



LIFE SCIENCES

DIAGRAMS, LABELS & FUNCTIONS BOOK

GRADE 12

PAPER 1

By: NP Mbhele

Reproductive
Strategies

Human
Reproduction

Responding
to the
Environment
by human

Endocrine
System &
Homeostasis

Responding
to the
Environment
by plants

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The structure of a male reproductive system.

Seminal vesicles: produces a **nutrient** rich fluid that provides **energy** for the sperm cells

E.

Cowper's gland: Produces **mucus** that **helps** with the **movement** of sperm cells

D.

Vas deferens: **Transports sperm** from the epididymis to the urethra

C.

Epididymis: **stores Sperm cells** and allow the mature.

B.

Testis: **Produces sperm cells** and the hormone **testosterone**

A.

Question: Why do testes hung outside the body?

Scrotum: Skin sac that **protects the testes** and holds the testes 'outside' the body, at a temperature that is 2°C below 37°C. This is the best temperature for the production of sperm.

J.

Prostate gland: Produces an **alkaline** fluid that **neutralises** the **acids** produced in the vagina, which would kill sperm cells

F.

Urethra: **Transports semen** and **urine** out of the body

G.

Urethra: **Transports semen** and **urine** out of the body

I.



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By M.SAIDI- 0848331738

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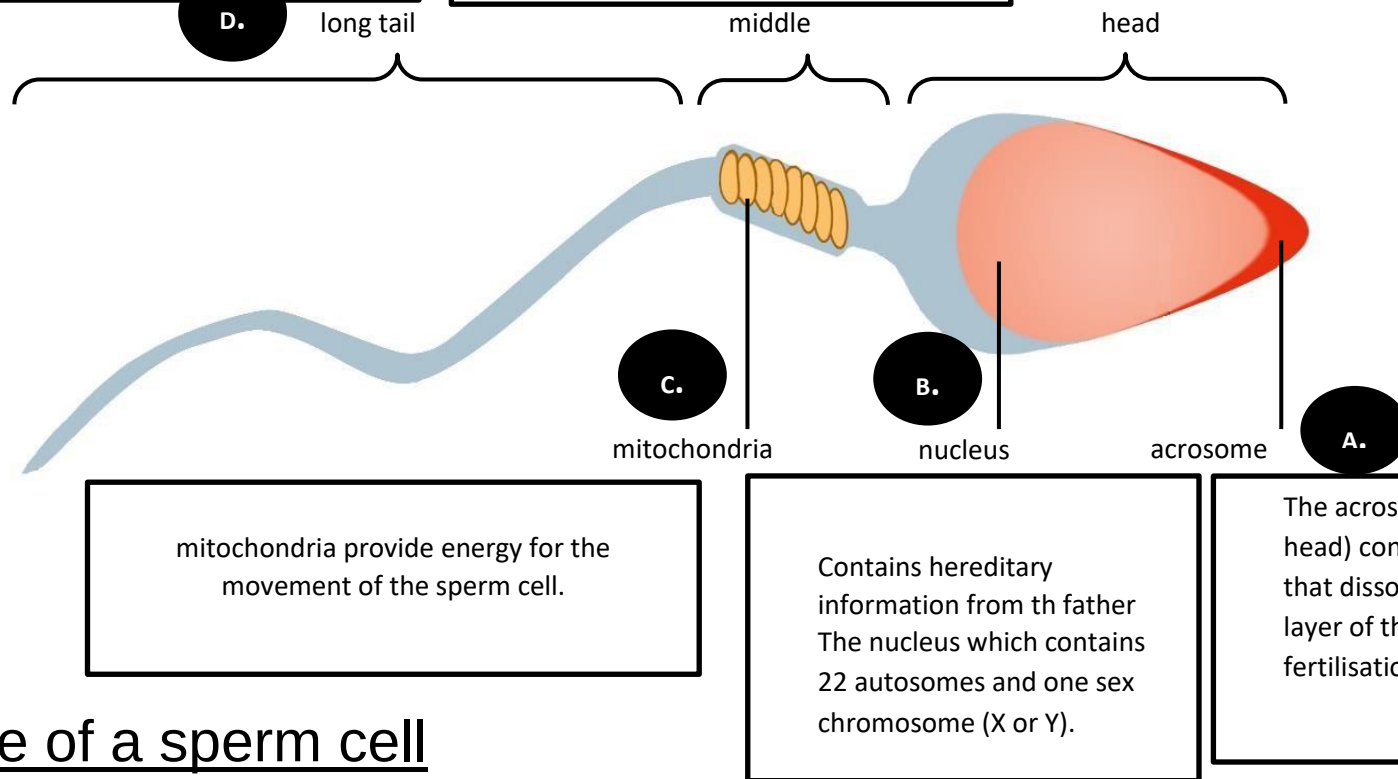
The structure of a human sperm cell.

Each sperm cell is made up of a **head**, **middle portion** (neck) and a **long tail**.

The long tail allows the sperm cell to propel itself forward (to swim) through fluid.

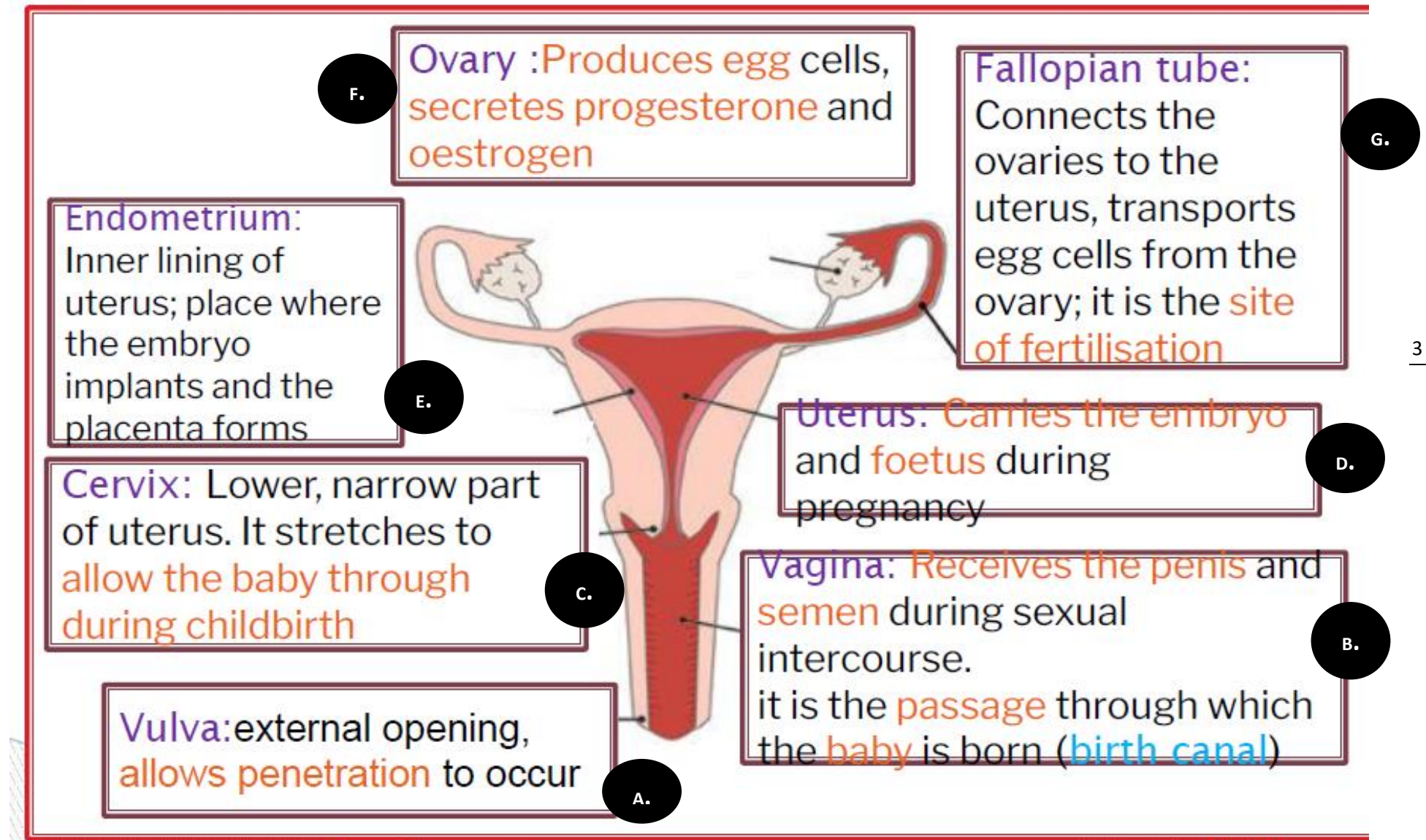
The middle portion contains mitochondria which provide energy for the movement of the sperm cell.

