

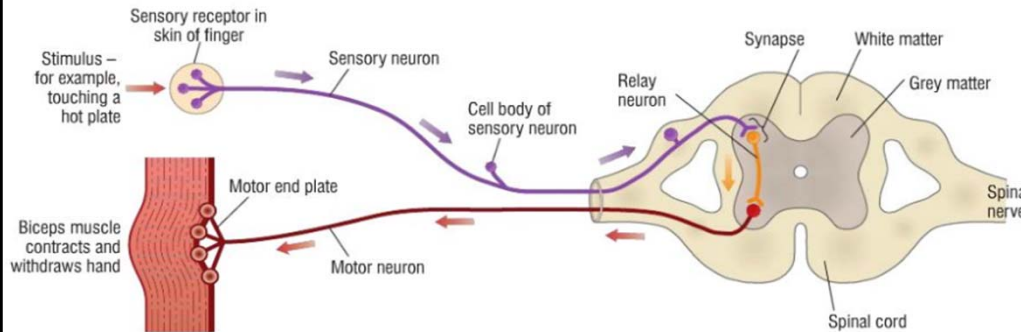


Homeostasis

- The **regulation of the internal conditions** of a cell or organism **to maintain optimum conditions** for enzyme action and all cell functions.
- Include control of:
 - blood glucose concentration
 - body temperature
 - water levels.

1

Nervous system structure

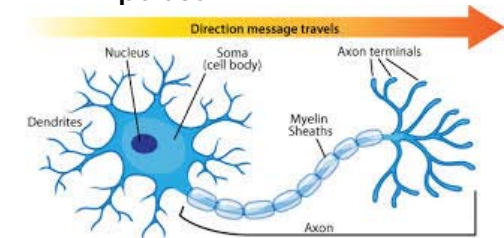


- Stimulus → Receptor → Sensory neuron → Relay neuron → Motor neuron → Effector → Response.
- Reflex actions are automatic and rapid; they do not involve the conscious part of the brain.

2

Nervous system

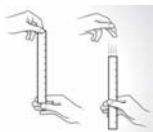
- Nerves are **long and thin** to allow fast transmission of electrical impulses
- Dendrites provide **large surface area**
- Myelin sheath provides insulation of **electrical impulses**



3

Reaction times (RP)

- Person A sits on stool and hold non-dominant hand out in front of you
- Person B stands and holds a ruler vertically with 0cm in between person A's finger and thumb
- Person B drops the ruler without warning
- Person A catches the ruler as quickly as possible, read off value level with top of thumb.
- Record and convert to a time using the chart
- Repeat 10 times



4

Negative feedback (HT)

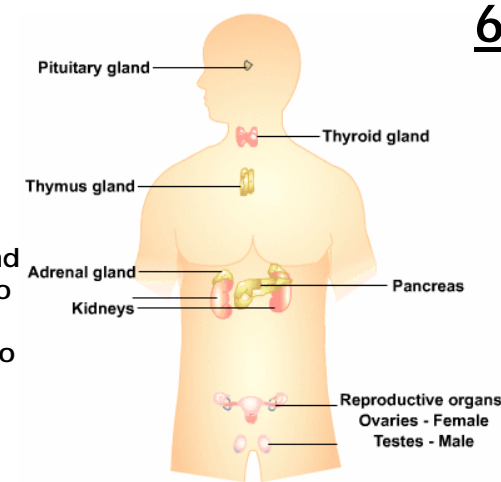
- Negative feedback prevents a system from becoming overactive
- It becomes inhibited by its own products when levels become too high.
- Examples:**
- Thyroxine** stimulates basal metabolic rate, which is important in growth and development.
- Adrenaline** is produced by the adrenal gland. Increases heart rate and increases delivery of oxygen and glucose to target organs preparing for fight or flight

5

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.
- The pituitary gland is the master gland which releases several hormones into the body, which then act on other glands to stimulate other hormones to be released**

Compared to the nervous system the effects are slower but act for longer.

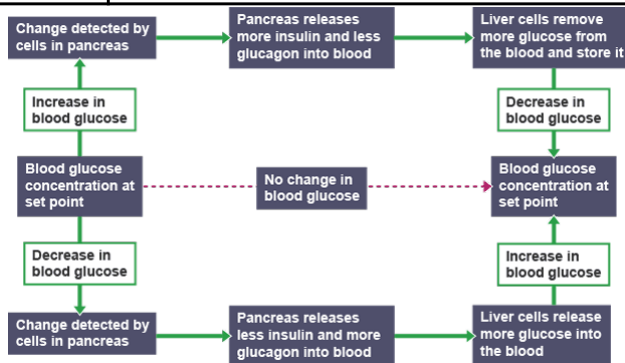


6

Control of blood glucose

- Type 1 diabetes** – Pancreas fails to produce insulin. Treated with injections
- Type 2 diabetes** – Body cells no longer respond to insulin. Obesity risk factors. Treated with carbohydrate controlled diet

7



Hormones in reproduction.

