Homeostasis

☆ Homeostasis is the maintenance of a constant internal environment.

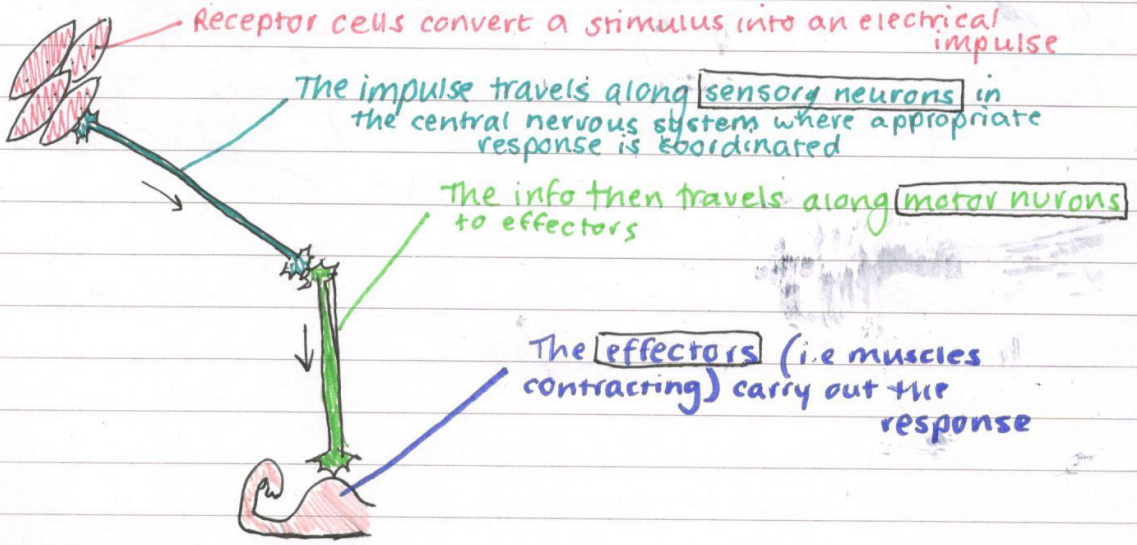
Homeostasis controls:
- blood glucose concentration
- body temperature
- water levels

RECEPTOR CELLS → COORDINATION CENTRES → EFFECTORS

detect stimuli — process info — bring about a response.

HUMAN NERVOUS SYSTEM

The nervous system allows us to react to our surroundings and coordinate actions in response to stimuli.



Recepter cells → sensory neurons → motor neurons → effectors

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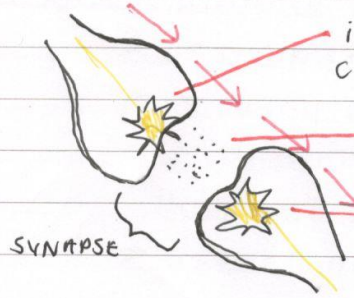
Reflexs take a different path because they're automatic so they don't require you to think

↳ The impulse instead travels down a **Reflex arc**:

1. Stimulus detected by receptors
2. Impulses sent along sensory neuron
3. In the central Nervous system, it goes down a relay neuron
4. Next down a motor neuron
5. Then to the effector

Synapse → the gaps between 2 neurons.

PROCESS:



impulse reaches end of neuron, this releases a chemical into the synapse

synapse. Here the chemical difusses across

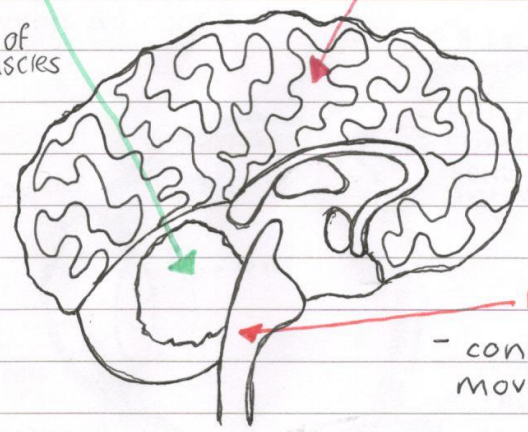
chemical reaches second neuron, triggering impulse to begin again