The head is mostly made up of the nucleus which contains 22 autosomes and one sex chromosome (X or Y).



The structure of a sperm cell

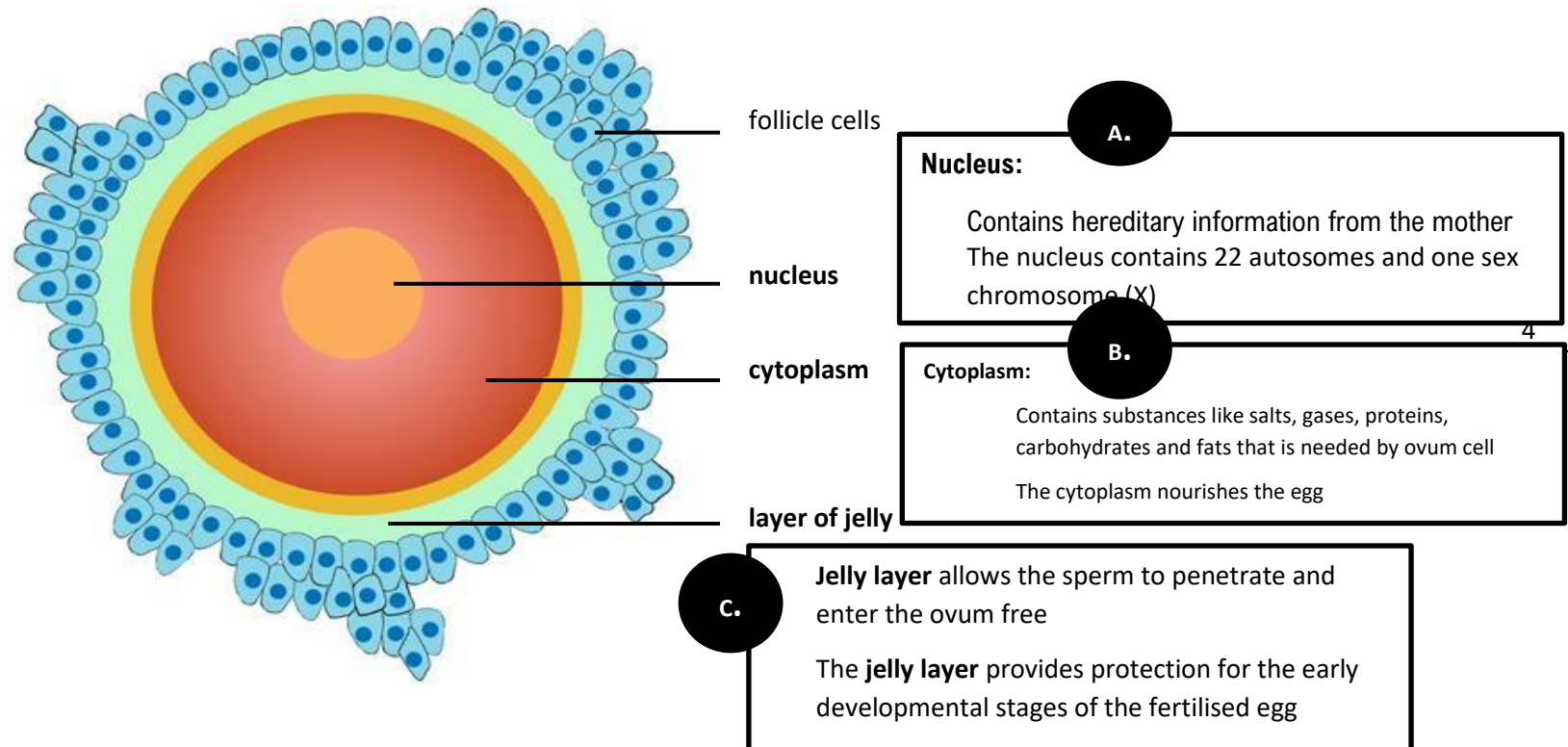
The structure of a female reproductive system



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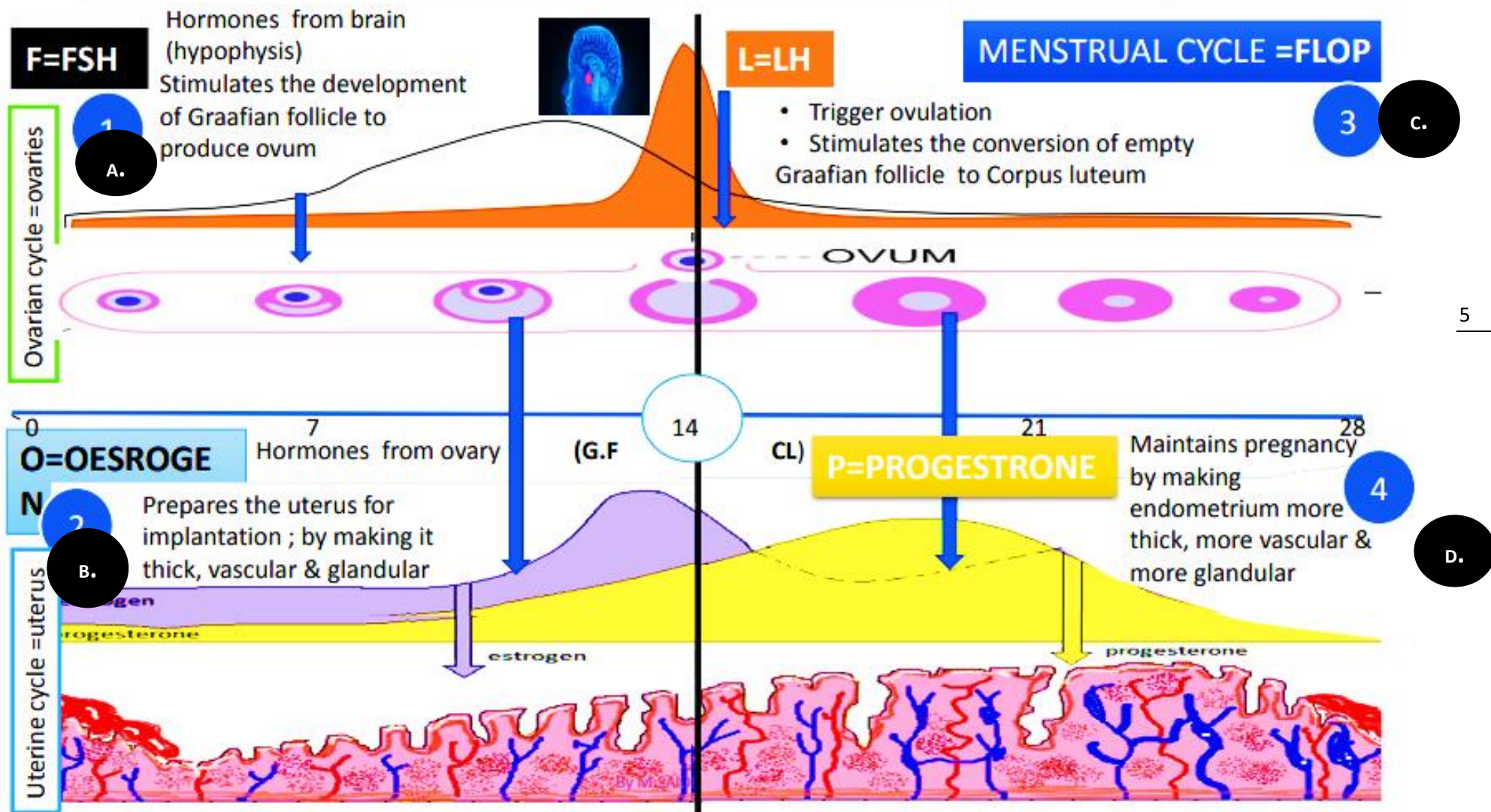
The structure of a human egg (ovum)

Each ovum is made up of **follicle cells**, a **layer of jelly**, **cytoplasm** and a **haploid nucleus**.

