GCSE Biology Complete Revision Summary

Animals Coordination , Control and homeostasis

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HOMEOSTASIS

The process of maintaining the constant internal environment.

- Temperature — Thermoregulation
- pH
- Blood Glucose
- Salt and Water Level — Osmoregulation

Nervous System and the Hormonal System

Homeostasis is important for the enzymes as the enzymes control all the reactions of the body and they need optimum condition to work.

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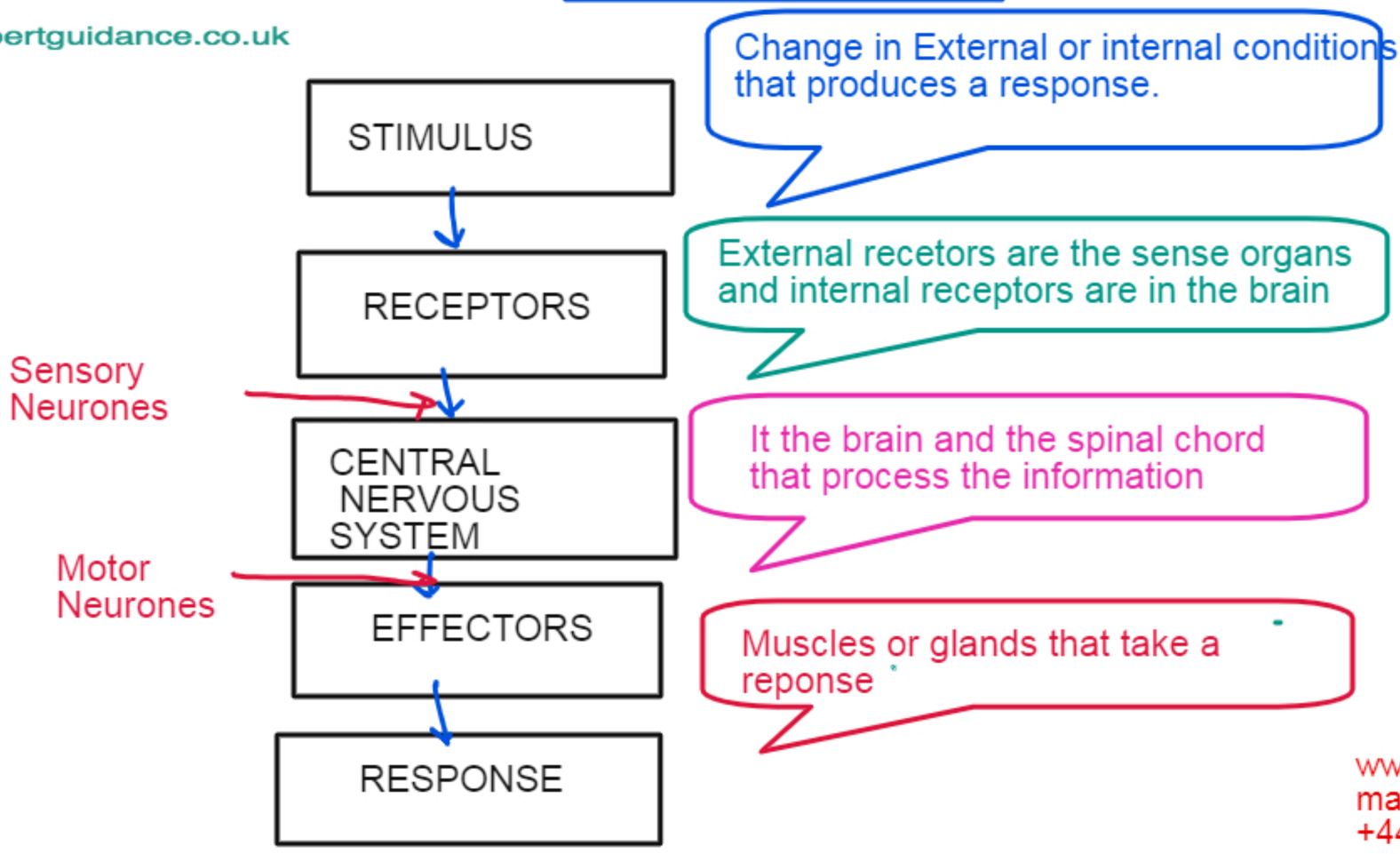
NERVOUS SYSTEM



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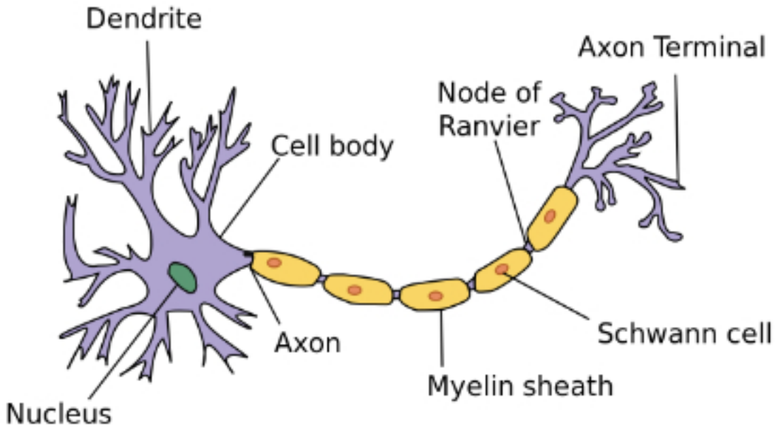
NEURONES

Motor Neurone

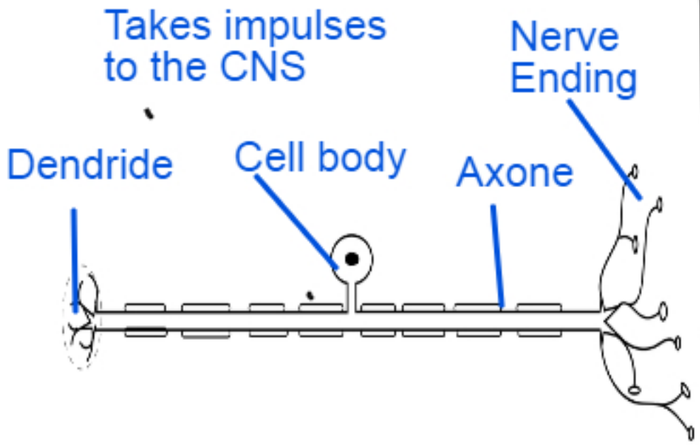
Takes impulses away from CNS



Motor neurones sends the message from the central nervous system to the effectors.

Sensory Neurone

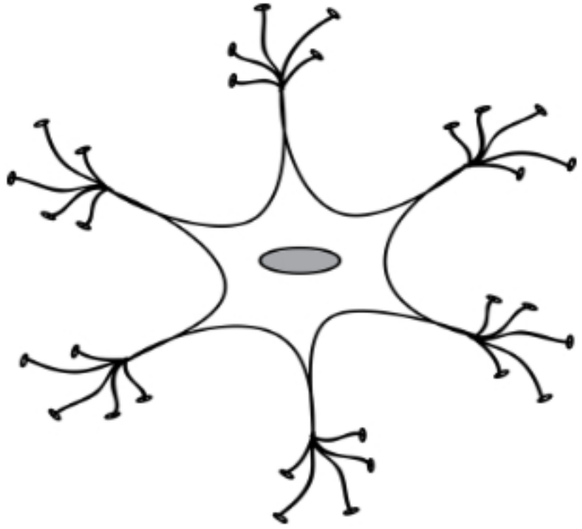
Takes impulses to the CNS



Sensory neurones send the message from the receptors to the central nervous system.

Relay Neurone

Found in CNS



Connect Sensory and Motor Neurones

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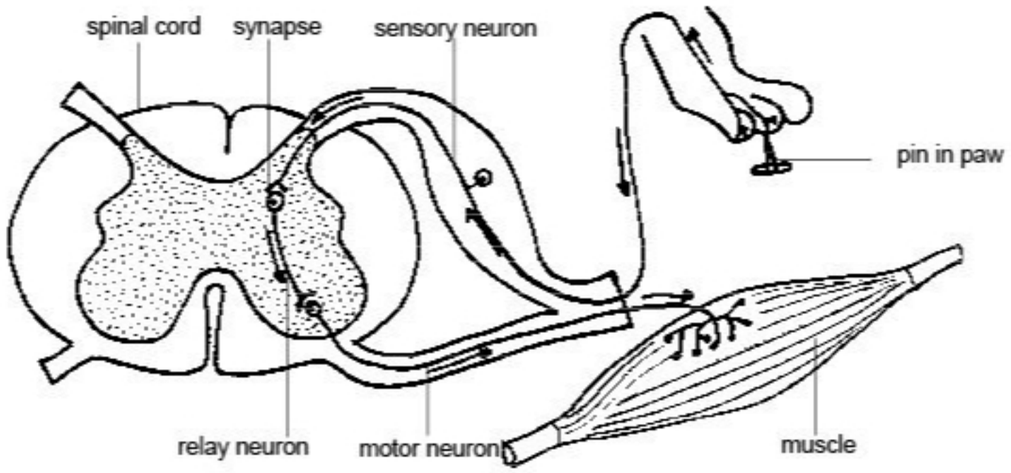
REFLEX ACTIONS



It is the automatic response of the body to a stimulus.