THE BRAIN

- The brain is part of the CENTRAL NERVOUS SYSTEM (CNS)

CEREBRAL CORTEX
- controls conciousness
intelligence
memory
language

CEREBELLUM
- controls:
- fine movement of muscles



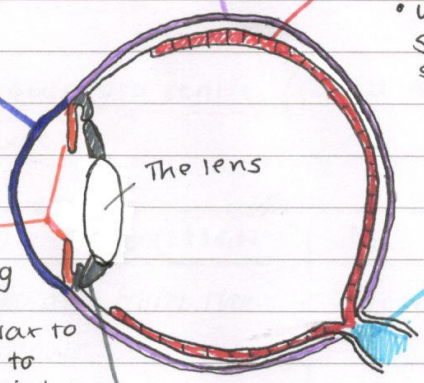
MEDULLA
- controls unconcious movements e.g breathing + heart beat

Why is it difficult to treat + investigate brain damage?

- ★ Its complex + delicate
- ★ Its easily damaged
- ★ medication cannot always reach the brain because of the membranes surrounding it.
- ★ Its not fully understood which part does what.

THE EYE

☆ The eye is a sense organ.



SCLERA
- The outer layer.
- prevents damage

THE RETINA
- A layer of light-sensitive cells found at the back of the eye.
- When light hits, the cells are stimulated, impulses are then sent to the brain, which interprets the info to form an image.

CORNEA
- see-through layer
- allows light through

The lens

IRIS
- muscles surrounding the pupil
- They contract or relax to change pupil size to affect how much light enters

THE OPTIC NERVE
- nerve from eye to the brain to carry to info.

CILIARY MUSCLES + SUSPENSORY LIGAMENTS
- Hold the lens in place + control its shape.

Accomodation = The process of changing the eyes shape to alter how much light enters.

PROCESS OF ACCOMODATION:

- NEAR OBJECT = ciliary muscles contract → suspensory ligament losen → lens is then thicker + more curved refracts light more

↳ opposite for a far object

eye defects:

- MYOPIA = **short** sightedness → lens is too curved so distant objects are blurry
- HYPEROPIA = **long** sightedness → lens is too flat so cannot refract light enough.

CONTROL OF BODY TEMPERATURE

- The thermoregulatory centre (found in the brain) controls Body temperature

when temperature is too **HIGH**	when temperature is too **low**
Sweat, it evaporates from the skin to cool you down	Sweating stops
Vasodilation = more blood flows closer to the surface which cools you down	**Vasoconstriction** = blood does not flow as close to the surface
	Skeletal muscles contract rapidly (shivering) to generate head from respiration
	Hair stands on end to trap warm air

Hormonal Coordination

The endocrine system

★ The endocrine system send **hormones** (chemical messengers) around the body. When they reach a target tissue they produce a response.

★ Glands secrete hormones.

examples:

- **Pituitary gland** – secretes hormones to either have an effect on the body or to stimulate other glands
- **Pancreas** – secretes **insulin** to controle glucose
- **Thyroid** – secretes thyroxine to control metabolic rate, heart rate + temperature.
- **Adrenal gland** – secretes **adrenaline** which helps during stressful moments.
- **Ovary** – secretes **oestrogen**
  – involved in the menstrual cycle
- **Testes** – secretes **testosterone**
  – involved in production of sperm

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CONTROL OF BLOOD GLUCOSE

- Glucose is needed for respiration.
- It's controlled by the pancreas

- If glucose levels are too high the pancreas secretes **insulin**.
- insulin then binds to target organs causing one of 2 things;
  1. Glucose moves from blood into muscle cells for respiration.
  2. Glucose is converted into glycogen which is stored in the liver.

During excercise:

↳ During excercise, cells respire more and they need glucose to do so. = less glucose in blood. so...

★ Glucose levels decrease so the pancreas produces the hormone glucagon.
★ Glucagon binds to liver cells, this causes glucagon to be broken down into glucose so blood glucose levels increase.

DIABETES:

TYPE 1 – Pancreas doesn't produce enough insulin
TYPE 2 – The body cells no longer respond to insulin.

maintaining water balance

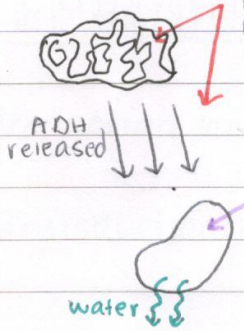
Why is water balance important?

