

1) The Human nervous System: enables humans to react to their surroundings and to coordinate their behaviour

Control system include:

Cells called receptors

which detect stimuli / changes in the environment

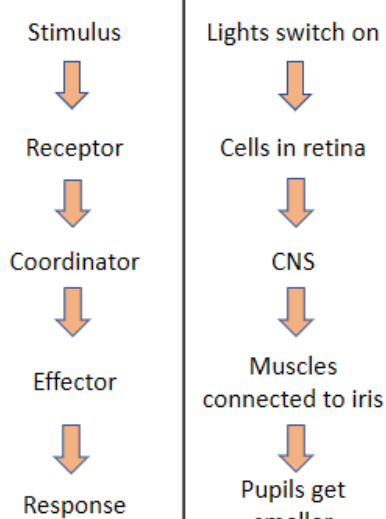
Coordination Centres such as the brain, spinal cord that receive information from the receptors.

Effectors such as the muscles and glands which bring about responses.



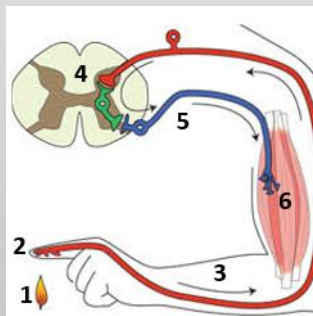
Central NS = brain and spinal cord.

Neurone = long cell, transmits electrical impulses



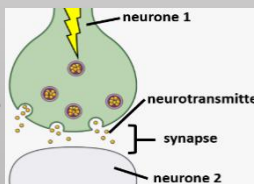
2) Reflex Action = Automatic, rapid response to danger to avoid further harm. Brain is not involved.

1. **Stimulus** – change in environment
2. **Receptor cell** – detects change
3. **Sensory neurone** – electrical impulse carried to CNS
4. **Relay neurone** – impulse transmitted to...
5. **Motor neurone** – impulse carried away from CNS to...
6. **Effector** - muscle/gland that brings about the response



Synapse = gap between 2 neurones

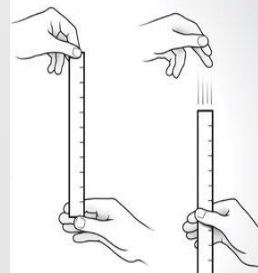
1. Electrical impulse arrives at synapse
2. Neurotransmitter diffuses across synapse
3. Bind to receptors on 2nd neurone
4. Electrical impulse passed on



3) Required Practical – REACTION TIMES

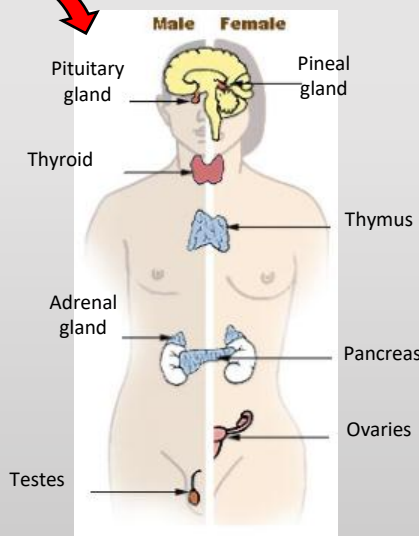
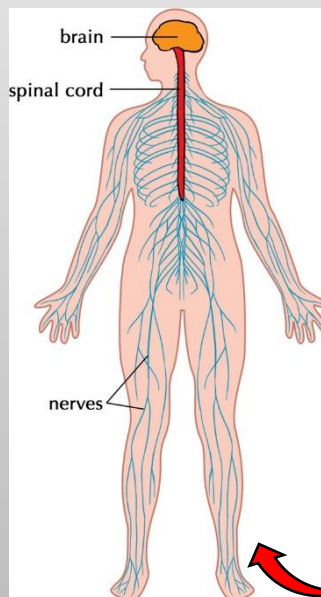
- Independent Variable: Number of practices
- Dependent Variable: Reaction time (distance where ruler is caught converted into a time)
- Control Variables
 - Ruler dropped from same height
 - Use weaker hand each time
 - Same test subject
 - Same mass of ruler
 - Same thickness of ruler