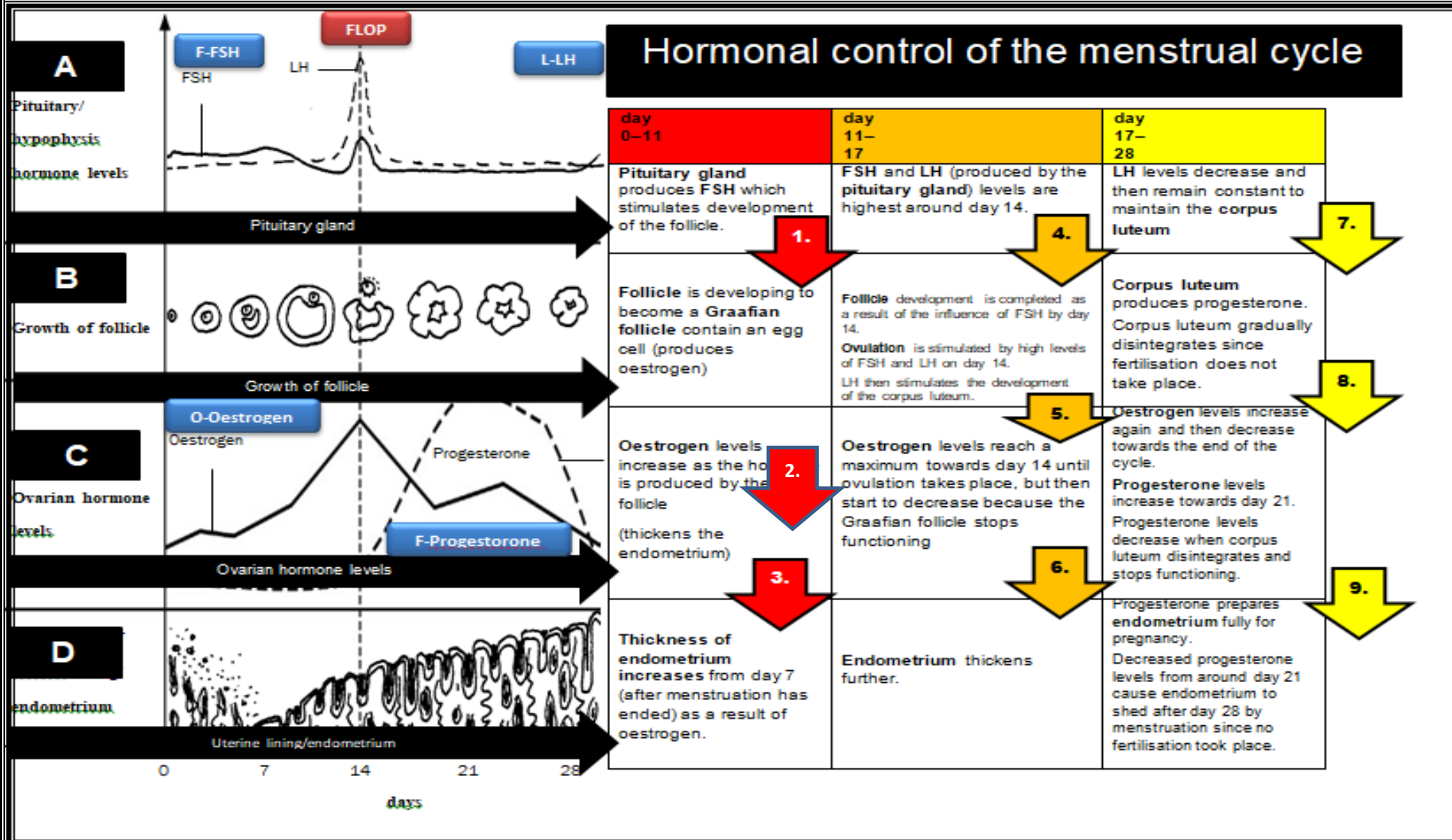


The structure of an ovum

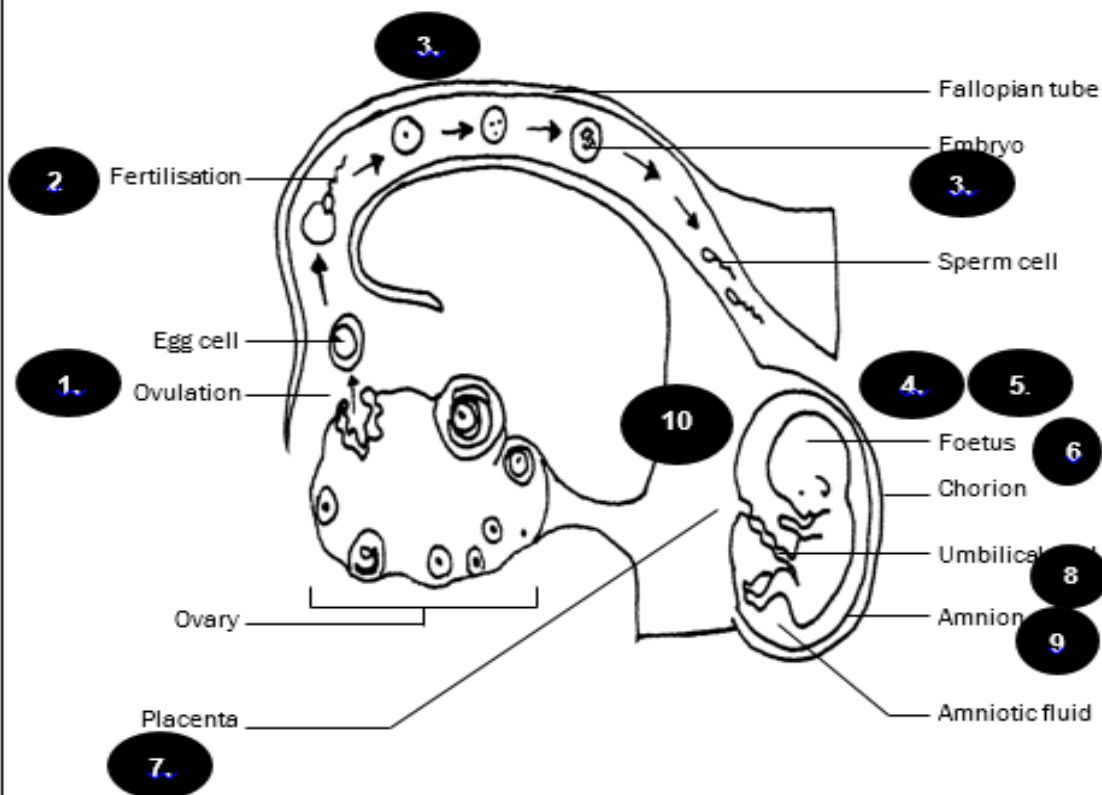
Hormonal control of the menstrual cycle



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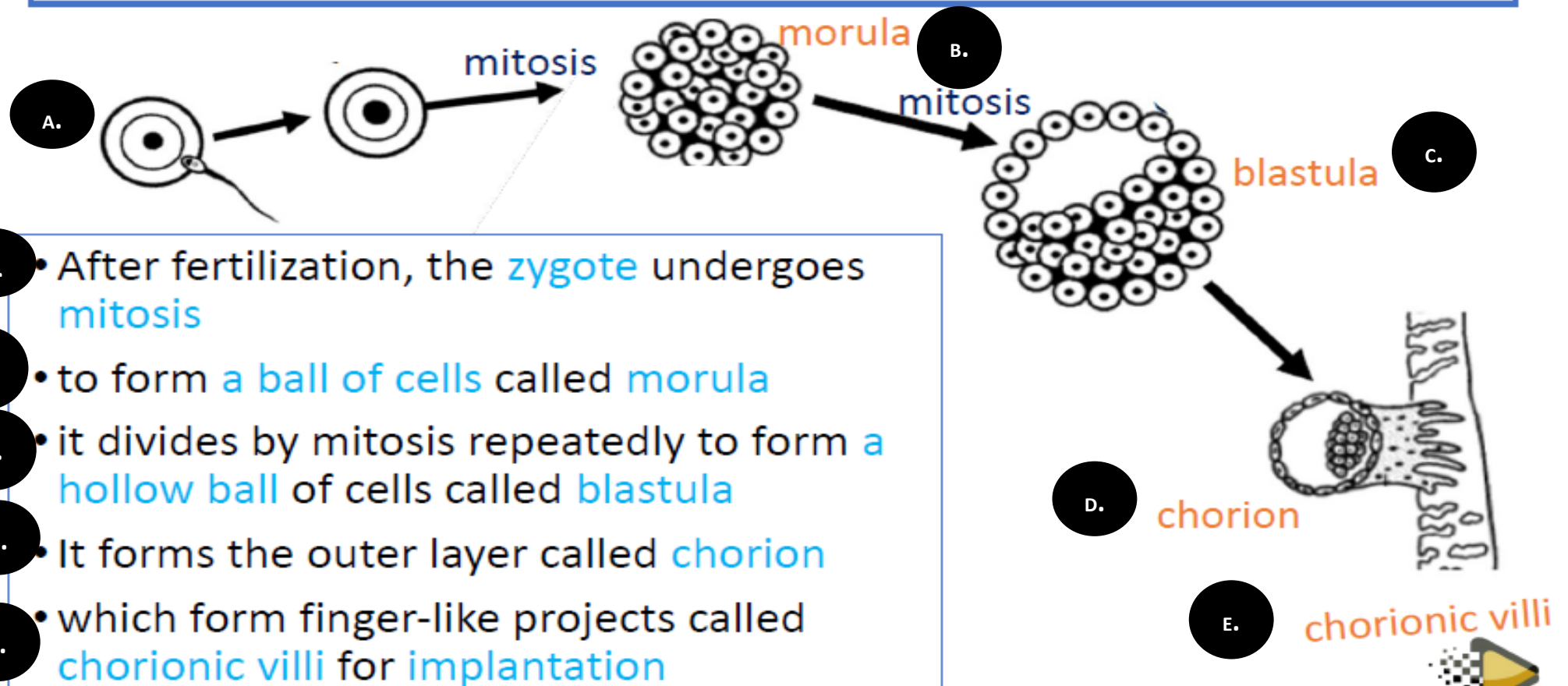
Development of the foetus



1. In the ovary a mature Graafian follicle bursts (usually on day 14 of the menstrual cycle) and releases an egg cell. This process is called **ovulation**.
2. **Fertilisation** takes place high up in the fallopian tube. The egg cell (containing 23 chromosomes) and sperm cell (containing 23 chromosomes) fuse to form a zygote (containing 46 chromosomes).
3. The zygote divides by mitosis to form a morula, then a blastocyst, and finally an **embryo** as it moves down the Fallopian tube.
4. It takes about 5 to 7 days for the embryo to reach the **uterus**.
5. In the uterus the embryo settles on the endometrium and sinks into it, embedding itself in the endometrium. This process is called **implantation**.
6. After implantation, the embryo produces many finger-like structures called villi from the outer membrane of the embryo, which is known as the **chorion**.
7. The villi grow into the tissue of the uterus to form a **placenta**.
8. The placenta is attached to the embryo by the **umbilical cord**. It has 2 **umbilical arteries** (which carry deoxygenated blood from the embryo towards the placenta) and 1 **umbilical vein** (which carries oxygenated blood from the placenta to the embryo).
9. The embryo is enclosed in a fluid-filled sac called the **amnion**. The fluid is called the **amniotic fluid**.