In reflex action the message from the sensory neurones is passed to the spinal chord instad of brain.

Spinal Chord sends the message to the effectors and produce a response.

Example: Knee Jerk Reflexes,
Touching hot object,
Sudden closure of light with bright light

It is rapid
It is quick
Automatic, Instantaneous
without consious thoughts

- Stimulus
- Receptor
- Sensory neurones
- Spinal Chord
- Motor Neurones
- Effector
- Response

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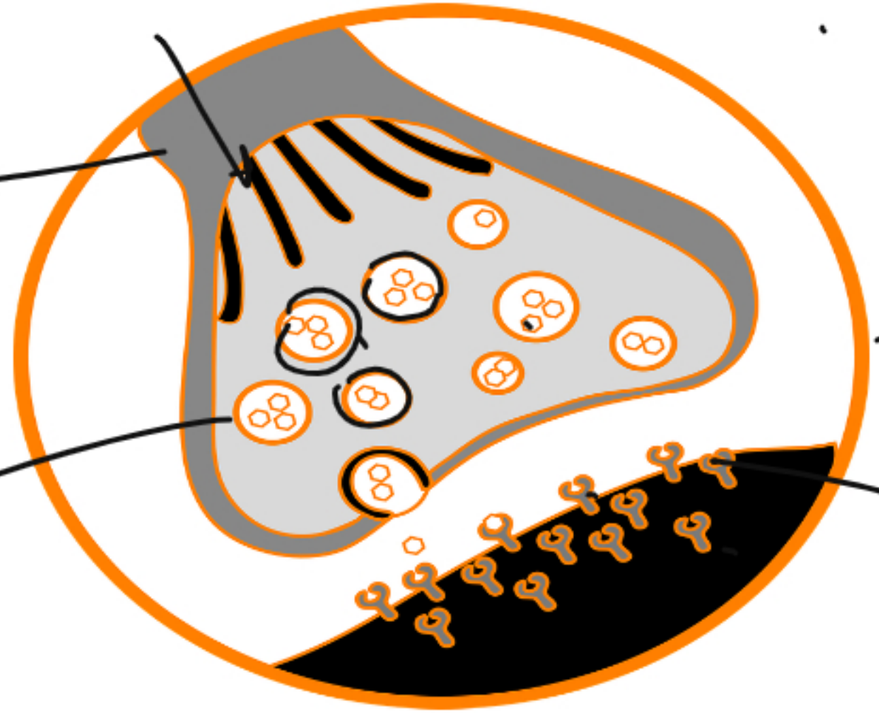
SYNAPSE

Message is transmitted by chemicals



Impulses arrives

Junction between two neurones

Vessicles containing neurotransmitter

Neurotransmitter generate impulses in the next neurone

Source: pixabay

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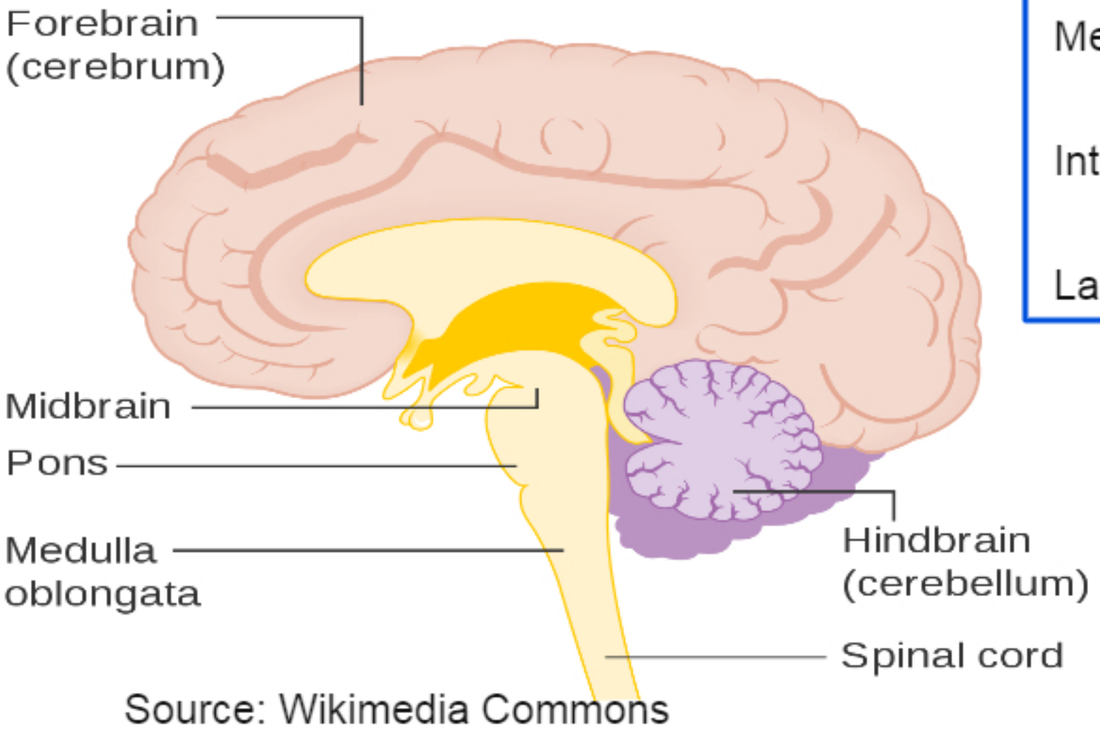
BRAIN

CEREBRUM

- Consiousness
- Memory
- Intelligence
- Language

CEREBELLUM

- Muscle Coordination
- Balance



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MEDULLA OBLONGATA

- Unconsious Activities
- like Heart Rate, Breathing.
- Gut Movement

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BRAIN SCAN

Magnetic Resonance Imaging (MRI) helps to take the images of different parts of the brain and relating it with loss of functions of the individual

Problems

Brain is complex
Skull protects the brain
Thousands and neurones and neurotransmitter are involved
The functions of different parts is still not understood.
Drugs do not reach the brain

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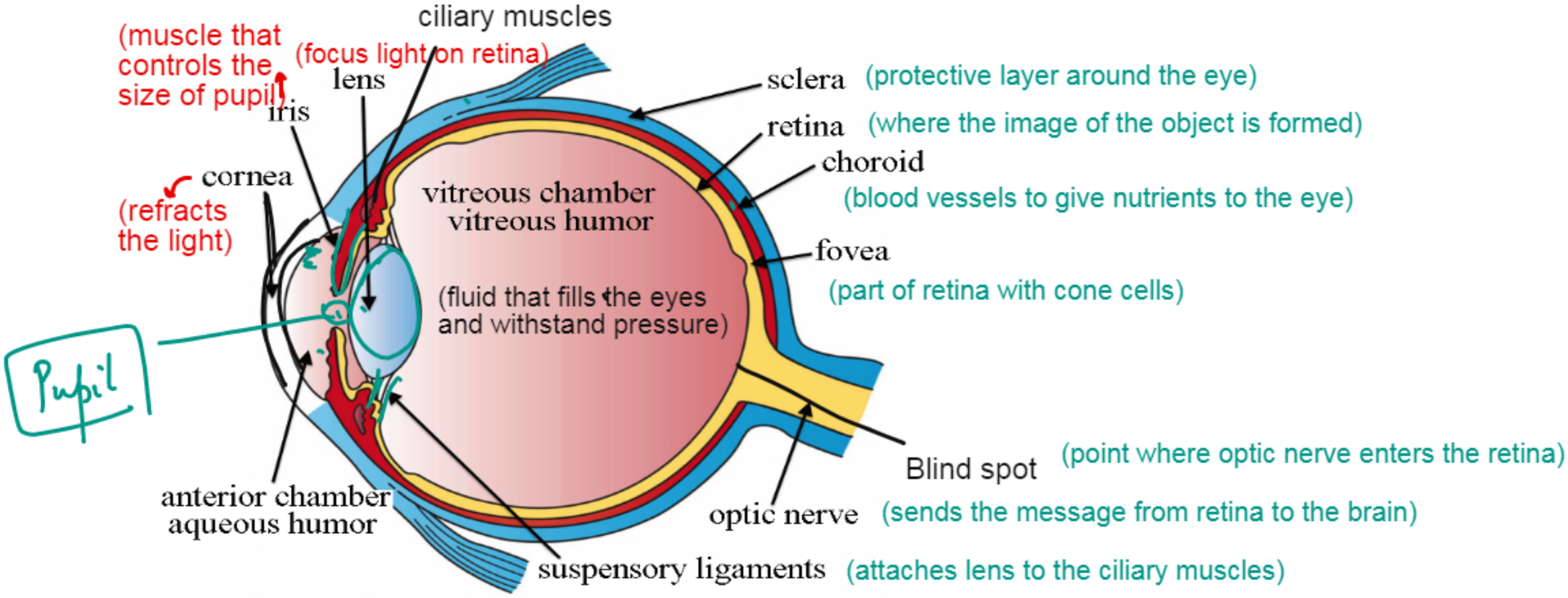
EYE

contracts and relaxes to change the shape of the lens.