Conclusion – increasing the amount of practice, decreases reaction time



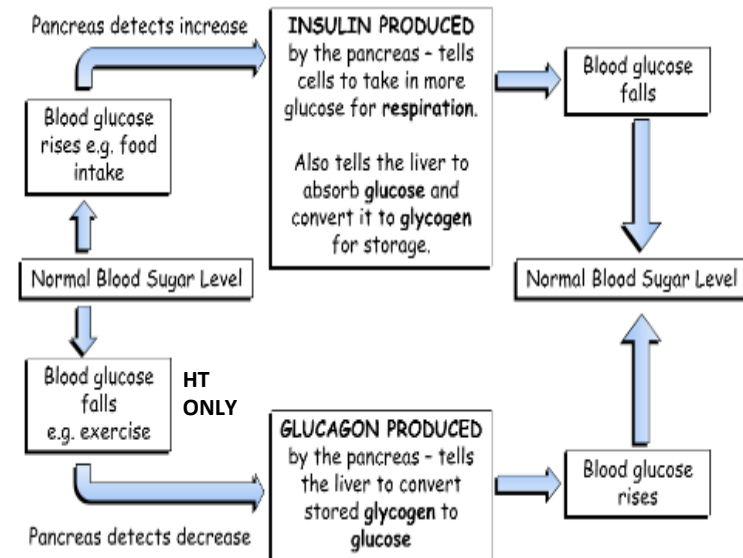
4) The Endocrine System: Composed of glands which secrete chemicals called **hormones** directly into the bloodstream. The blood carries the hormone to a target organ where it produces an effect.

Hormonal control – chemical, slow, blood, general, long lasting



Neuronal control – electrical, fast, neurones, specific, short lasting

5) Control of blood glucose concentration



Type 1 Diabetes – early onset

- Born with it - Don't make insulin
- Insulin injected daily
- Pancreas transplant/stem cells

Type 2 Diabetes – late onset

- Brought on by bad diet/obesity
- Liver does not respond to insulin
- Control diet & exercise

6) Negative Feedback (HT ONLY): a factor increases or decreases away from the normal and the system acts to **reverse** the change to bring the factor back to normal levels.

eg. **Thyroxine** – from the thyroid gland stimulates the basal **metabolic rate** and plays an important role in **growth and development**. The level of thyroxine in the blood is controlled by **negative feedback**.

Adrenaline is produced by the adrenal glands in times of fear or stress. It increases the heart rate and boosts the delivery of oxygen and glucose to the brain and muscles, preparing the body for 'flight or fight'.

7) Hormones In Human Reproduction



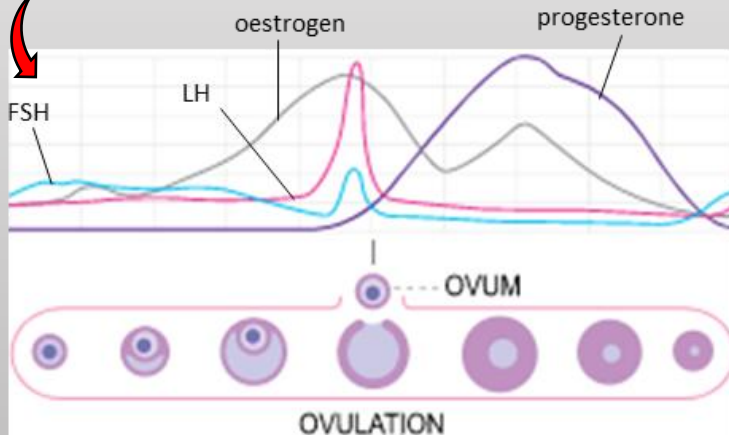
During puberty reproductive hormones cause secondary sexual characteristics to develop

Sex Hormones: Testosterone controls male puberty, sex characteristics & sperm production.