10. After about 8 weeks, the embryo develops structures such as limbs and all the organs of the body. Now it is called a **foetus**.
11. **Gestation** is the period between fertilisation and the birth of the baby. It usually lasts for a period of 9 months (39–40 weeks).
12. The stages involved in the natural birth process are:
 - Dilation of the cervix (labour)
 - Expulsion of the foetus.
 - Delivery of the afterbirth (placenta) and extra-embryonic membranes.

Development of the foetus

How do we write in exams **(most important)**



- A. After fertilization, the **zygote** undergoes **mitosis**
- B. to form a **ball of cells** called **morula**
- C. it divides by mitosis repeatedly to form a **hollow ball** of cells called **blastula**
- D. It forms the outer layer called **chorion**
- E. which form finger-like projects called **chorionic villi** for **implantation**

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The foetus and its extra-embryonic membranes

The foetus contains extra-embryonic membranes and other structures which aid in the development of the embryo Figure 11 below:

Two **umbilical arteries** which carry deoxygenated blood and waste products from the foetus to the placenta.

One **umbilical vein** which carries oxygenated blood, nutrients, water and other substances from the placenta to the foetus.

amniotic fluid

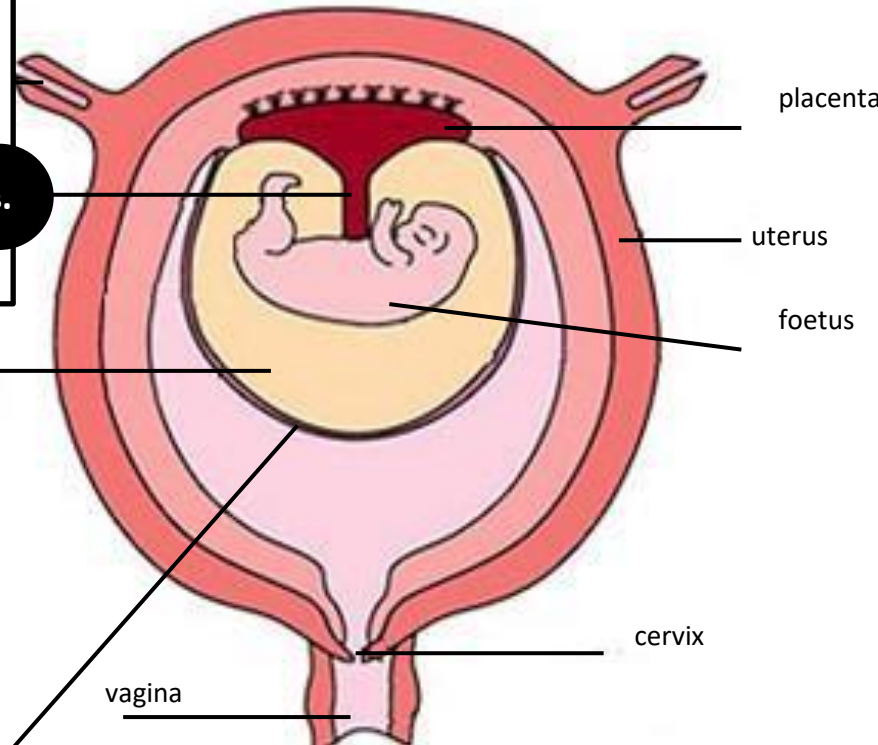
B.

A.

The **amniotic fluid** has the following functions:

- Protects the foetus against mechanical injury (shock-absorber)
- Prevents dehydration
- Maintains the temperature of the foetus
- Allows for free-movement of the foetus as it grows and develops