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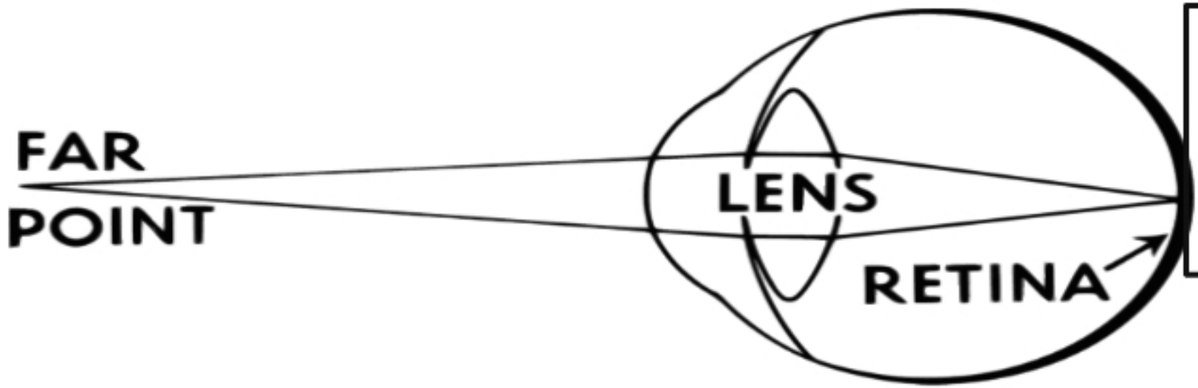
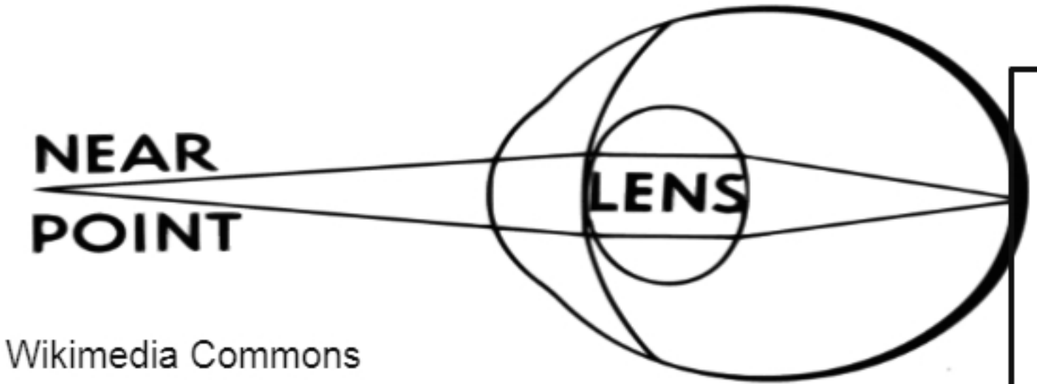
ACCOMMODATION



For distant vision, ciliary muscle relax making the suspensory ligaments tensed which inturn make the lens thin so that the image is focussed on the retina.



For near vision, ciliary muscle contract

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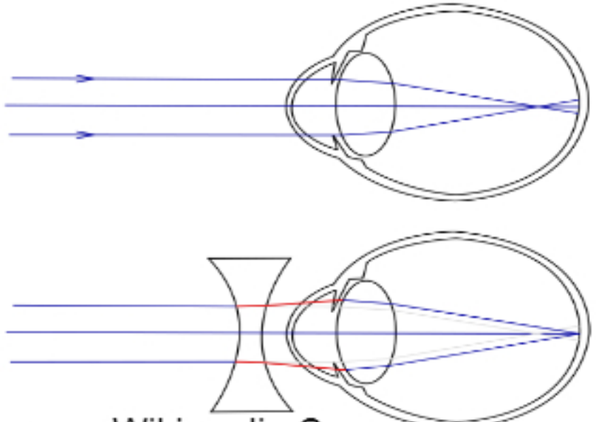
DEFECTS OF VISION

MYOPIA

- Short sightedness
- The image falls in front of the retina of the eye.
- Eye ball gets elongated
- corrected by concave lens



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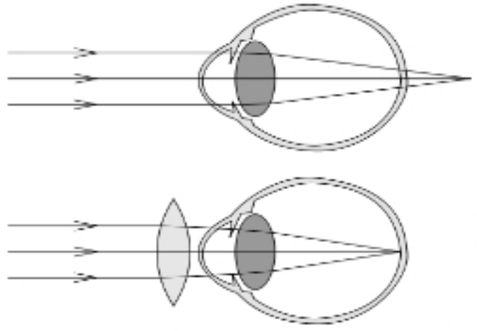
HYPEROPIA

- Long sightedness
- The image falls behind the retina of the eye.
- Eye balls gets shortened
- corrected by convex lens



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NEW EYE TECHNOLOGIES

Contact Lenses

- Lenses are placed on the surface of the eye.
- Includes soft, silk and disposable lenses
- Can be used by any person at any age

Laser Surgery

- Laser is used to change the thickness or the curve of the cornea so that defects of vision can be corrected.
- Can be done on adults after the growing age.

Replacement Lens

- It involves either replacing the faulty lens or inserting the correct one with the faulty one.
- Include damage risk to the eye.

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HORMONAL CONTROL

HOMEOSTASIS

- NERVOUS SYSTEM
  - NEURONES
- ENDOCRINE SYSTEM
  - ENDOCRINE GLANDS
  - HORMONES

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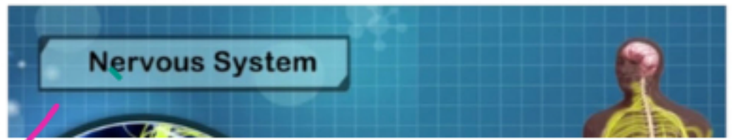
HORMONAL and NERVOUS SYSTEM

- They are chemical messenger secreted by the endocrine glands

- they are secreted in the blood and travel to the target organ

- Target organ has receptors and hormones bind to the receptor and trigers a response

- It produces a slower but long term response



- Is the system of neurones which send electrical impulses to produce a response

- The message is transmitted via electrical impulses

- The response produced is localised and impulses do not travel large distances

- It produces quick but short term response

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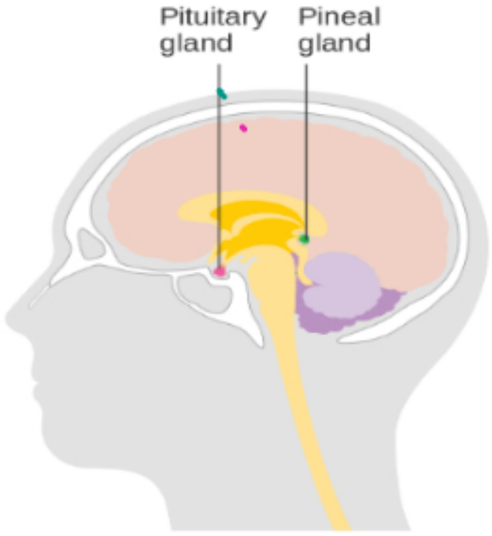
PITUITARY : THE MASTER GLAND



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Master Gland

It controls other glands of the body

- Follicle Stimulating Hormone
- Antidiuretic Hormone
- Thyroid Stimulating Hormones