Menstrual cycle: controlled by 4 female hormones, 28 days (ovulation day 14)

FSH	<ul style="list-style-type: none"> From pituitary gland 	<ul style="list-style-type: none"> Egg matures in ovary
Oestrogen	<ul style="list-style-type: none"> From ovaries 	<ul style="list-style-type: none"> Stops FSH Thickens uterus lining Stimulates LH
LH	<ul style="list-style-type: none"> From pituitary gland 	<ul style="list-style-type: none"> Egg released (ovulation day 14)
Progesterone	<ul style="list-style-type: none"> From ovaries 	<ul style="list-style-type: none"> Maintains thick uterus lining

(HT only) a graph of hormone levels over time



8) Fertility can be controlled by hormonal and non hormonal methods.

These include:

- A) **oral contraceptives** that contain hormones to inhibit FSH production so that no eggs mature
- B) **injection, implant or skin patch** of slow release progesterone to inhibit the maturation and release of eggs for a number of months or years
- C) **barrier methods** such as condoms and diaphragms which prevent the sperm reaching an egg
- D) **intrauterine devices** which prevent the implantation of an embryo or release a hormone
- E) **spermicidal agents** which kill or disable sperm
- F) **abstaining** from intercourse when an egg may be in the oviduct
- G) **surgical methods** of male and female sterilisation

Evaluate the use of:

A

☺ Easily self-administered. Short-term effects. Can easily be reversed. Very reliable.

☹ May have mild side-effects associated. Could lead to pregnancy if missed. Does not protect from STIs.

B

☺ Administered through routine appointment at GP surgery. Requires little to no aftercare or maintenance. Very reliable.

☹ May take some time for effects to be reversed once removed. Does not protect from STIs.

C

☺ Easy to use. Short-term effects. Very reliable. Provides protection from most STIs.

☹ Can fail.

D

☺ Requires little to no aftercare or maintenance. Very reliable.

☹ May take some time for effects to be reversed once removed. Does not protect from STIs.

E

☺ Easy to use. Short-term effects.

☹ Does not protect from STIs. Less effective when used as the only method.

F

☺ inexpensive

☹ Not always reliable.

G

☹ Risks associated with surgery (such as infection).

☹ Difficult to reverse (if at all possible). Can take several months to be reliable.

9) The use of hormone to treat infertility (HT only)

Hormones are used in modern reproductive technologies to treat infertility.

FSH and LH are used as 'fertility drugs' to help someone become pregnant in the normal way

In Vitro Fertilisation (IVF) treatment.

Involves giving a mother FSH and LH to stimulate the maturation of several eggs

The eggs are collected from the mother and fertilised by sperm from the father in a laboratory.



The fertilised eggs develop into embryos.



At the stage when they are tiny balls of cells, one or two embryos are inserted into the mother's uterus (womb).

Potential disadvantages of IVF

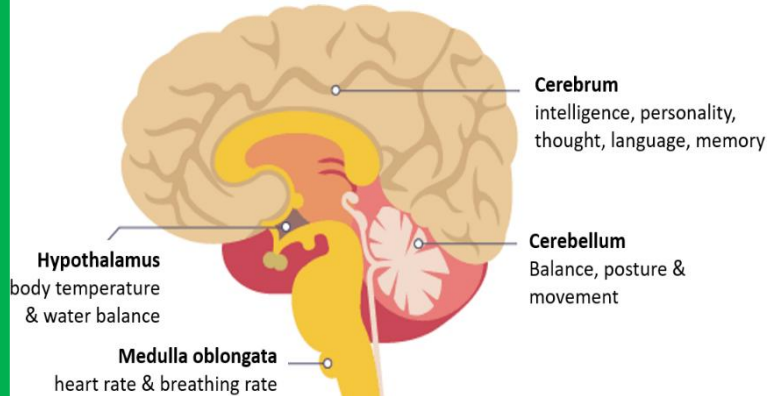
Emotional and physical stress.

Success rates are not high.