TOO HIGH = if there is too much water in the blood, cells will take in water due to osmosis This can burst cells.

TOO LOW = too little and cells lose water + shrink.

Anti-duretic hormone (ADH)

↳ A hormone involved in the control of the loss of water as urine



The pituitary gland in the brain releases ADH when a receptor in the brain detects blood is too concentrated.

ADH reaches kidney tubles which increases their permeability to water so more water moves out the tubie + into bloodstream.

↳ This hydrates the blood (but also means theres less water in the urine so urine is more concentrated (i.e darker yellow))

Kidney failure

- Kidney failure = when kidneys stop working. If this happens, waste products build up + can result in death.

How to treat:

- Dialysis – this is when the function of the kidneys is carried out using an artificial membrane.
- Kidney transplant

REPRODUCTION HORMONES

★ male reproduction hormone = TESTOSTERONE

★ female reproduction hormone = OESTROGEN

menstrual cycle = process the female body undergoes each month to prepare for a potential pregnancy.

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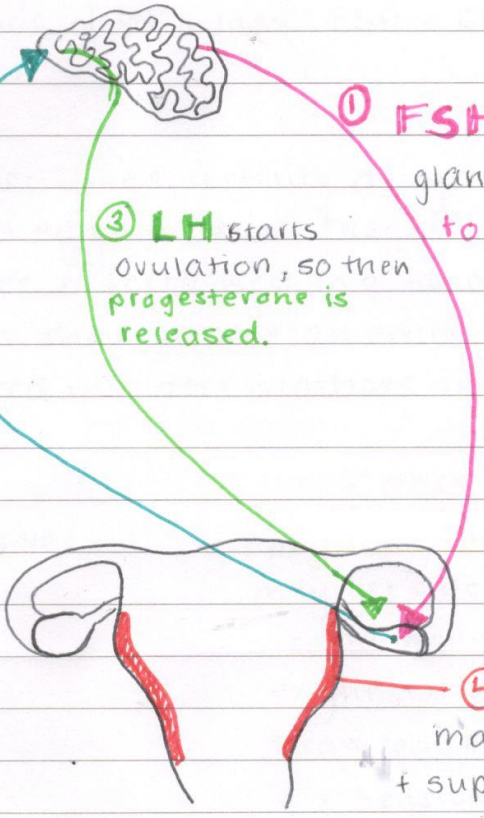
menstrual cycle process



① **FSH** released from pituitary gland. stimulates ovaries to produce **oestrogen**

② **OESTROGEN** causes the uterus lining to grow. stimulates **LH** and inhibits **FSH**

③ **LH** starts ovulation, so then **progesterone** is released.

④ **PROGESTERONE** maintains uterus lining + supports pregnancy if egg is fertalised. inhibits FSH + LH

CONTRACEPTION:

↳ methods to stop an egg maturing therefore stopping pregnancy.

HOW?

The pill – contains oestrogen + progesterone.
– As above oestrogen inhibits FSH = no eggs can mature

The implant – releases progesterone = stops ovaries releasing an egg

USING HORMONES TO treat infertility

- fertility drugs are used to increase chance of pregnancy. as they are made of hormones FSH + LH which stimulates egg maturation.

- IVF – mother given fertility drugs
  - when eggs mature they're taken out of the mother + fertalised in a labatory.
  - when they become an embryo they're inserted into the mothers uterus

BENEFITS

- helps infertile couples

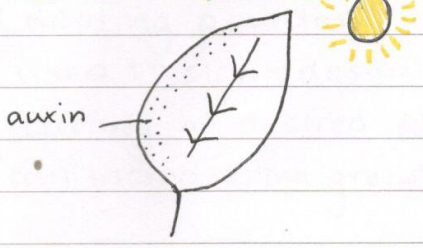
CONS

- physically stressful as women may get side effects.
- emotionally stressful as it might not work
- can lead to multiple births
- expensive.

PLANT HORMONES

★ plants need hormones to control growth, they do so in the following ways:

① Phototropism — plants move toward the light



① Plant is exposed to light on one side.
② **Auxin** (hormone) gathers on the **shaded** side.
③ Auxin stimulates growth, so the shaded side grows faster = the leaf bends towards the light so it can photosynthesise more.