amnion



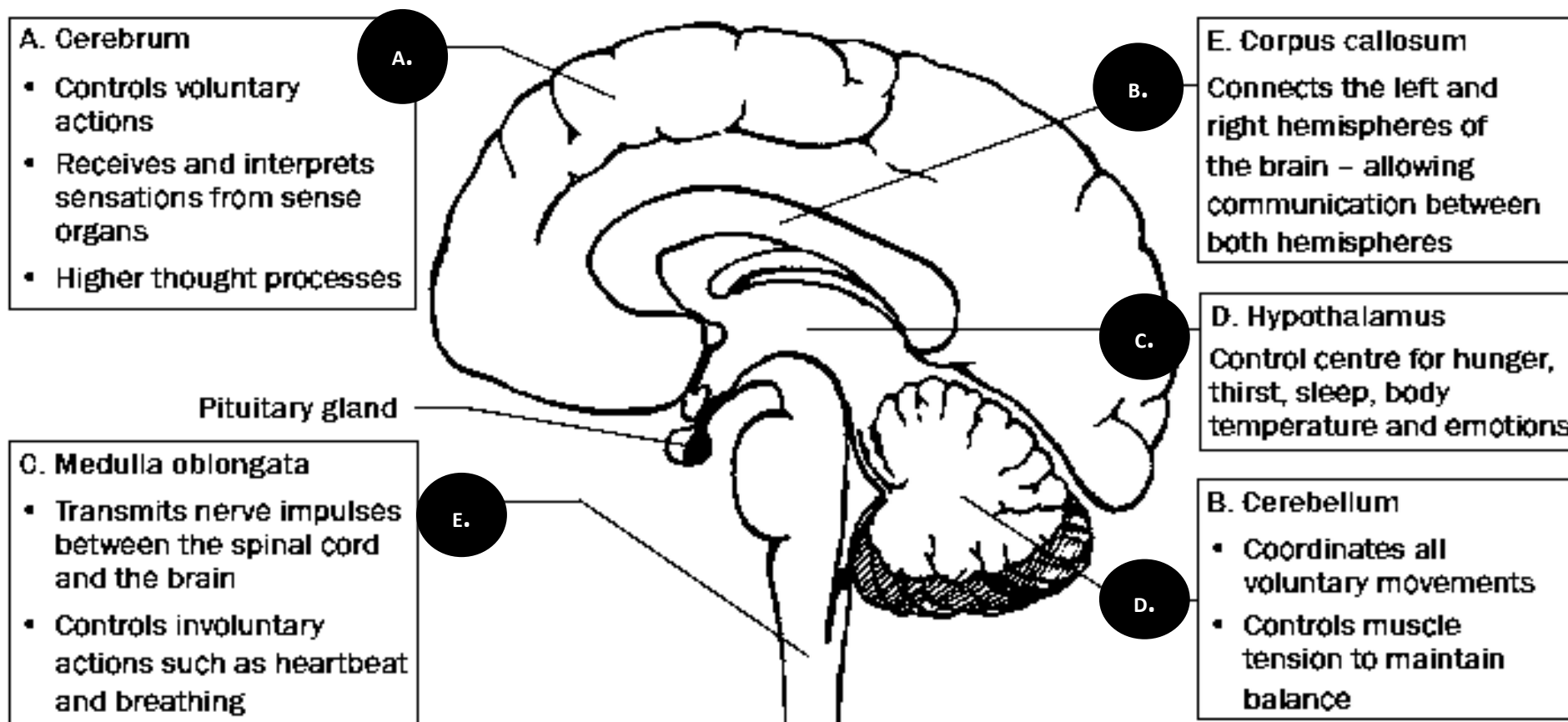
B.

Placenta allows for substances to be transferred by diffusion between the mother and foetus without any blood being in direct contact. This means that the mother and foetus' blood never actually mixes.

- It is the point of attachment of the foetus to the mother
- It allows for diffusion of nutrients from the mother to the foetus
- It allows for the diffusion of oxygen from the mother to the foetus and for the diffusion of carbon dioxide from the foetus to the mother (gas exchange)
- It allows for the diffusion of waste products from the foetus to the mother
- After 12 weeks, the placenta secretes progesterone to maintain the pregnancy

The foetus and its extra-embryonic membranes

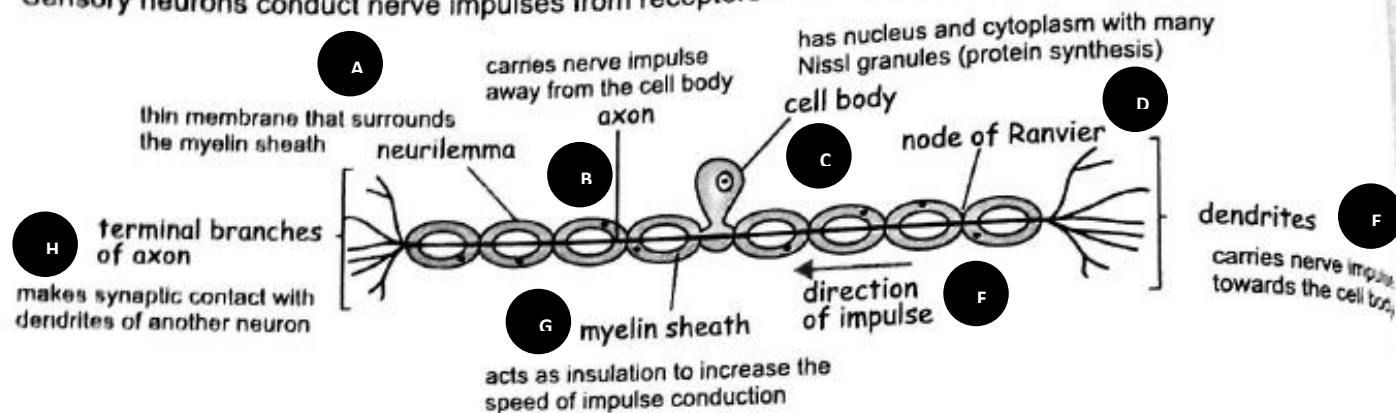
THE BRAIN



THE NUERONS

Sensory Neurons

Sensory neurons conduct nerve impulses from receptors towards the spinal cord and brain.



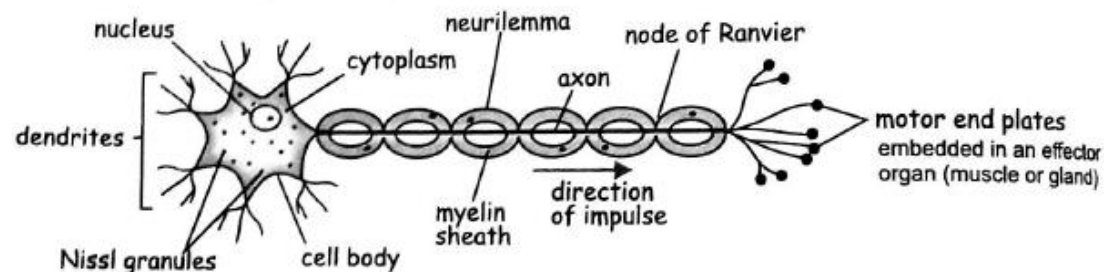
A sensory neuron

A **synapse** is a microscopic gap between the end of an axon of one neuron and the dendrite of another neuron. Neurotransmitters are stored at the end of the axon. They are released when an impulse reaches this point. These neurotransmitters then stimulate the dendrite of the next neuron to generate a new nerve impulse, which moves through the next neuron.

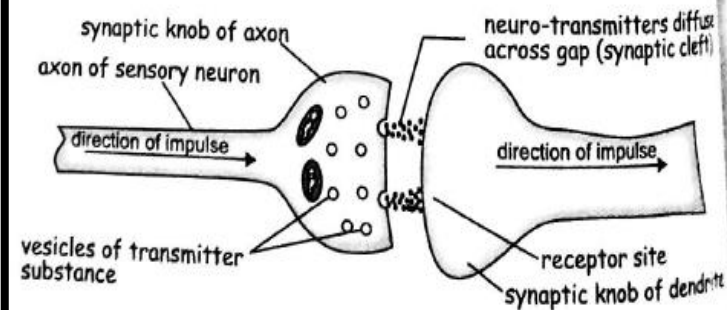
Synapse

Motor Neurons

Motor neurons conduct nerve impulses away from the brain and spinal cord towards the effectors.



A motor neuron



Movement of an impulse across a synapse

REFLEX ARCH

12.

The path of a reflex arc:

Receptor (A) → Sensory neuron (B) → Interneuron (C) → Motor neuron (D) → Effector (E)

RSIME

A.

A Receptor: A structure which receives a stimulus and converts it into an impulse (the heat sensor of the finger feels burn)

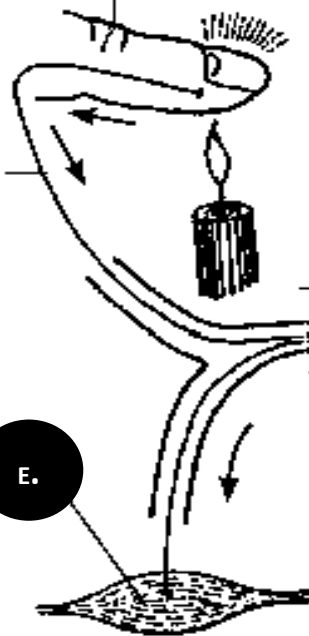
C.

C Interneuron: Carries the impulse from sensory neuron to the motor neuron in the spinal cord

B.