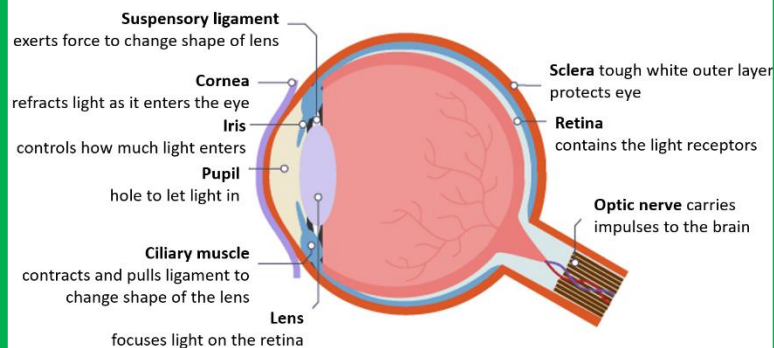
Multiple births risk to mother and babies.

10) The Brain: controls complex behaviour, made of billions of interconnected neurones & different regions for different functions. Scientists try to understand how the brain works by:

- Studying people with brain damage – what doesn't work
- Electrically stimulate different brain regions – see what happens
- MRI scans – see inside the brain and watch activity change
- Investigating problems with the brain eg. strokes



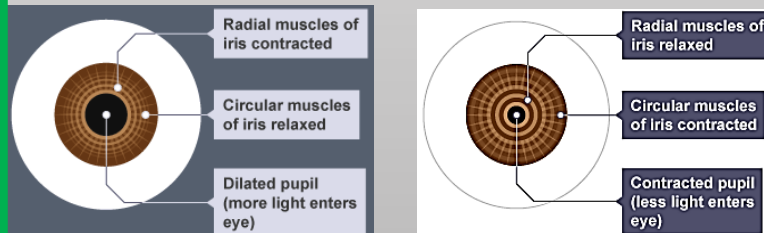
11) The Eye: sense organ containing receptors sensitive to light intensity and colour.



Pupil reflex: dim light

v

bright light



12) Accommodation: the process of changing the shape of the lens to focus on near or distant objects.

To focus on a **near** object:

- the ciliary muscles **contract**
- the suspensory ligaments **loosen**
- the lens is then **thicker** – more refraction of light rays.

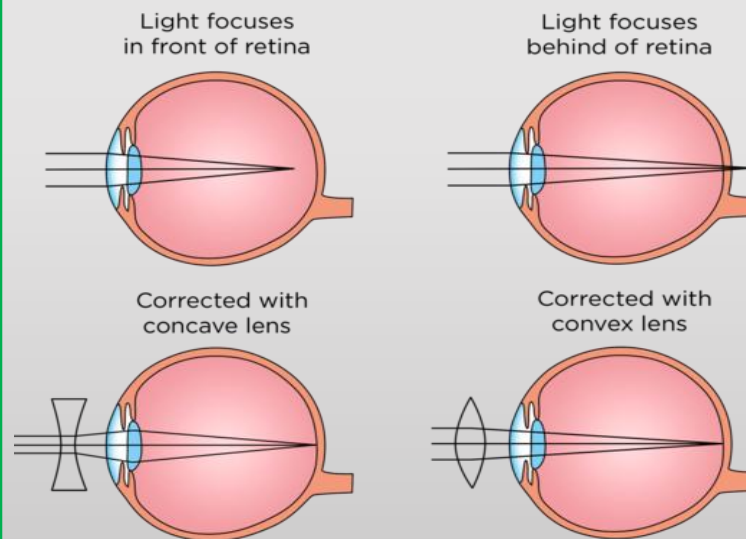
To focus on a **distant** object:

- the ciliary muscles **relax**
- the suspensory ligaments are **pulled tight**
- the lens is then pulled **thin** - less refraction of light rays.