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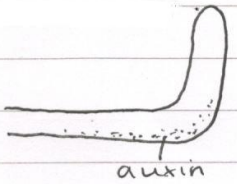
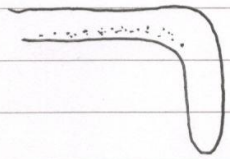
② GRAVITROPISM

- NEGATIVE = roots grow AWAY from gravity



① Auxin moves to lower side + stimulate growth = root grows away from gravity + toward light

- POSITIVE = roots grow TOWARDS gravity.



② Auxin, in positive gravitropism, does the opposite to the above and causes less growth = root grows down towards water.

SUMMARY:

AUXIN → phototropism – Auxin causes growth
negative gravitropism – auxin causes growth
positive gravitropism – auxin causes **less** growth

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Using plant hormones:

① Weed Killers

- contain auxin causing the cells in the weed to rapidly grow resulting in the weed dying.

② Rooting powders

- used to clone desirable plants
- cutting of desired plant is dipped in auxin so it can increase the growth speed

Inheritence, Variation + Evolution

REPRODUCTION

★ SEXUAL REPRODUCTION → joining of male + female gametes (sex cells)

- sperm + egg in animals
- pollen + egg in flowering plant

formed by **meiosis**

★ ASEXUAL REPRODUCTION → involves one parent + no gametes joining
It happens by **Mitosis** which leads to clones of the parent cell.

Meiosis

meiosis = formation of 4 non-identical cells from one cell

REMEMBER - MITOSIS = formation of 2 identical cells from one cell

- cells in the reproductive organs divide by meiosis to form gametes (i.e. sperm + egg cells).
  - gametes only have one copy of each chromosome, (i.e. 23 instead of the 46 in all body cells).

WHY? Because eventually they'll fuse together so each will have 23 eventually having 46 after they've fused.

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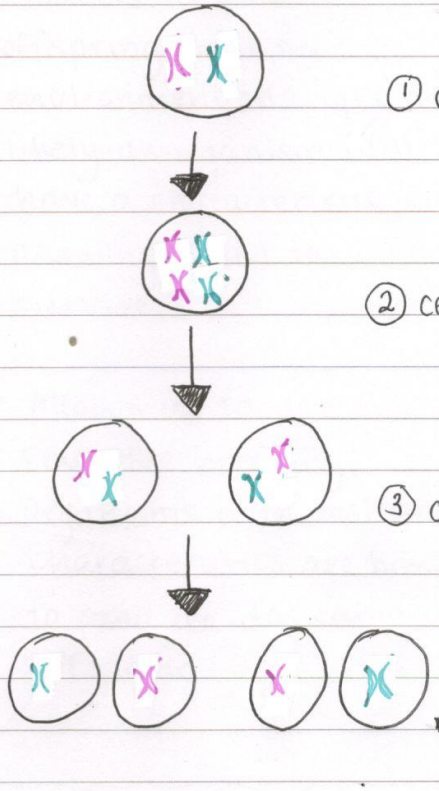
Meiosis:



① cell copies its chromosomes

② cell divides into 2 cells

③ cell divides again into 4 cells

GAMETES.

They're all genetically different from eachother as chromosomes are shuffled in the process.

* The gametes have 23 chromosomes. They then join at fertilisation to produce a cell with 46, the normal number. The cell then divides by MITOSIS to produce copies

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SEXUAL REPRODUCTION	ASEXUAL REPRODUCTION
• Produces variation in offspring. So if the environment changes its likely an organism will have a characteristic allowing them to survive.	• Only one parent is needed
• Allows us to use selective breeding; Organisms with desirable characteristics are bred to produce desirable offspring.	• Uses less energy + is faster as no need to find a mate.

DNA Structure

↳ i.e "a long molecule"

★ DNA is a polymer that contains instructions for the body

Its made of many small parts called NUCLEOTIDES

↓

Each is made of one sugar + one phosphate molecule + one of the 4 types of **organic bases**

ORGANIC BASES:

A C G T are the 4 types.

BASE PAIRING:

A pairs with T

C pairs with G

Think "At" pairs together

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