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EXAMPLES

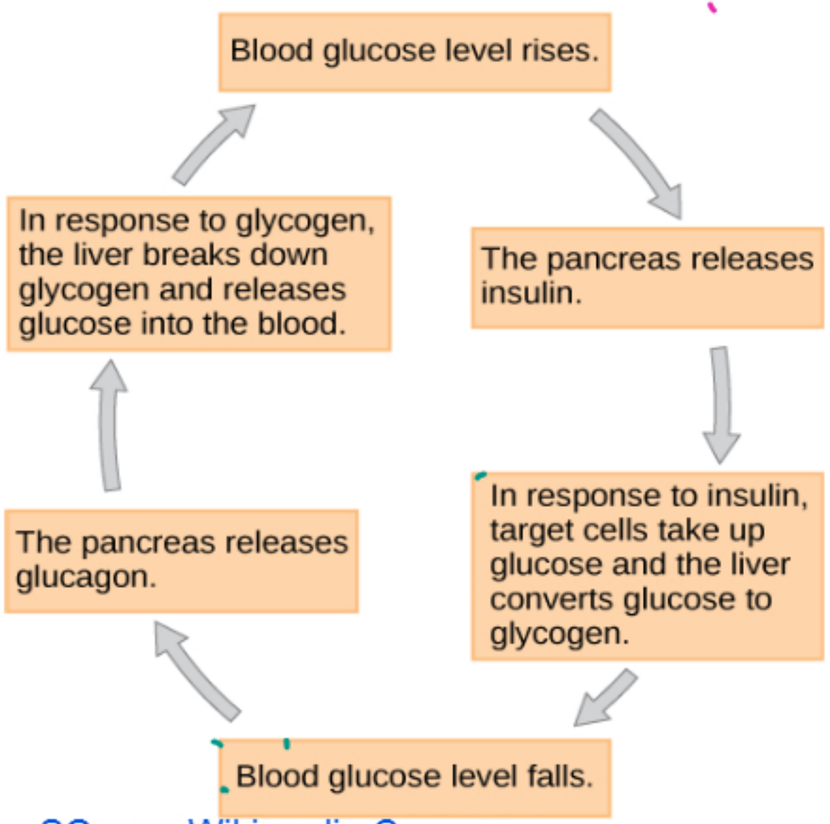
GLAND	HORMONE	TARGET ORGAN	EFFECT
Pituitary	Follicle stimulating hormone (FSH)	Ovaries	make the female sex hormones oestrogen
	Thyroid stimulating hormone (TSH)	Thyroid Gland	stimulate the gland to release thyroxine which controls metabolism
	Anti-diuretic hormone (ADH)	Kidneys	controls the water level by causing reabsorption of water
Thyroid Gland	Thyroxine	Liver and Kidenys	Controls the metabolism
Adrenal Gland	Adrenaline	Liver and Heart	Prepares for fight and flight
Testes	Testosterone	Male reporductive organs	Developes secondary sexual chacteristics
Pancreas	Insulin	Liver	Decreases blood glucose levels
	Glucagon	Liver	Increases blood glucose levels
Ovaries	Oestrogen	Female reporductive organs	Controls the development of egg, menstural cycle and develop secondary sexual characteristics.
	Progesterones		

CONTROL OF BLOOD GLUCOSE

Pancreas → Insulin and Glucagon

Insulin (lowers the blood glucose level)

Glucagon (Increases the blood glucose level)



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Insulin Effect

- It increases the permeability of cells to glucose
- It converts excess glucose to glycogen
- It converts excess glucose to fats
- It stops the breakdown of fats

Glucagon is the hormone

Glycogen is the stored carbohydrate

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DIABETES

TYPE 1	TYPE 2
Insulin dependent	Insuline independent
Body does not produce insulin	Body is resistance to insulin
Caused by damage to pancreas	Caused by poor lifestyle and diet
Treated with insulin injections	Treated with lifestyle changes
Most common in young age	Common in obese people
It can be genetic.	It is mostly environmental.
Drugs might not be required	Drugs are given to make body to respond to insulin

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DIABETES TREATMENT

TYPE 1

- Insulin injections directly into the blood stream. Less taken orally as being a protein hormone it can get digested by stomach.
- The insulin converts excess glucose into glycogen and control the blood glucose level.
- Less intake of carbohydrates.
- Pancreatic Transplant
- Pancreatic Cell Transplant
- Using stem cells to regenerate pancreatic cells

TYPE 2

- Balanced diet
- Regular Exercise
- Weight Management
- Drug to increase sensitivity of pancreas to insulin
- Insulin injections to increase the concentration of insulin to make them more responsive to insulin.

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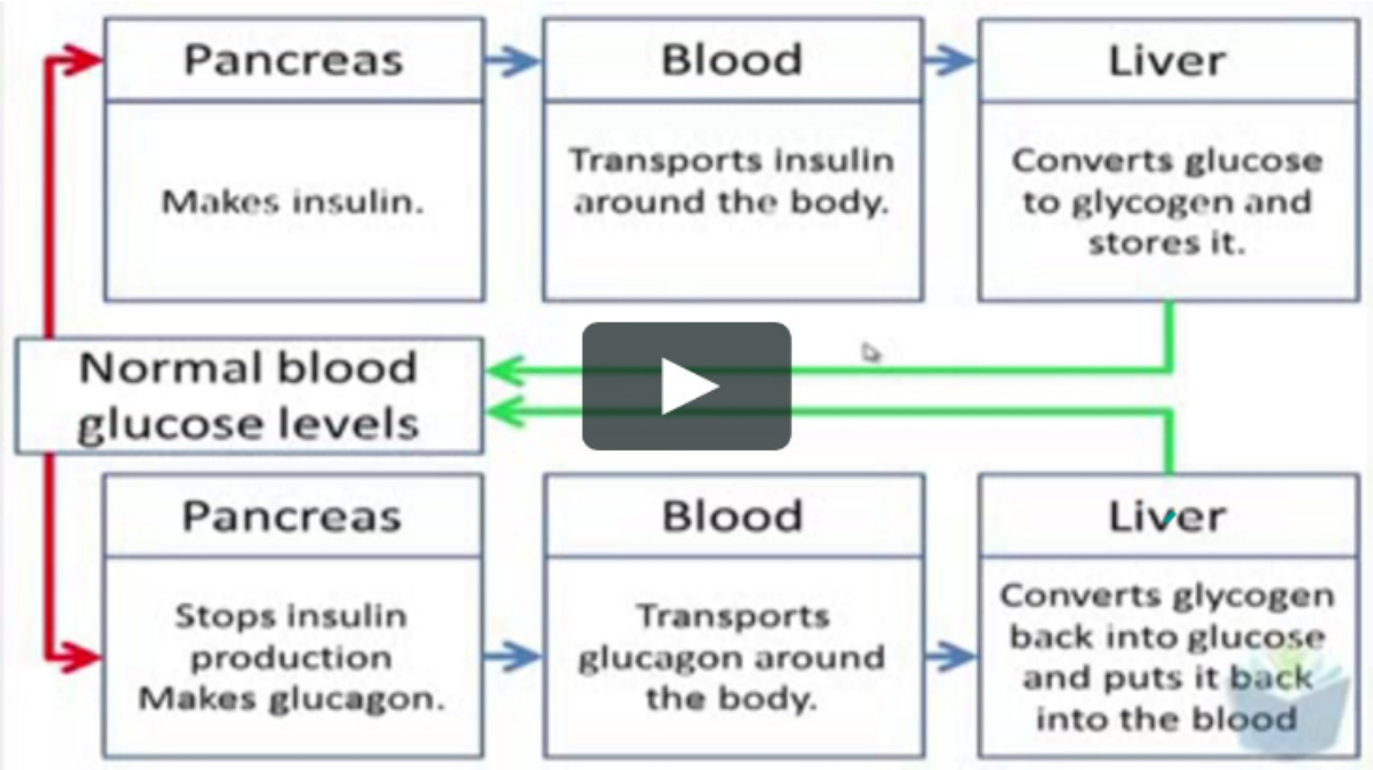
NEGATIVE FEEDBACK



When the level of any thing rises above optimum like glucose concentration, water concentration or temperature negative feedback decreases it

When the level of anything decreases below optimum the negative feedback raises it.

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FIGHT OR FLIGHT HORMONE

Stress Hormone

Emergency Hormones

Increase heart rate
Increase breathing rate

Dilate the pupil

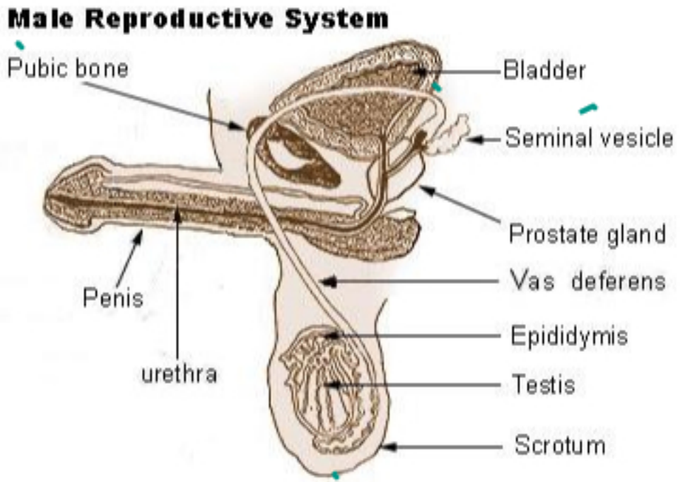
ADRENALINE

Divert blood flow away from the gut

Increase Blood Flow

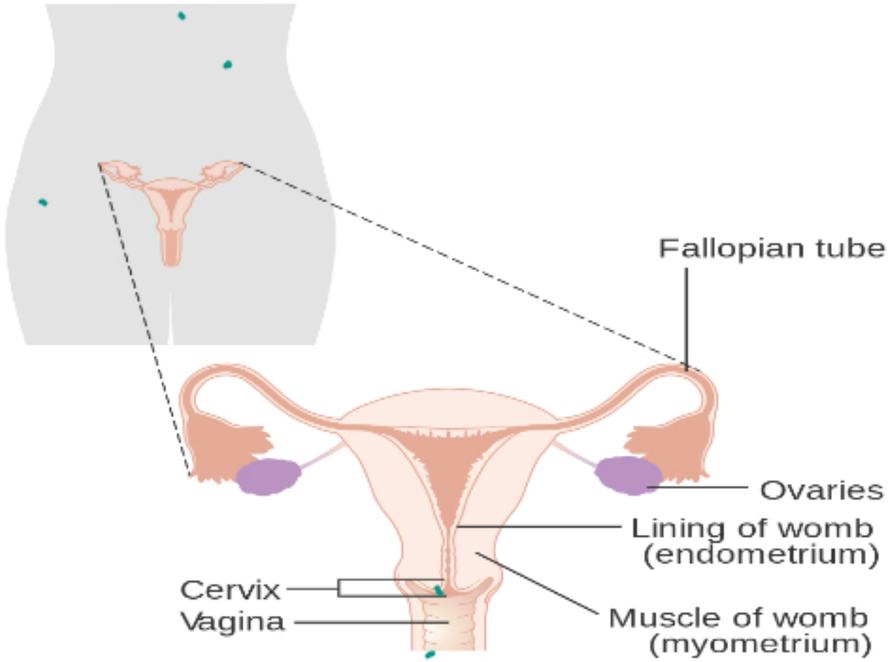
Increase the flow of oxygen to the brain