13) Sight defects: rays of light do not focus on the retina

Myopia (short sightedness)

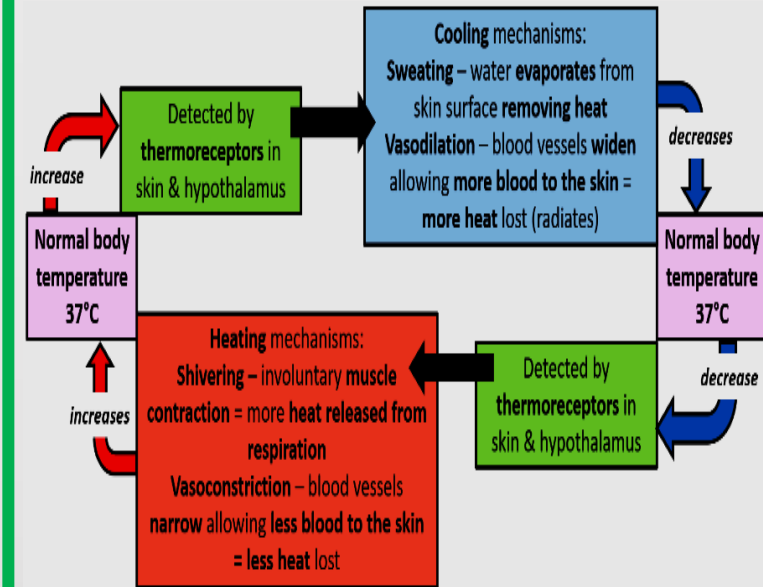
Hyperopia (long sightedness)



Treated with spectacle lenses which refract the light rays so that they do **focus on the retina**.

New technologies: hard and soft contact lenses, laser surgery to change the shape of the cornea and a replacement lens in the eye.

14) Thermoregulation: core body temperature is monitored by the **hypothalamus** and controlled by **negative feedback**



15) Kidney: organ controlling the blood concentration of water, ions, urea

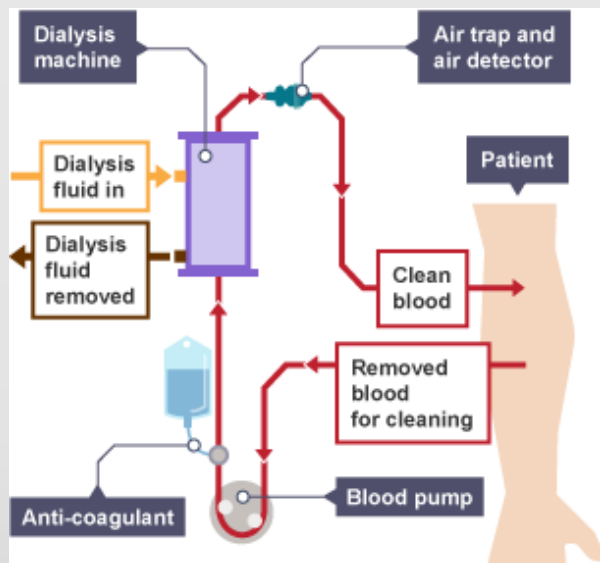
Kidneys produce urine by **filtration** of the blood and selective reabsorption of useful substances such as **glucose** (by active transport) some **ions** (by diffusion) and **water** (by osmosis). Large molecules (proteins) and blood cells are not filtered out of the blood as they are not small enough.

Urea: by-product of excess **amino acid breakdown** (deamination in the liver)

(HT) The water level in the body is controlled by the hormone **ADH** which makes the **kidney tubules more permeable** to water. ADH is released by the **pituitary gland** when the blood is **too concentrated** and it causes **more water** to be **reabsorbed** back into the blood from the kidney tubules. This results in a **smaller volume of concentrated urine** being formed. Blood water level is controlled by **negative feedback**.

15) Kidney Failure: Infections, accidents or inheritance can lead to kidney failure. Toxins would build up, pH levels would change, cells would be damaged, enzymes would denature and eventual death is likely.

Treatment includes **organ transplant** or **kidney dialysis**.



Dialysis: The fluid in the dialysis machine has no urea, a normal glucose concentration and a normal ion concentration this controls movement of substances from the patient's blood via diffusion.