B Sensory neuron: Carries the impulse from the receptor to the spinal cord

E Effector: A structure which produces the reaction (the muscles in the finger contract and the finger is pulled away)



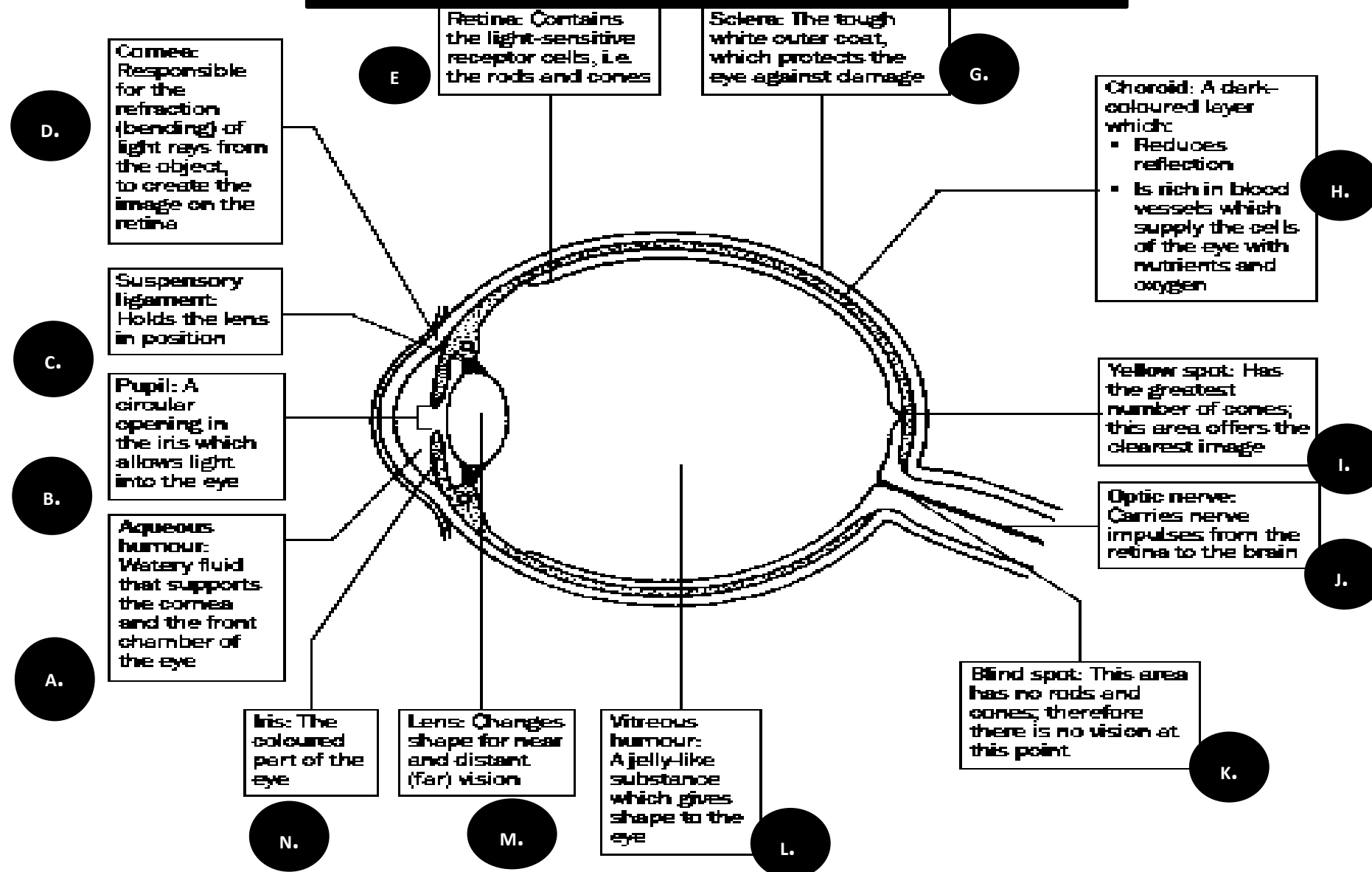
E.

D.

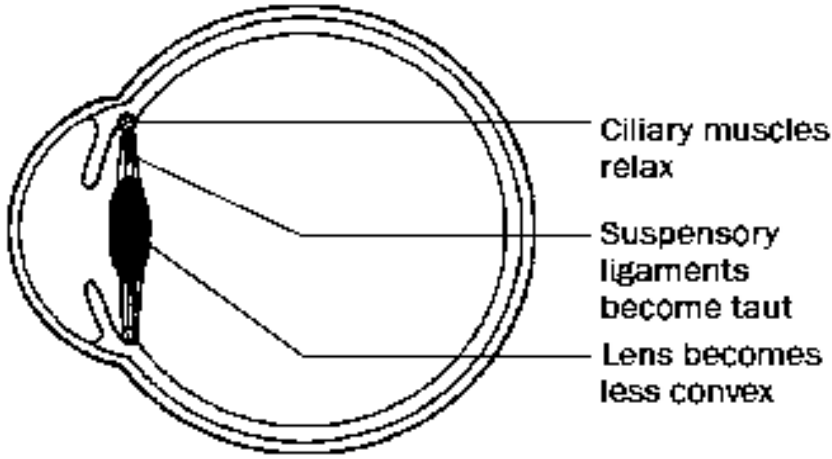
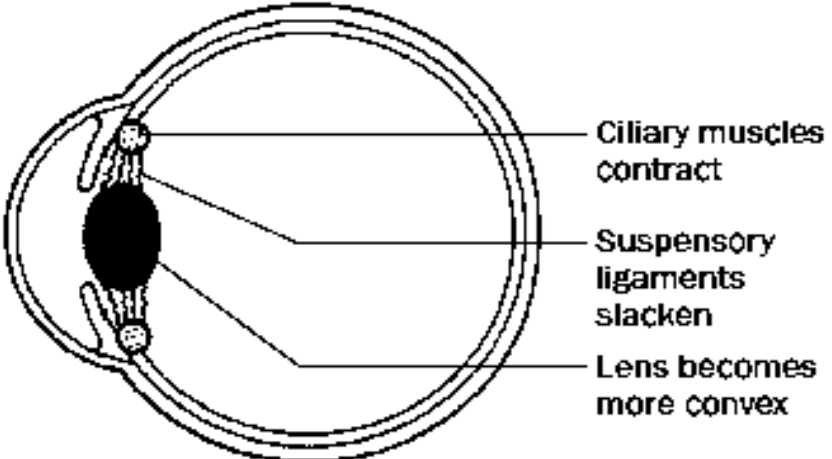
D Motor neuron: Carries the impulse from the spinal cord to the effectors

Grey matter
White matter

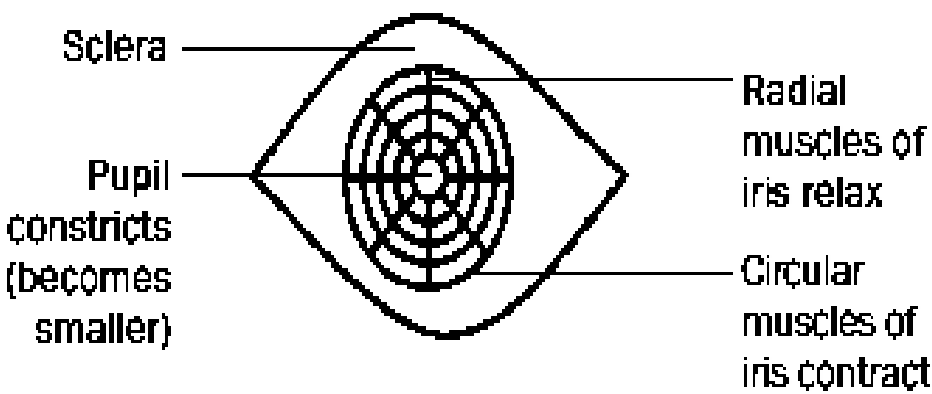
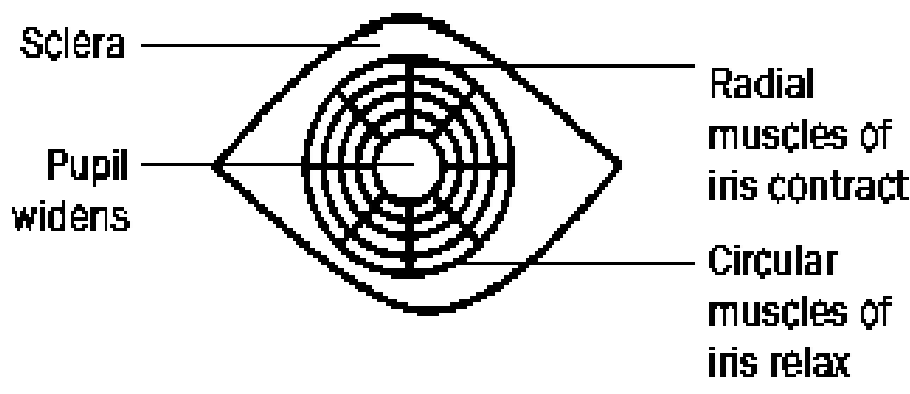
THE EYE



