

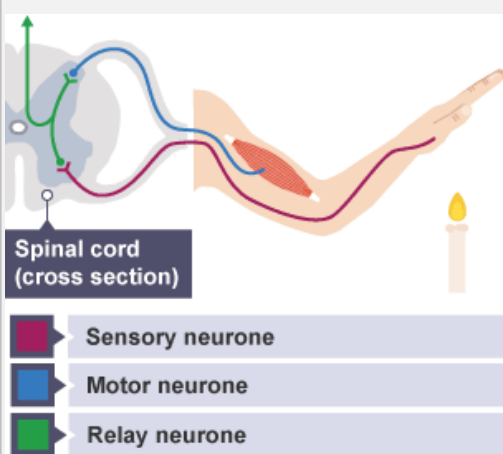
Homeostasis is the regulation of internal conditions to keep them the same – at **optimal conditions**. This means they cannot get too high or too low
It is controlled by two systems:

	Nervous System	Endocrine system
Response	Rapid	Slower
Message	Electrical	Hormone
Action	Specific location	Target organ

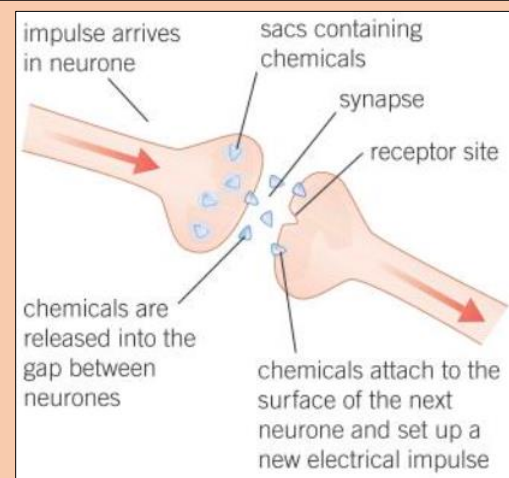
All control systems follow this pattern:

1. **Receptor** detects changes.
2. **Co-ordination centre** receives message (CNS, pancreas etc)
3. **Effector** respond (muscles or glands)

The CNS is the brain and spinal cord
Reflex reactions are co-ordinated by the **spine** so they are **fast and automatic**.



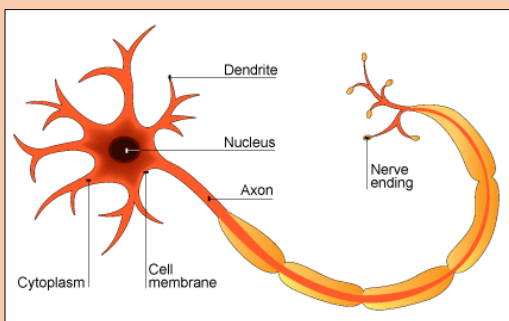
Nerves are linked to each other by **synapses**. The signals are transferred by **neurotransmitters**.



At the synapse, the signal becomes a **chemical signal**.

The electrical signal in one neurone causes the release of chemical neurotransmitters.

These diffuse across the synapse and trigger another electrical impulse on the next neurone.



Nerve cells (neurones) are adapted to their function by having a long **axon** that allows them to reach across the body.

The axon is surrounded by the myelin sheath – this speeds up transmission of impulses by **insulating** the cell and providing gaps the impulse can “jump across”.

Make sure you can label all the regular parts of a cell on a neurone.

Required Practical: Plan and carry out an investigation into a named factor on human reaction times.

Things that might affect human reaction times:

- Distractions
- Alcohol
- Caffeine

One of these could be an **independent variable**.

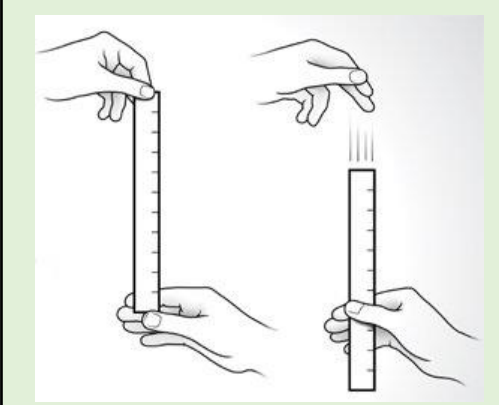
The rest would be **control variables**.

Anything else that needs to be kept the same would also be a control variable (e.g. same measuring equipment).

Control variables are important because they allow you to compare data from different tests and make a reliable conclusion.

The **dependant variable** is what you will measure to measure reaction time.

One method involves dropping a ruler and using the distance it fell to measure reaction time:



To make a reliable conclusion you would have to repeat the test and take an average score. This will allow you to spot anomalies and get a more accurate measure of reaction time.

Hormones are released from the **endocrine system** from special tissue called glands (or glandular tissue):

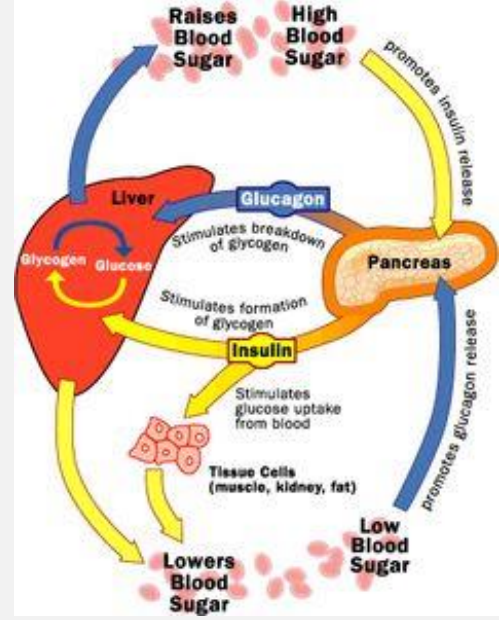
- Pituitary gland
- Thyroid gland
- Pancreas
- Ovaries/testes
- Adrenal glands

Diabetes is a disease effecting the hormones that control blood glucose levels.