HUMAN REPRODUCTIVE SYSTEM



TESTOSTERONE

Male hormone resposible for secondary sexual characters



OESTROGEN

Female hormone responsible for secondary sexual characters

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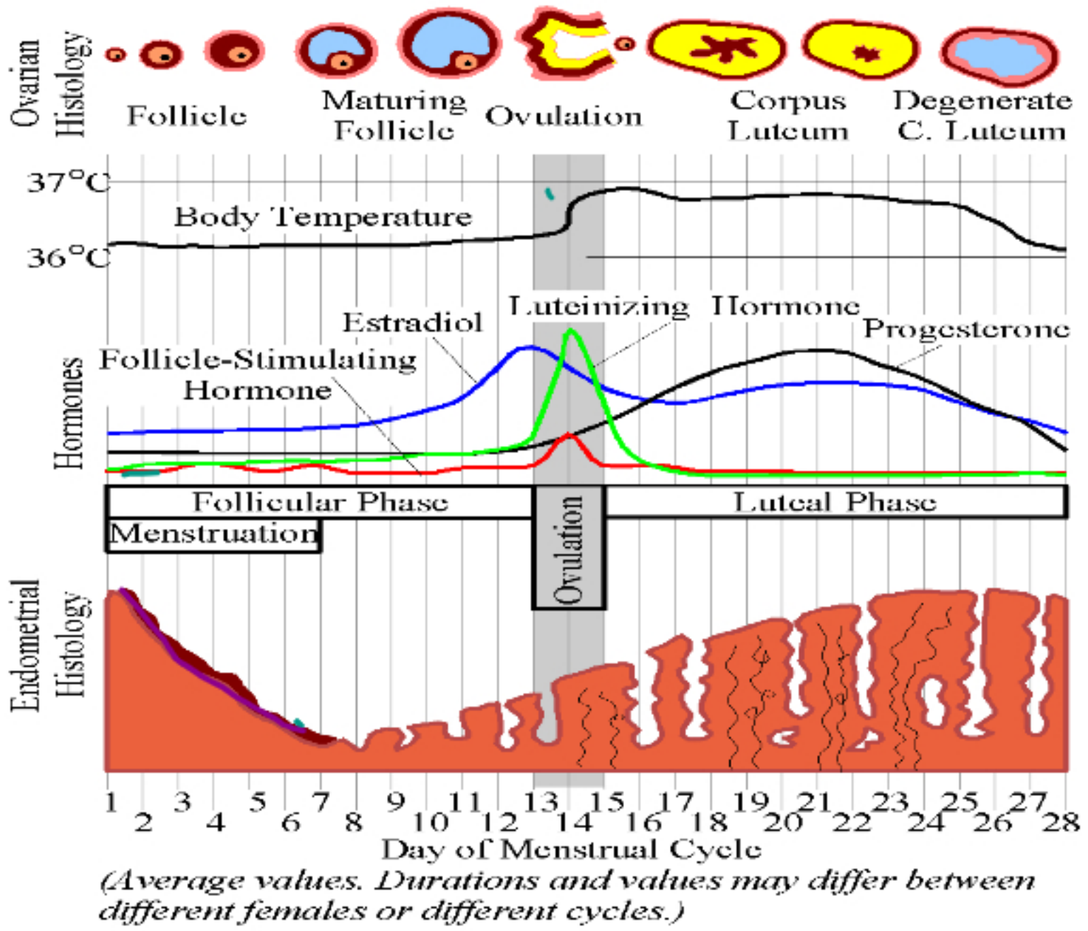
MENSTURATION CYCLE



(Average values. Durations and values may differ between different females or different cycles.)

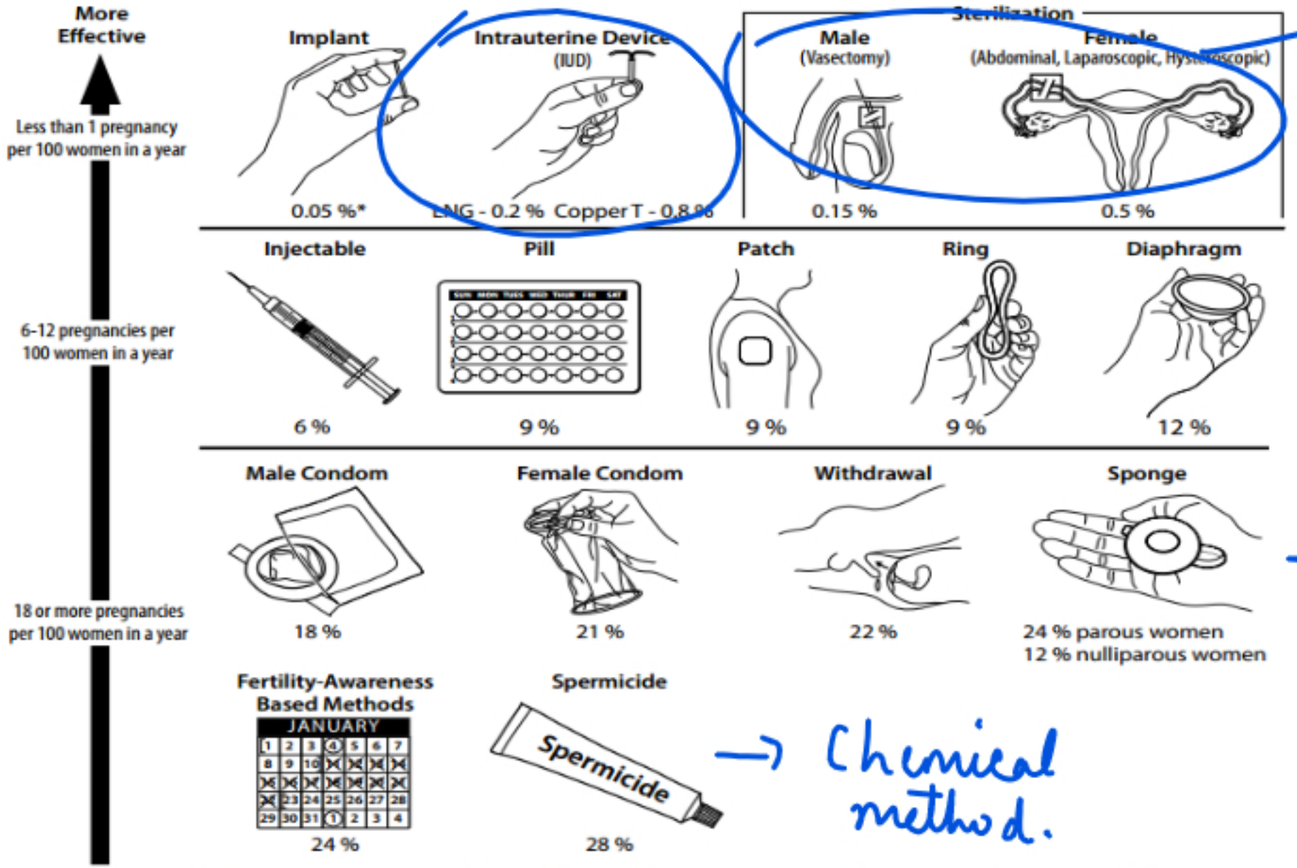
Days	Phase	Development
Day 1- Day 4	Mensturation	Shedding of the uterus linning along with the egg. Progesterone falls
Day 5- Day 14	Folicular Phase	Egg is matured in the ovary. Increase in FSH
Day 14	Ovulation	Egg is released. Caused by Lutenizing Hormone
Day 14-Day 28	Luteal Phase	Increase in progesterone and oestrogen which maintains the uterus linning and wait for eggs to fertilize. If not fertilize in next 14 days Linning breaks.

HORMONES OF MENSTURATION

Hormone	Gland	Effective Days	Effect
Follicle Stimulating Hormone (FSH)	Pituitary	Day 1-Day 14	Maturation of egg in the follicle. Stimulate the production of oestrogen
Lutenizing Hormone (LH)	Pituitary	Day 14	Cause Ovulation
Oestrogen	Ovaries	Day 14-Day 28	Develops uterus lining. Stimulates LH and inhibit FSH
Progesterone	Empty egg follicle in the ovaries	Day 14- Day 28	maintains linning of uterus and prepare for pregnancy. Inhibits both LH and FSH So no mensturation happen during pregnancy.

