
B



C



D



6 **(a)** Some maize seeds were pinned on a board and provided with light from all directions.

The board was placed in a clinostat that rotated the board.

The board was rotated continuously as the seeds germinated and the roots grew.

Fig. 6.1 shows the apparatus and results after 5 days.

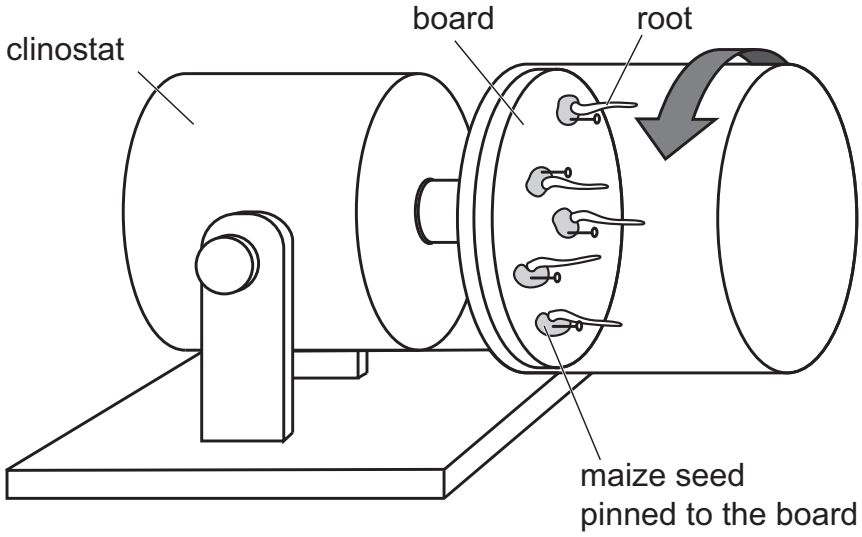


Fig. 6.1

(i) Complete the sentences to explain the root growth in Fig. 6.1.

Auxin is produced in shoot and root ..... . The auxin travels

down the root by the process of ..... .

As the clinostat rotates, the effect of ..... on all sides of the root is equal.

This causes the distribution of auxin in the root to be ..... .

Auxin stimulates cell ..... causing the roots to grow horizontally.
[5]

(ii) The rotation of the clinostat was stopped.

Predict the change in growth that will occur in the germinating maize seeds in Fig. 6.1.

.....

.....

..... [1]

(iii) State the name of the tropic response to light.

..... [1]

(b) A student observed cells from a plant that had wilted.

State **and** explain the expected appearance of the cells.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 10]

23 In the dark, plant shoots grow upwards and roots grow downwards.

What causes these responses?

	gravitropism	phototropism
A	no	no
B	no	yes
C	yes	no
D	yes	yes