Insulin from the pancreas removes glucose from the blood by allowing the liver to absorb it and convert it into **glycogen**.

Glycogen can be converted back into glucose using **glucagon**.

Type 1 diabetes is where the pancreas cannot produce enough insulin. This is controlled with injections of insulin into fatty tissues.
Type 2 is diabetes is where cells do not respond as much to insulin and is caused by poor diets.



Human reproduction is controlled by hormones. **Testosterone** causes male development; **Oestrogen** causes female development. The menstrual cycle controls female reproduction. It is controlled by four hormones:

- **FSH** causes eggs to mature
- **LH** causes the egg to be released
- **Oestrogen** thickens the uterus lining and inhibits FSH production
- **Progesterone** maintains the lining of the uterus and inhibits both FSH and LH

FSH and LH are produced in the **pituitary gland**.

Oestrogen is produced by the ovary.

Progesterone is produced in the ovary.

Falling levels of FSH and LH caused by progesterone trigger **menstruation** (the break down of the uterus lining).

Fertility treatments are used to help women get pregnant who normally would not be able.

Hormonal fertility treatments involve providing a woman with artificial FSH to make more eggs mature and then artificial LH to cause ovulation.

- This requires careful control of the hormonal dosage
- The advantages include that it is a relatively simple and stress free treatment

IVF is where eggs are matured using artificial FSH and then collected. Eggs are fertilised in a lab and then implanted once they have begun to divide.

- IVF is not 100% successful and will have lower success rates in older women.
- It is also emotionally and physically demanding
- It can however help women with blocked or damaged oviducts

Contraception is used to plan pregnancies.

Hormonal contraception can involve using a pill, patch, implant or injection to provide oestrogen and a small amount of progesterone. These will inhibit FSH and LH.

Barrier methods (male and female condoms/diaphragm) prevent sperm reaching the egg. They also protect against STDs.

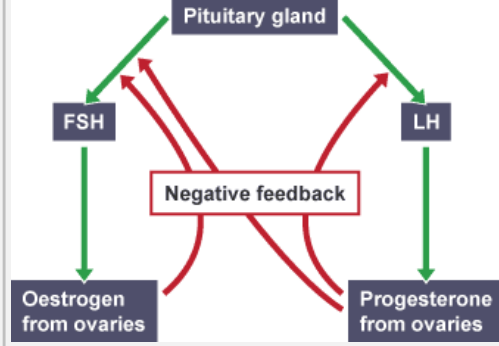
Intrauterine devices (IUDs) are small coils of copper inserted into the uterus to prevent implantation. They also produce lots of mucus to stop sperm. These are very effective, but can cause discomfort or period problems.

Surgery can also be used to sterilise someone permanently.

Negative feedback is where the action of a system feeds back to inhibit that action.

If something drops too low, an action causes it to rise, which will eventually stop when it gets to the correct level.

E.g. TSH causes the thyroid gland to make thyroid hormone. Thyroid hormone will stop the pituitary gland making TSH – it feeds back and stops its own production.



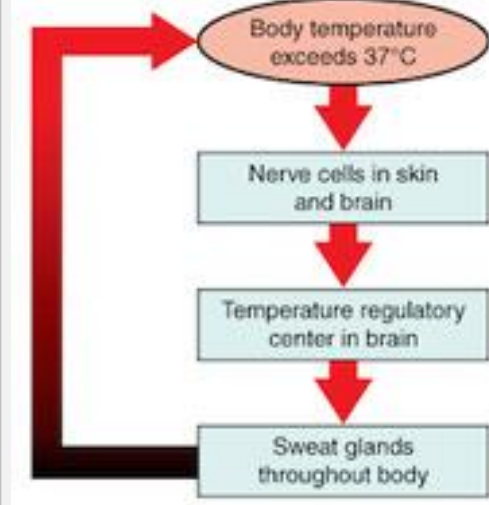
Adrenaline is a hormone that is not controlled by negative feedback.

Adrenaline is produced by the **adrenal glands** on the kidney in times of stress or fear.

- Adrenaline:
- Speeds up heart rate
 - Boosts blood supply to the muscles

This prepares the body for its "flight or fight" response as more energy will be needed so more respiration will need to occur.

This is not controlled by negative feedback because adrenaline levels do not have to be kept within specific levels.



- Keywords**
- Synapse** - the gap between two nerve cells
 - Pituitary gland** - gland in the brain that produced FSH, LH and other hormones
 - IUD** - Intrauterine device
 - Neurone** - nerve cell
 - Effector** - part of the body that gives a response (a muscle or a gland)
 - Receptor** - a cell that detects changes in the environment
 - Stimulus** - a change in the environment
 - IVF** - *In vitro* fertilisation

- Hormone** - a chemical messenger
- Respiration** - process that releases energy from glucose
- Adrenaline** - hormone that controls the flight-or-fight response
- Glucose** - sugar used in respiration
- Donor** - someone who donates an organ for transplant
- Reflex reaction** - a fast, automatic response to a stimulus
- Contraception** - method of preventing pregnancy
- STD** - Sexually Transmitted Disease
- Ovary** - part of the female reproductive system where eggs are stored.