CONTRACEPTION METHODS

Effectiveness of Contraceptive Methods



Surgical Methods.

→ Barrier Method

→ Chemical method.

Preventing Sperms to reach the egg. Preventing the implantation of the zygote in the uterus.

Barrier Methods : Prevent the sperm to meet the eggs.

Hormonal Methods: Prevents the eggs to mature or prevent the implantation of eggs in the uterus.

Chemical Methods: Kills the sperm

Intrauterine Device: Prevent embryo from implanting

Surgical Method: It is permanent contraception.

HOW CONTRACEPTION WORKS ?

Contraceptive Pills

- They contain the mix of femal hormones oestrogen and progesterone. -MIx PILL
- Prevent the release of FSH preventing the maturation of eggs.
- MAke thick mucus in the cervix to prevent the entry of sperms.
- Prevent the uterus linning development, preventing implantation.
- Some pills are progesterone only pills.
- A contraceptive implant is also inserted which slowly release progesterone in the uterus.
- A contraceptive patch also absorbs the mix of hormones into the blood.

Side Effects: blood pressure, has to be taken daily, changes in menstural pattern.

Intra Uterine Device

Copper T is inserted into the uterus.

It releases copper ions which are toxic to sperms .

The device also prevent the implanting of the embryo into the uterus.

Some releases progesterones which works the same like contraceptive pills :-

Prevent the release of FSH preventing the maturation of eggs.

MAke thick mucus in the cervix to prevent the entry of sperms.

Prevent the uterus linning development, preventing implantation.

Side Effects : Infection, Internal Bleeding

Surgical Methods

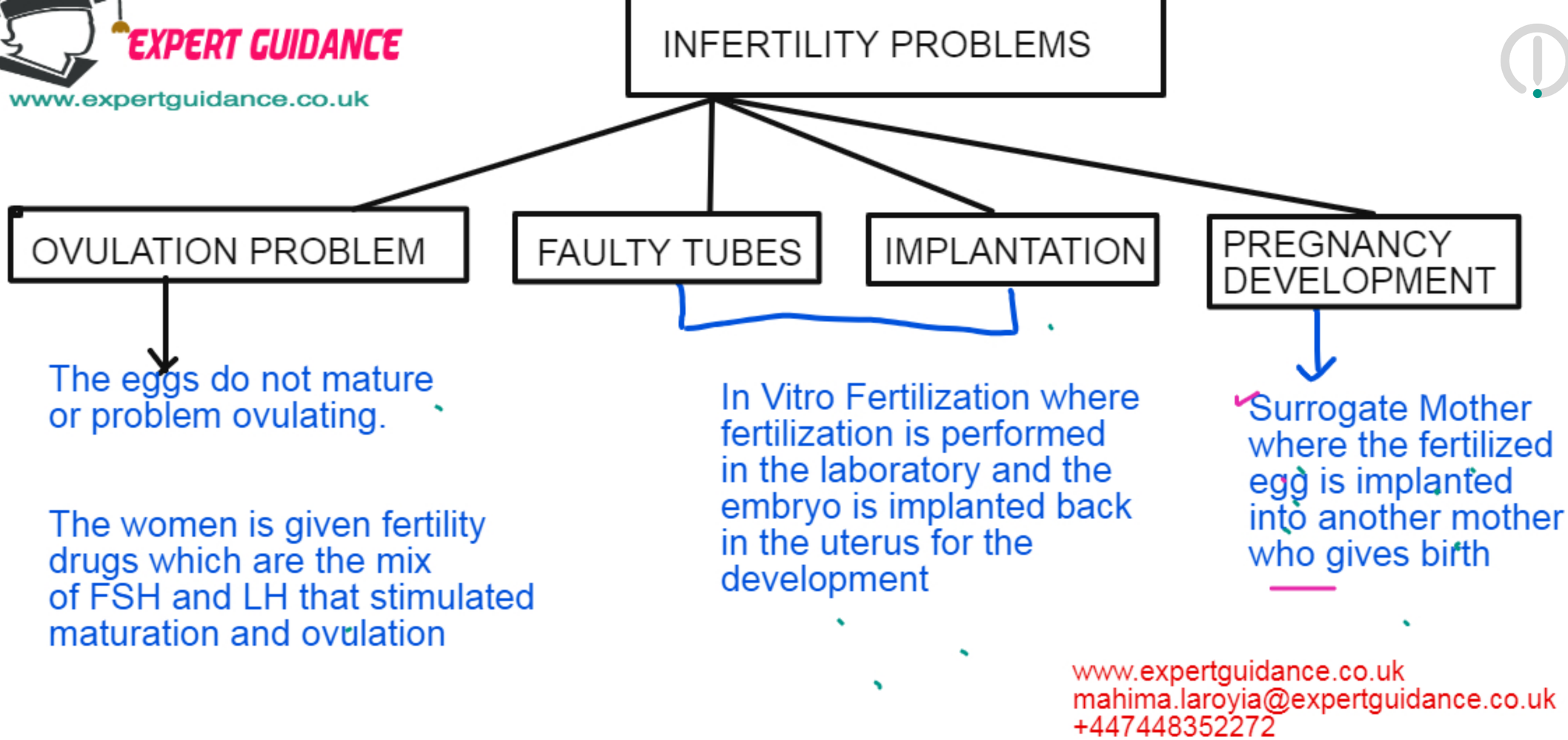
VASECTOMY: Male Sterlization

Sperms ducts are cut and sealed so that the sperms cannot enter the urethra preventing fertilization.

TUBECTOMY: Femal Sterlization

The oviducts are cut and tied to prevent the release of egg which prevent Sterlization.

Side Effects : It is permanent.



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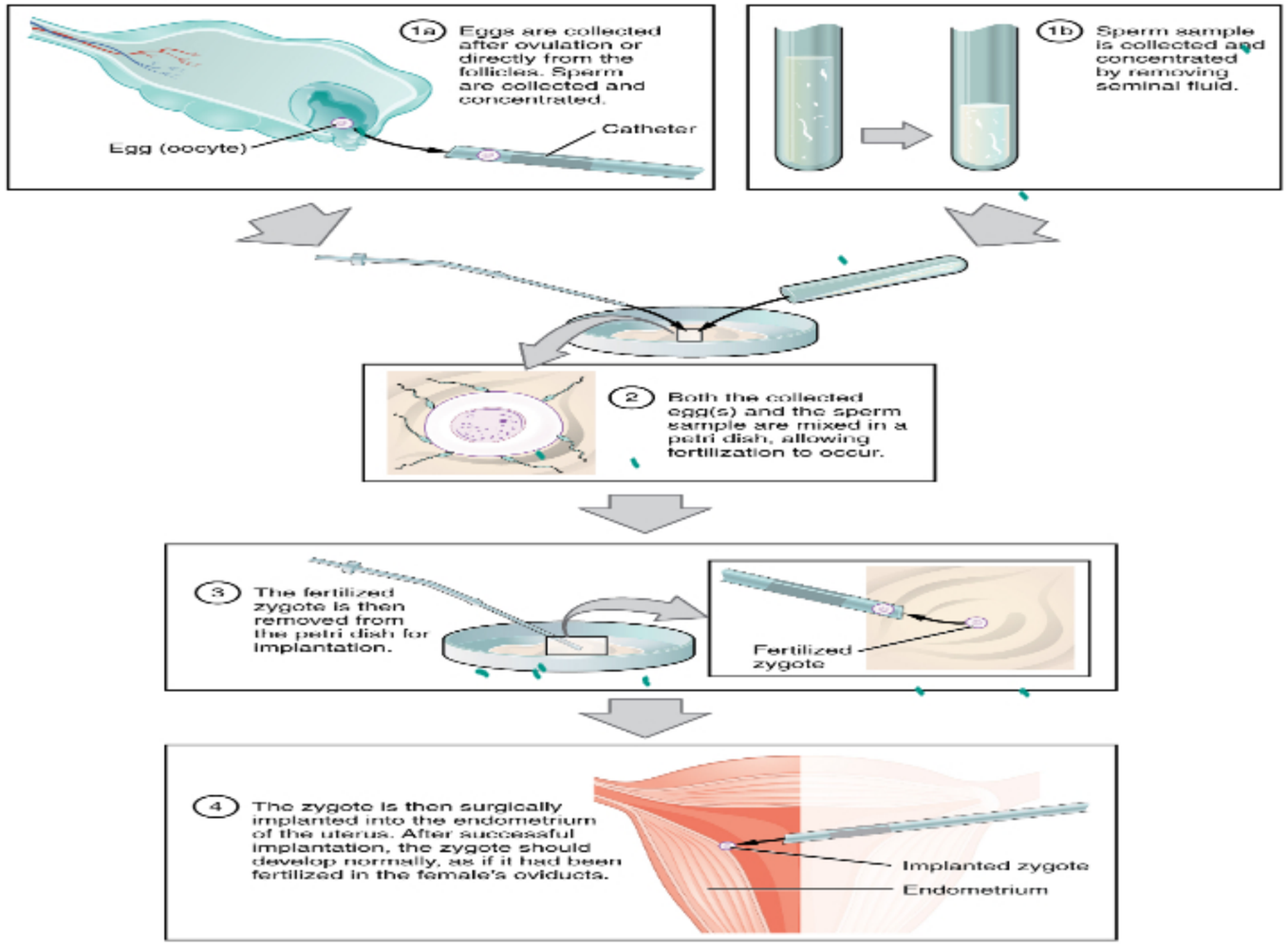
EXPERT GUIDANCE

IN VITRO FERTILIZATION

Expensive
Results in multiple embryos
Premature births
Birth with disability
Not always successful



Fertility drugs to stimulate ovulation.