ACCOMODATION

Distant vision (objects further than 6 m)	Near vision (objects closer than 6 m)
1. Ciliary muscles relax	1. Ciliary muscles contract
2. Suspensory ligaments tighten (become taut)	2. Suspensory ligaments slacken
3. Tension on lens increases	3. Tension on lens decreases
4. Lens is less convex (flatter)	4. Lens becomes more convex (more rounded)
5. Light rays are refracted (bent) less	5. Light rays are refracted (bent) more
6. Light rays are focused onto the retina	6. Light rays are focused onto the retina
 Ciliary muscles relax Suspensory ligaments become taut Lens becomes less convex <i>Figure 6.8 Distant vision</i>	 Ciliary muscles contract Suspensory ligaments slacken Lens becomes more convex <i>Figure 6.9 Near vision</i>

PUPILLARY MACHANISM

Light is bright	Light is dim
1. Radial muscles of the iris relax	1. Radial muscles of the iris contract
2. Circular muscles of the iris contract	2. Circular muscles of the iris relax
3. Pupil constricts (gets smaller)	3. Pupil widens (gets bigger)
4. Less light enters the eye	4. More light enters the eye
 Figure 6.10 The pupil in bright light	 Figure 6.11 The pupil in dim light

PUPILLARY MACHANISM

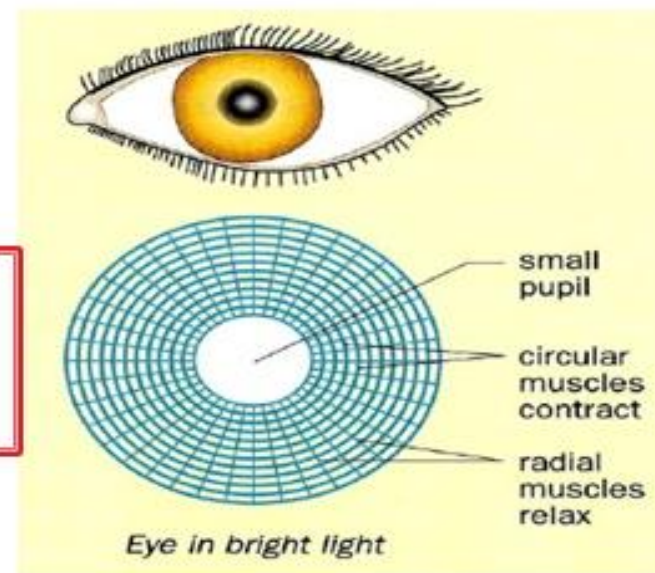
the process by which the **diameter** of the pupil is altered to **control the amount of light entering** the eye.

BRIGHT LIGHT CONDITIONS

- **Radial** muscles of the iris **Relax**
- **Circular** muscles of the iris **Contract**
- Pupil constricts (gets smaller)
- Less light enters the eye

➤ **Radial - Relax**
➤ **Circular - Contract**

➤ **R-R**
➤ **C-C**



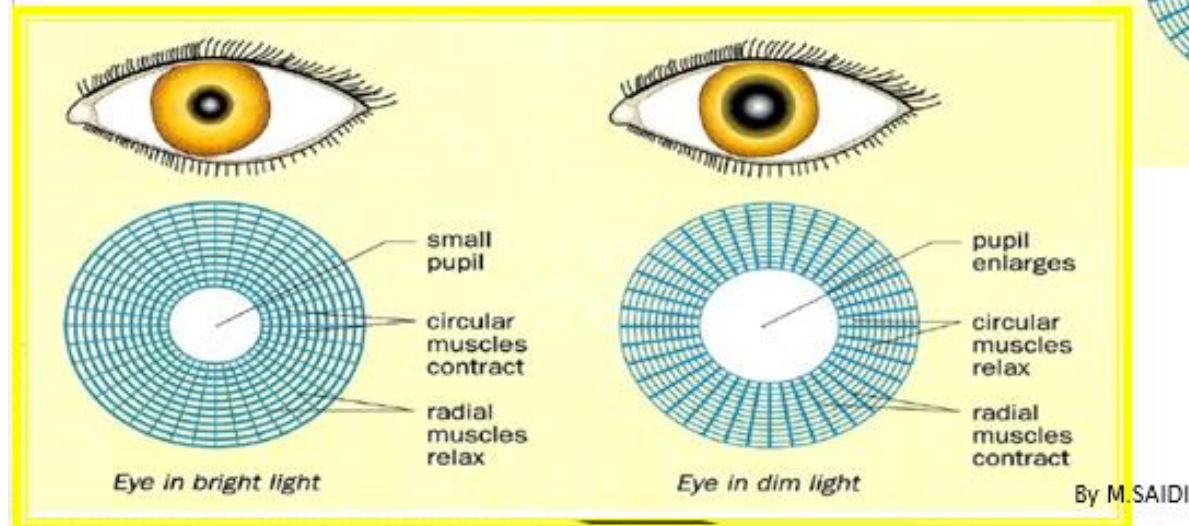
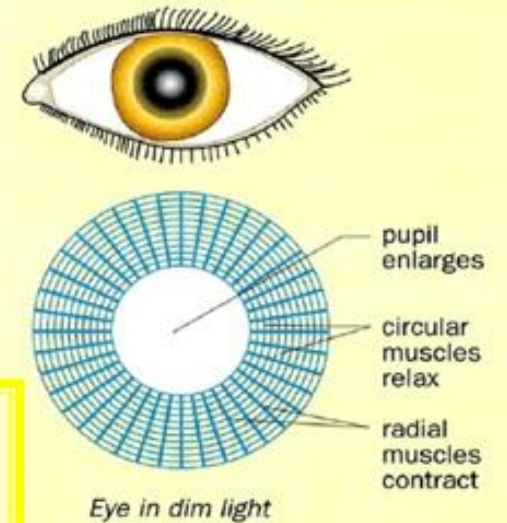
PUPILLARY MACHANISM

BRIGHT LIGHT CONDITIONS

- **Radial** muscles of the iris **Contract**
- **Circular** muscles of the iris **Relax**
- Pupil constricts (gets bigger)
- More light enters the eye

