Human endocrine system

4.5.3.1 · Homeostasis and response · revision notes

The glands of the endocrine system, the hormones they release, and how hormonal control compares with nervous control. Expect labelling of glands on a body outline, matching glands to hormones, and 'compare' questions.

Key facts

- Hormone = chemical secreted by a gland into the blood, carried to a target organ
- Pituitary also releases ADH (water balance)
- Adrenal glands: adrenaline
- Ovaries: oestrogen and progesterone; testes: testosterone
- Pituitary: 'master gland'; releases FSH, LH and TSH
- Thyroid: thyroxine
- Pancreas: insulin and glucagon
- Hormones: slower but longer-lasting than nerve impulses

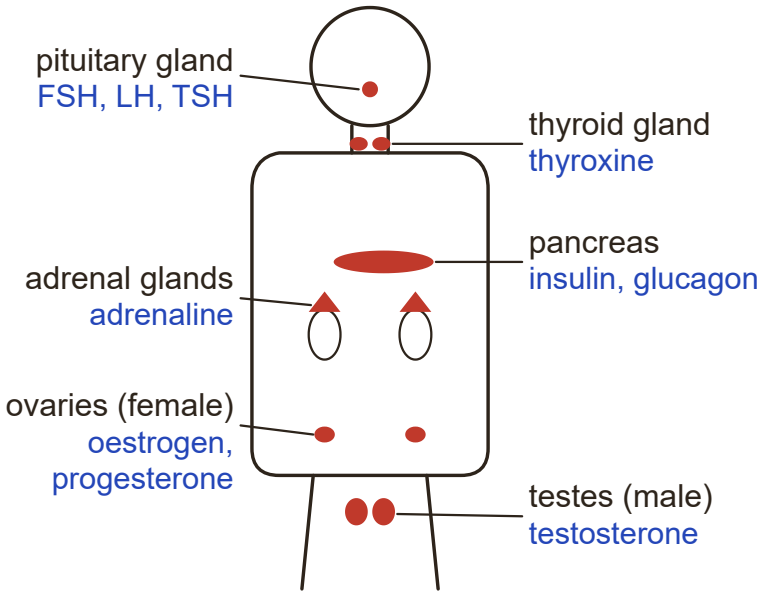
Notes

The endocrine system

- The **endocrine system** is made up of **glands** that secrete chemicals called **hormones** directly into the **bloodstream**.
- The blood carries the hormone to a **target organ**, where it produces an effect.
- Compared with the nervous system, the effects of hormones are **slower** but **act for longer**.

Glands and their hormones

- **Pituitary gland** (in the brain): the **'master gland'**. It secretes several hormones into the blood in response to body conditions. Some of these act on other glands, stimulating them to release their own hormones.
- Pituitary hormones include **FSH** and **LH** (which act on the ovaries) and **TSH** (which stimulates the thyroid).
- The pituitary also releases **ADH**, which acts on the kidneys to control the water content of the blood.
- **Thyroid gland** (in the neck): **thyroxine**, which controls metabolic rate.
- **Adrenal glands** (on top of the kidneys): **adrenaline**, for 'fight or flight'.
- **Pancreas** (below the stomach): **insulin** and **glucagon**, which control blood glucose.
- **Ovaries**: **oestrogen** and **progesterone**. **Testes**: **testosterone**.



The main endocrine glands (red) and their hormones (blue).

Nervous and hormonal control compared

- Nervous: **electrical impulses** along **neurones**; very **fast**; **short-lived**; acts on a precise area.
- Hormonal: **chemicals** carried in the **blood**; **slower**; **longer-lasting**; can affect target organs all over the body.
- Nervous control suits fast, short responses such as reflexes; hormonal control suits slower, long-term processes such as growth and the menstrual cycle.

How to answer each type of question

Name the gland or hormone

1 mark each | **Grade 4**

1. Learn each gland with its hormone as a pair.
2. Spell the gland carefully: 'adrenal', 'thyroid', 'pituitary'.

Example. Name the gland that produces:
(a) adrenaline
(b) thyroxine
(c) insulin
(d) testosterone.

Model answer.

(a) Adrenal gland (1)
(b) Thyroid gland (1)
(c) Pancreas (1)
(d) Testes (1)

Compare nervous and hormonal control

3 to 4 marks | **Grade 5**

1. Make direct comparisons with 'whereas'.
2. Cover how the information travels, the speed, and how long the effect lasts.

Example. Compare the way the nervous system and the endocrine system send information around the body.

Model answer. The nervous system uses electrical impulses, whereas the endocrine system uses hormones / chemicals (1). Impulses travel along neurones, whereas hormones are carried in the blood (1). Nervous responses are faster (1), but the effects of hormones last longer (1).

Explain the role of the pituitary gland

2 marks | **Grade 5**

1. Say that it secretes several hormones in response to body conditions.
2. Say that some of these stimulate other glands to release hormones, and give an example.

Example. The pituitary gland is often called the 'master gland'.
Explain why.

Model answer. It secretes several hormones into the blood in response to body conditions (1). Some of these hormones act on other glands, stimulating them to release their own hormones, e.g. TSH stimulates the thyroid to release thyroxine (1).

Don’t lose marks

- Saying hormones travel along nerves. They are carried in the blood.
- Saying hormones are slower without giving the other half: their effects last longer.
- Putting the adrenal glands in the wrong place. They sit on top of the kidneys.
- Mixing up the pituitary gland (in the brain) and the pancreas (in the abdomen).

More tips

Memory tricks

- ADRENaline comes from the ADRENal glands; THYRoxine from the THYRoid.
- Glands from the head down: pituitary, thyroid, adrenal glands and pancreas, then ovaries or testes.
- Nerves are like a text message: instant, to one place. Hormones are like a letter in the post: slower, but the effect lasts.
- Endocrine glands pour hormones straight into the blood: there are no tubes.

Exam technique

- In 'compare' questions, every point must say something about both systems.
- Learn gland positions on a body outline: labelling questions are quick marks.
- When a question names a hormone, try to give the gland it comes from and its target organ.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3 — **Define a hormone**
A chemical secreted by a gland directly into the bloodstream, which carries it to a target organ.

Grade 4 — **Locate the main endocrine glands**
Pituitary, thyroid, adrenal glands, pancreas, ovaries and testes on a body diagram.

Grade 4 — **Match glands to their hormones**
E.g. pancreas: insulin; adrenal glands: adrenaline; testes: testosterone.

Grade 5 — **Compare hormonal and nervous control**
Hormones travel in the blood and are slower but longer-lasting; nerve impulses are fast and short-lived.

Grade 5 — **Explain why the pituitary is the 'master gland'**
Its hormones act on other glands, stimulating them to release their own hormones.

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