↓

Ovary and sperm are collected to perform fertilization.

↓

Fertilized egg is developed in the laboratory giving suitable conditions to develop into an embryo.

↓

Embryo is inserted into the uterus.

↓

Develops into a baby.

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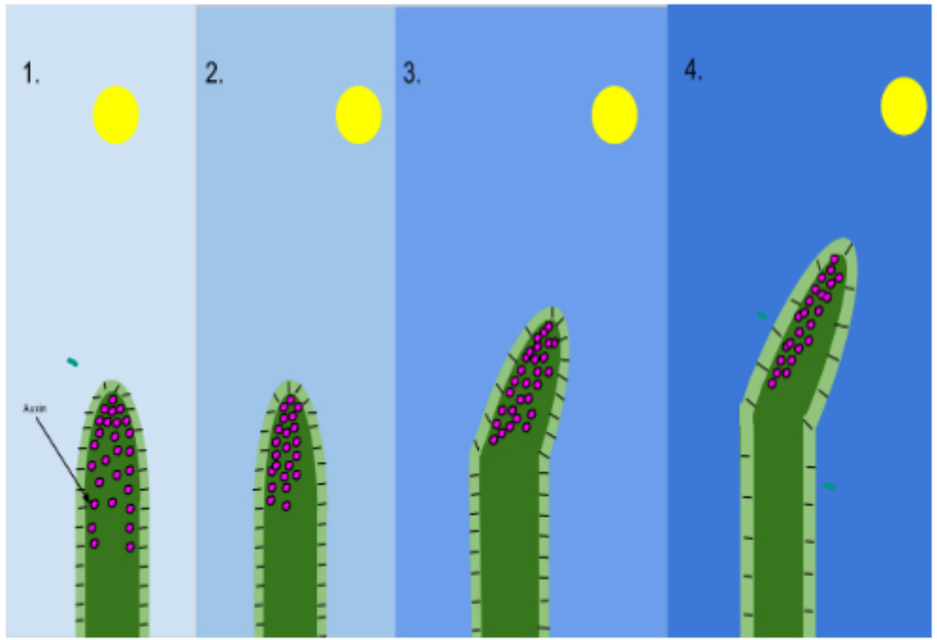
Plant Hormones

Phototropism



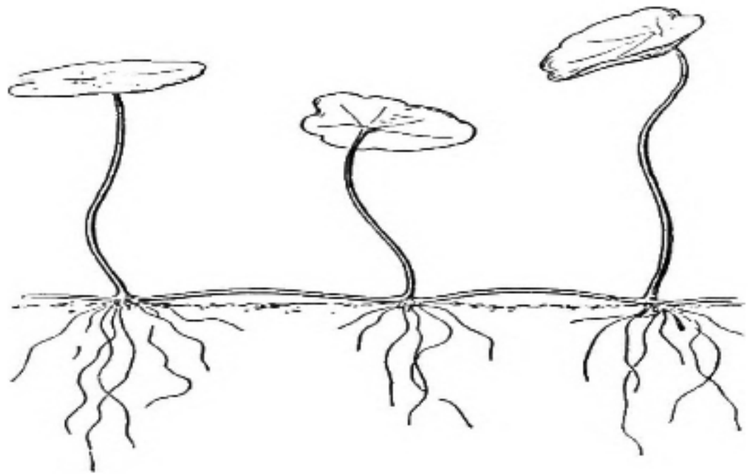
The movement of the shoot towards light.

It is caused by hormone auxin.

Auxin is produced in the shoot tip. When light falls on auxin it is displaced to the shader side promoting growth of the shader region resulting in growth of shoot towards light.

Gravitropism

The movement of roots towards gravity.



It is also caused by auxin. In roots auxin inhibits the growth of the roots at the lower side resulting in bending of the root downwards. Auxin is displaced to lower side in response to gravity.

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PLANT HORMONES

AUXINS

It stimulates cell divsion and growth of the plant

It is used to stimulate rooting in tissue culture.

Used as Weedicide causing excess growth of the weed and killing them.

GIBBERLINS

Seed germination
Promote flowering
End seed dormancy
Elongation of stem.

ETHENE

It is a gaseous hormone

It is involved in fruit ripening

Allows transportation of raw fruit to long distances and then they can be riped by ethene.

Cytokinin

Caused Cell Division

Abscicic acid

Stress hormone prepared the plant for stress conditions

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THERMOREGULATION

2 Temperature receptors in hypothalamus stimulate heat-producing mechanisms

1 Body temperature is low

3

Superficial arteries are constricted, reducing heat loss to the air. Blood flow to the digestive system decreases.

Shivering increases aerobic respiration in the muscles, releasing heat.

Thyroid stimulates cells to increase metabolic heat production.

Body Hair Stands up

Hair traps the layer of insulated air preventing heat loss by conduction.

VASOCONSTRICTION

The blood vessels or capillaries that supplies the blood to the surface constricts preventing the blood flow to the surface which can prevent the heat loss at the surface.

4 Body temperature increases

Temperature homeostasis (36.5–37.5°C)

5 Body temperature is high

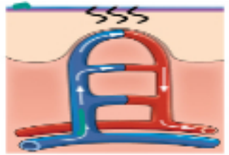
8 Body temperature decreases

VASODILATION

The blood vessels or capillaries that supplies the blood to the surface dilates increasing the blood flow to the surface which caused heat loss by radiation from the surface.

6 Temperature receptors initiate heat-releasing mechanisms

7



Superficial arteries are dilated, causing flushing and increasing heat loss to air. Blood flow is not diverted away from the

Sweating initiated in skin.

Thyroid stimulates cells to decrease metabolic heat production.

Body hair lies flat

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WASTE PRODUCTS

The products produced during metabolic reactions like respiration, digestion etc.

Carbon Dioxide

Produced during respiration.

Is excreted out through the lungs by the process of expiration

Carbon dioxide is harmful as it can alter the pH of the blood affecting enzyme activity.

Water

Produced during respiration and digestion process.

Is excreted through skin in the forms of sweating or some by breathing and by kidney in the form of urine.

Water can also disturb the osmotic balance and salt level of the body.

Urea

Produced by the liver by metabolising excress proteins as it is toxic and cannot be stored.

It is excreted by Kidney in the form of Urine.

Protein → (Digestion) Amino Acid → (Deamination) Ammonia → Urea.

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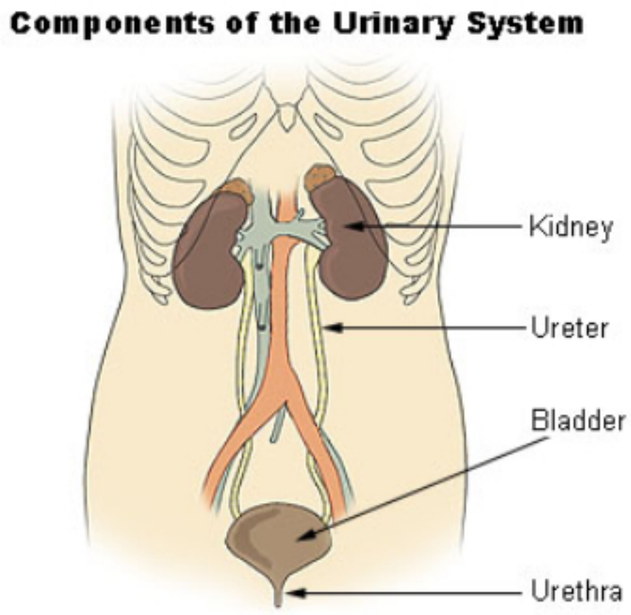
HUMAN EXCRETORY SYSTEM



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ULTRAFILTRATION

Kidneys filters the blood at a very high pressure. All the water, glucose, and useful components gets into the kidney filtrate. The blood cells and blood proteins due to their bigger size are not filtered.

SELECTIVE REABSORPTION

Since the kidney contains useful substance in the filtrate it reabsorbs back them into the blood.

The water also gets reabsorbed depending on the needs of the body.