- FSH** – causes maturation of an egg in the ovary
- LH** – stimulates release of an egg
- Oestrogen/ Progesterone** – maintains uterus lining
- High levels of oestrogen and progesterone inhibit the release of LH and FSH

8

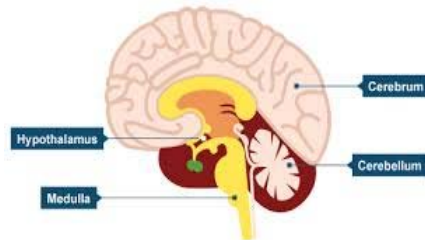
Treating infertility (HT)

- FSH and LH given as fertility drugs during IVF**
- Stimulates maturation of eggs
- Eggs collected and fertilised by sperm
- Develop embryos
- 1 or 2 embryos inserted into mother's uterus

9



The brain



1

Part	Function
Cerebrum	Conscious thought, intelligence, memory, language
Cerebellum	Co-ordination of muscle activity
Hypothalamus	Responsible for maintaining homeostasis. Connected to pituitary gland which releases hormones
Medulla	Controls unconscious activities: heartbeat and breathing

The brain (HT)

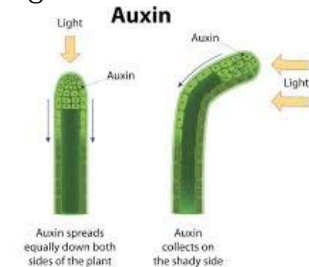
2

- Brain mapped using an MRI scanner
- Uses strong magnetic fields and radio waves to produce an image
- Treating brain disorders is very difficult due to potential tissue damage
- Monoclonal antibodies and gene therapy are being developed to treat brain cancer
- Stem cells may be used to repair tissue damage

Plant hormones (HT)

3

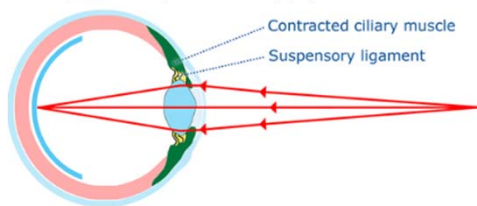
- Hormones control growth and response to light (phototropism) and gravity (geotropism)
- **Unequal distribution of auxin causes unequal growth**
- Required practical – effect of light or gravity on growth of seedlings



Focusing - near object

4

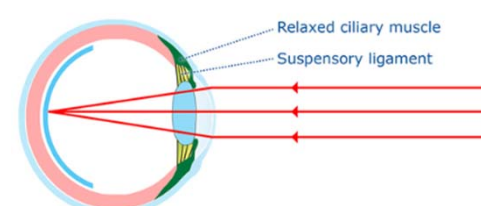
- Ciliary muscles contract
- Suspensory ligaments loosen
- Lens thickens and refracts light rays strongly



Focusing - distant object

5

- Ciliary muscles relax
- Suspensory ligaments are pulled tight
- Lens pulled thin and only slightly refracts light rays



The structure of the eye

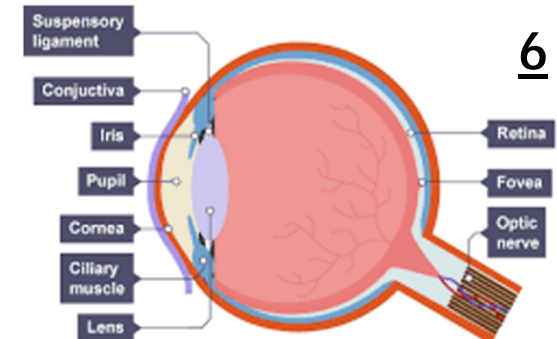
6

Common defects:

- Myopia – short sightedness
- Hyperopia – long sightedness
- Corrected with corrective lenses in glasses
- Laser surgery corrects the shape of the cornea

Adaptation to dim light

- Dim light – **Radial muscles** in the iris contract. Pupil becomes larger
- Bright light – **Circular muscles** in the inner iris contract and the pupil becomes smaller

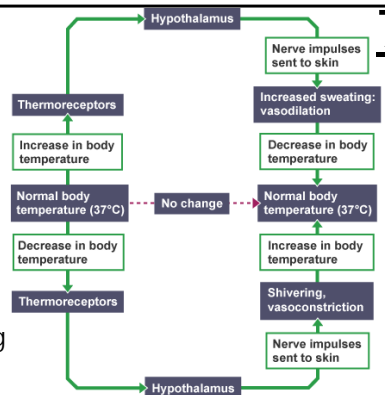


Regulating body temperature

7

- Body temperature is controlled by the thermoregulatory centre in the brain
- Both the thermoregulatory centre and the skin contain receptors which send nervous impulses to the brain

- Too hot – Blood vessels dilate and sweat is produced
- Too cold – Blood vessels constrict, sweating stops and muscles contract (shiver)



Maintaining water and nitrogen levels

8

- Digestion of proteins results in excess amino acids which are converted to ammonia in the liver. Ammonia is toxic so converted to urea to be excreted safely
- Kidneys maintain water balance. Produce urine by filtration of blood and selectively reabsorbs glucose, ions and water
- ADH controls water levels. ADH is released by the pituitary gland when the blood is too concentrated, so stimulates the reabsorption of more water into the blood from the kidney. Controlled by negative feedback