+ patient doesn't die of blood poisoning
- 8hrs 3xper wk, restricted diet, tired, unwell, expensive

Transplant: Tissue-type match to ensure antigens are similar, risk from surgery, risk of rejection - immunosuppressant drugs are given for the rest of your life to decrease the activity of the immune system, transplanted organs need replacing on average every 10 years, return to normal quality of life with new kidney (no diet restrictions/hospital visits)

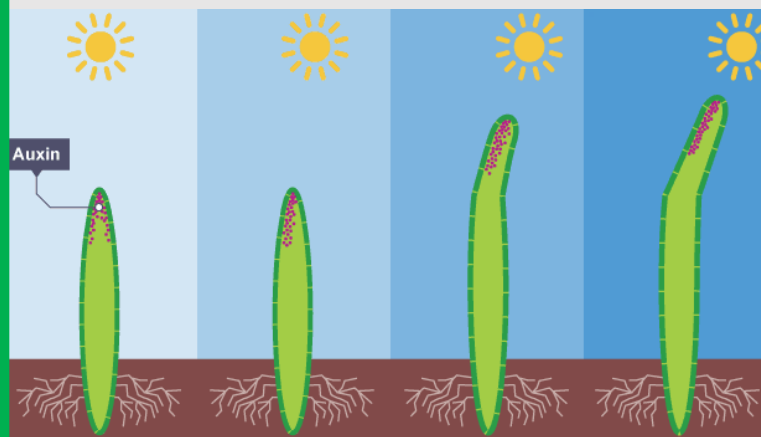
16) Plant Hormones:

Plants produce hormones to coordinate and control growth and responses to light (**phototropism**) and gravity (**gravitropism** or **geotropism**).

Unequal distributions of auxin cause unequal growth rates in plant roots and shoots. **Auxin** speeds up growth in the shoot cells and slows down growth in the root cells

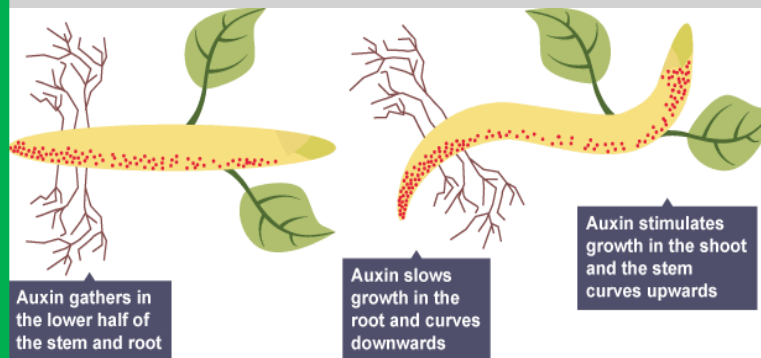
Why do plant shoots grow towards the Sun?

Auxin builds up on shaded side = cells on the shaded side grow faster = shady side grows faster = plant shoot grows towards the direction of sunlight



Why do plant roots grow down with gravity?

Auxin builds up on bottom edge = cells on the bottom edge grow slower = bottom edge grows slower = plant root grows downwards the direction of gravity



17) Uses of hormones:

Auxin is used as a **rooting powder** when taking cuttings of plants, to promote growth in tissue culture and as a **weed-killer** (disrupts the growth of weeds).

(HT only) **Gibberellins** initiate seed germination, end seed dormancy, promote flowering and increase fruit size.

Ethene controls cell division and **ripening of fruits** and is used in the food industry to control ripening of fruit during storage and transport.

18) PRACTICAL – EFFECT OF LIGHT ON THE GROWTH OF SEEDLINGS

- Independent variable - amount of light
- Dependent variable - mean height of seedlings
- Control variables - number of seeds per dish, how much they are spread out, the volume of water the seedlings are given, the temperature they are kept at.

Method

1. Put cotton wool into three petri dishes, and add the same volume of water to each dish.
2. Add ten seeds to each dish and place them in a warm place where they won't be disturbed.
3. Allow the seeds to germinate, and add more water if the cotton wool dries out.
4. Once the seeds have germinated, ensure the petri dishes each contain the same number of seeds, and remove any extra seeds if necessary.
5. One petri dish will sit in full light on a windowsill, the second will be in a dark cupboard, and the final dish will be placed in partial light.
6. Every day for one week, measure the height of each seedling and record the results in a table. You must record the height of the individual seedlings on each day.
7. Calculate the mean of the seedlings each day, and compare the mean heights in the three different locations