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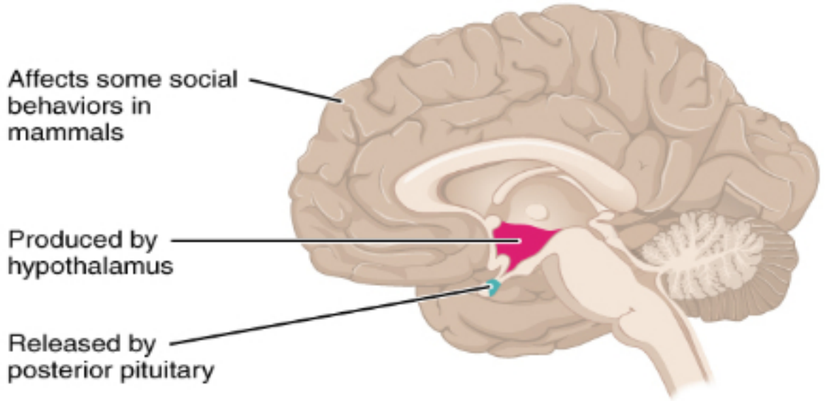
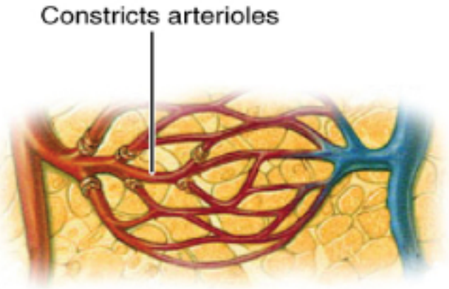
OSMOREGULATION

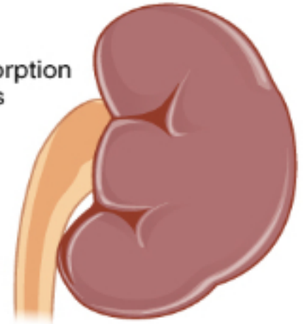


detected by osmoregulatory centre in the brain → Simulated pituitary to release ADH: Anti-diuretic Hormone → Increased reaborption of the water into the blood → NORMAL WATER LEVEL → Water level decreases → detected by osmoregulatory centre in the brain

Concentrated urine.

NEGATIVE FEEDBACK





NORMAL WATER LEVEL → Water level increases → detected by osmoregulatory centre in the brain → release of ADH is inhibited → less reabsorption of water → dilute urine → NORMAL WATER LEVEL

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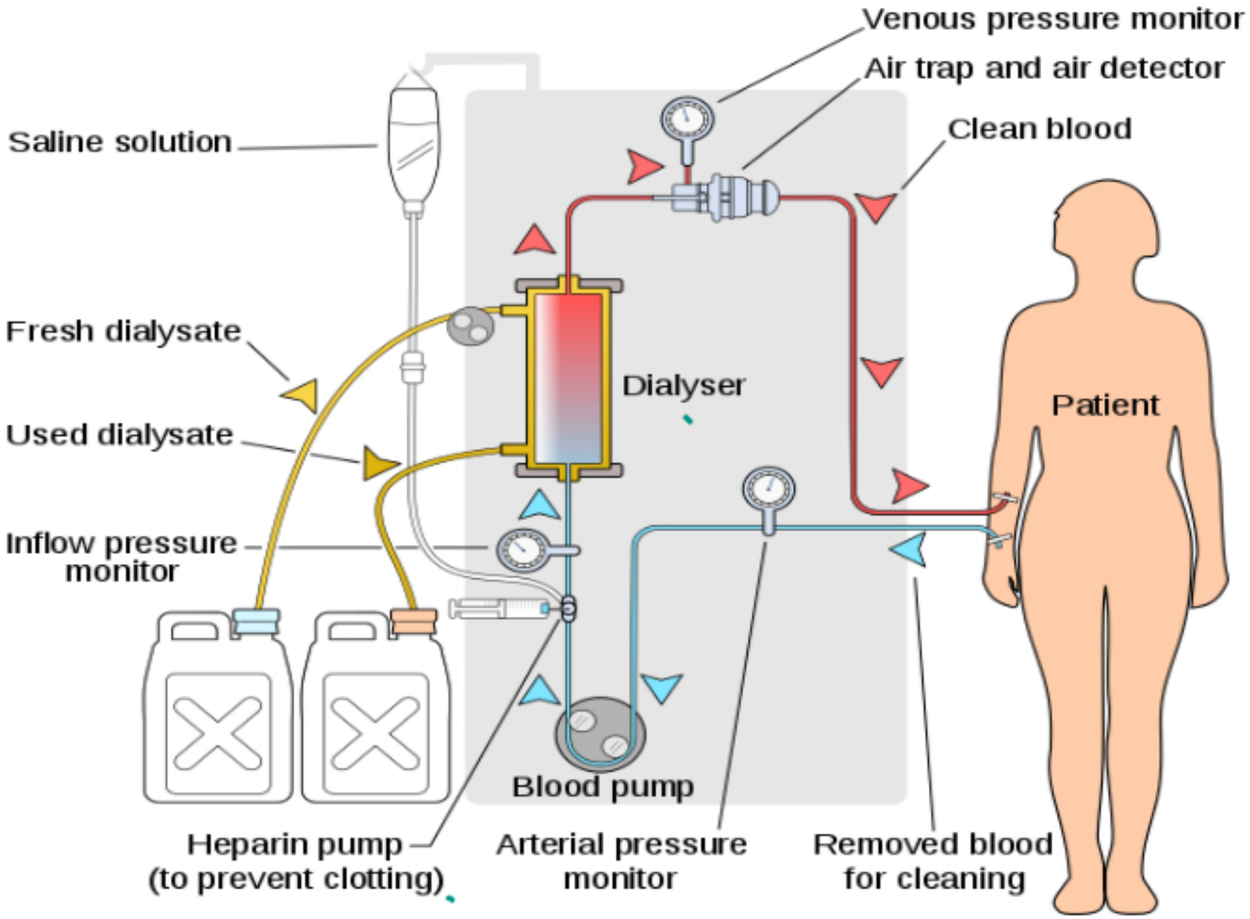
DIALYSIS



Artificial Kidney

blood flows into the dialysis machine which contains dialysis fluid.

Dialysis fluid contains the same concentration of essential minerals ions as that of blood but no urea.

As blood flows into the dialysis fluid, urea is diffused out along the concentration gradient and excess salt is also removed maintaing the normal salt and mineral ions level.

The clean blood is then pumped back.

Lifestyle changes, regular visits, change in diet and regular expenditure are some of the disadvantages.

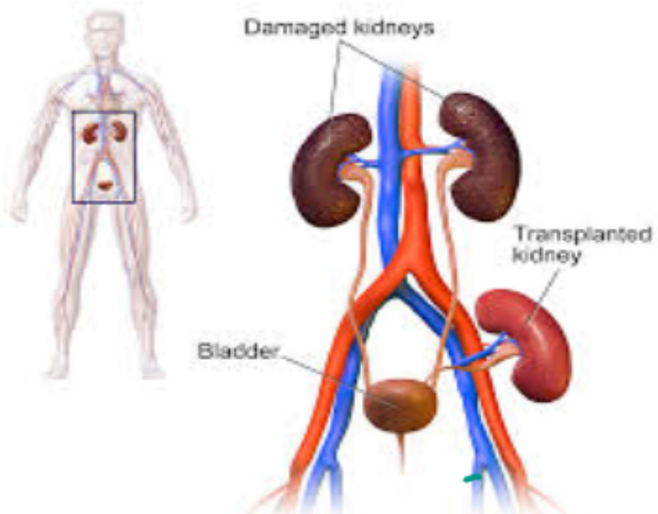
KIDNEY TRANSPLANT

Replacing diseased kidney with the healthy one.

The donor should be a close relative to prevent rejection.

The person has to be on immuno suprresant drugs so that the body immune system does not reject it.

Does not last long and person is prone to other infectious diseases due to immuno suppresant drugs.



Kidney Transplant

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DIALYSIS V/s KIDNEY TRANSPLANT

	DIALYSIS	KIDNEY TRANSPLANT
ADVANTAGES	No surgery No infection No immuno supressant drugs Easyily available	No regular visit No lifestyle changes No diet restriction
DISADVANTAGES	Lifestyle changes Regular visits and long procedure Restricted Diet	Does not last forever Chances of rejection Immuno supressant drugs to be taken Person is more prone to infections. Finding a suitable donor is a problem .

- Homeostasis
- Receptors
- Effectors
- Stimulus
- Neurones
- Central Nervous System
- Sensory Neurones
- Motor Neurones
- Relay Neurones
- Reflex Arc

- Brain
- Cerebral Cortex
- Cerebellum
- Medulla
- MRI
- Eye
- Cornea
- Retina
- Blind Spot
- Ciliary Muscles
- Suspensory Ligament

- Sclera
- Iris
- Pupil
- Accommodation
- Myopia
- Hyperopia
- Endocrine System
- Hormones
- Adrenaline
- Insulin
- Pituitary Gland

- FSH
- LH
- Oestrogen
- Progesterone
- Glucagon
- Glycogen
- Diabetes
- Mensturation
- Ovulation
- IVF

- Phototropism
- Gravitotropism
- Auxins
- Gibberlins
- Ethene
- Vasoconsriction
- Vasodilation
- Thermoregulation
- Dialysis

Selective Reabsorption

NEXT STEP

CHECK SPECIFICATION

EXAM QUESTIONS ON THIS TOPIC

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