➤ **Radial - Contract**
➤ **Circular - Relax**

➤ **R-C**
➤ **C-R**



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VISUAL DEFECTS

Short sightedness

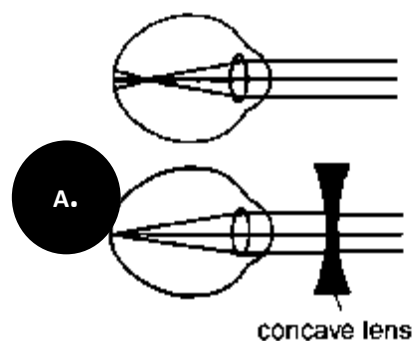


Figure 6.12 A

Long sightedness

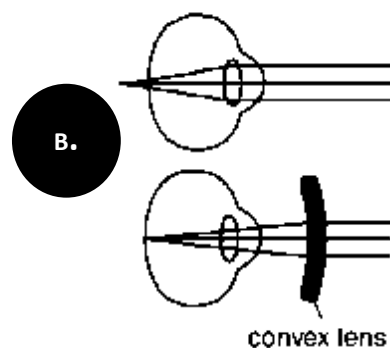


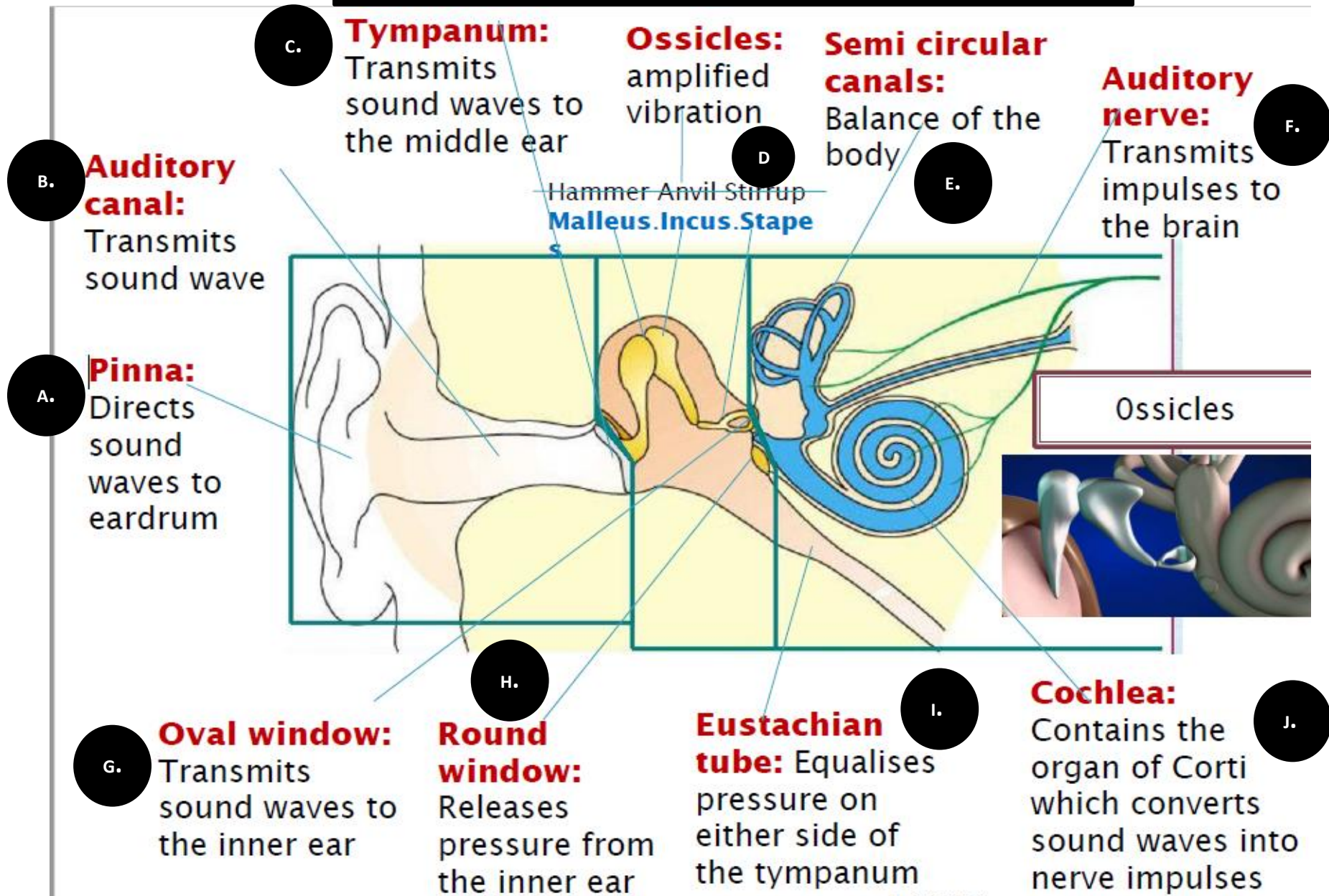
Figure 6.12 B

////

Visual defect	Nature of the defect	Corrective measures
Short-sightedness Near objects can be seen clearly (myopia)	• Inability of lens to become more flat/eyeball is longer than normal • Lens bends the light rays too much • As a result it falls in front of the retina • causing the image to be blurred • Cannot see distant objects clearly	Wearing glasses with converging (biconcave) lens Figure 6.12 A
Long-sightedness Objects far away can be seen clearly (hyperopia)	• Inability of lens to become more convex/eyeball is shorter than normal • Lens does not bend light rays enough • As a result it falls behind the retina • causing the image to be blurred • Cannot see near objects clearly	Wearing glasses with converging (biconvex) lens Figure 6.12 B
Astigmatism	• The curvature of the lens or cornea is uneven resulting in distorted images	Glasses with lenses shaped to correct the distortion
Cataracts	• Lens becomes cloudy and opaque	Surgery to replace the lens with a synthetic lens

THE EAR

19.



19

Hearing process

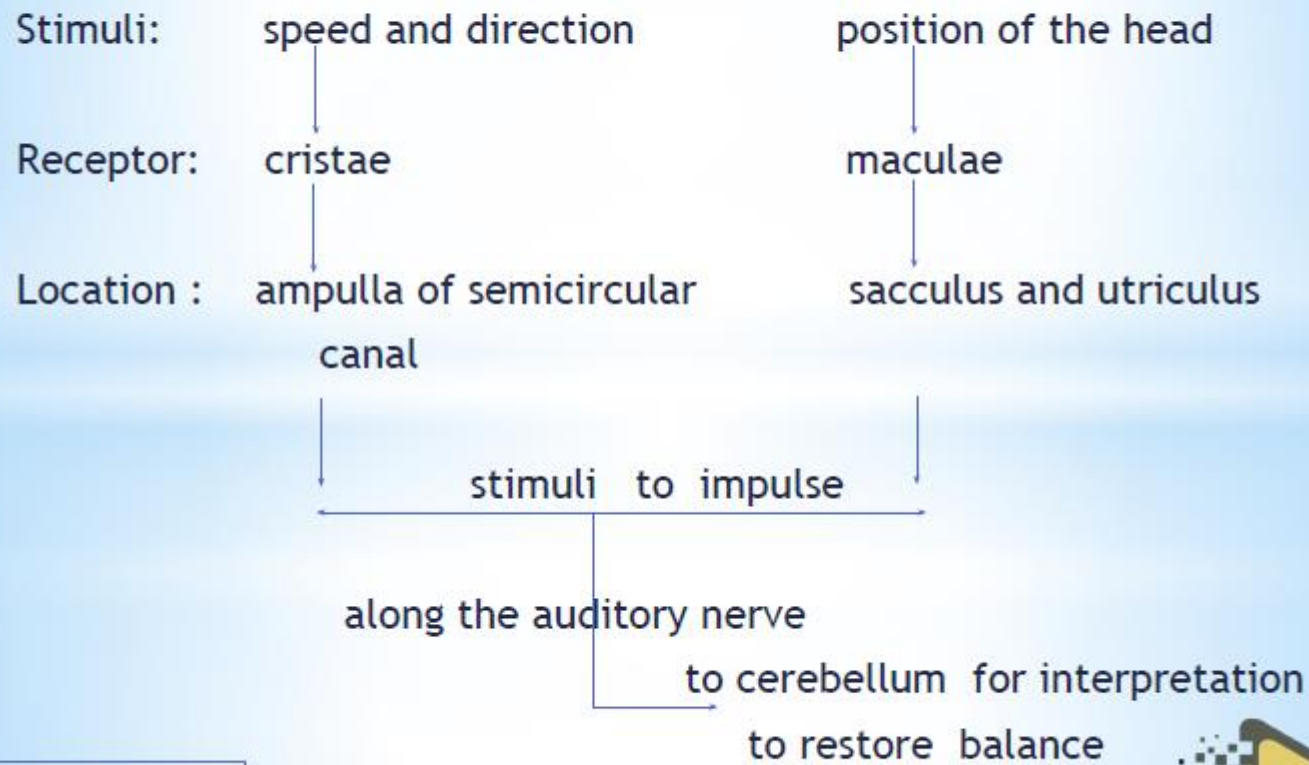
1. Pinna **Traps** the sound waves and **directs** them into the auditory canal.
2. Tympanic membrane **Vibrates** and **transmits** the vibrations to the ossicles in the middle ear.
3. Ossicles The ossicles **amplify** the vibrations and **carry them** via the middle ear to the membrane of the oval window.
4. Oval window **Vibrates** and **causes pressure** waves in the inner ear.
5. Cochlea **vibrations** cause the **sensory cells** in the organ of Corti to be **stimulated** in the cochlea and nerve impulses are generated.
6. Auditory nerve **Transmits** nerve **impulses** to the **cerebrum** to be interpreted.



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PROCESS OF BALANCING



M. Saidi's model
of balance



Summary of balance

1. The **cristae** in the **semicircular** canals are stimulated by changes in the **direction and speed** of movement
2. The **maculae** in the **sacculus** and **utricle** are stimulated by changes in the **position** of the head When stimulated,
3. the **cristae and maculae** convert the **stimuli** received into **nerve impulses**.
4. Which are transported along the **auditory nerve** to the **cerebellum** to be **interpreted**.
5. The cerebellum then **sends impulses** to the **muscles** to **restore balance**.



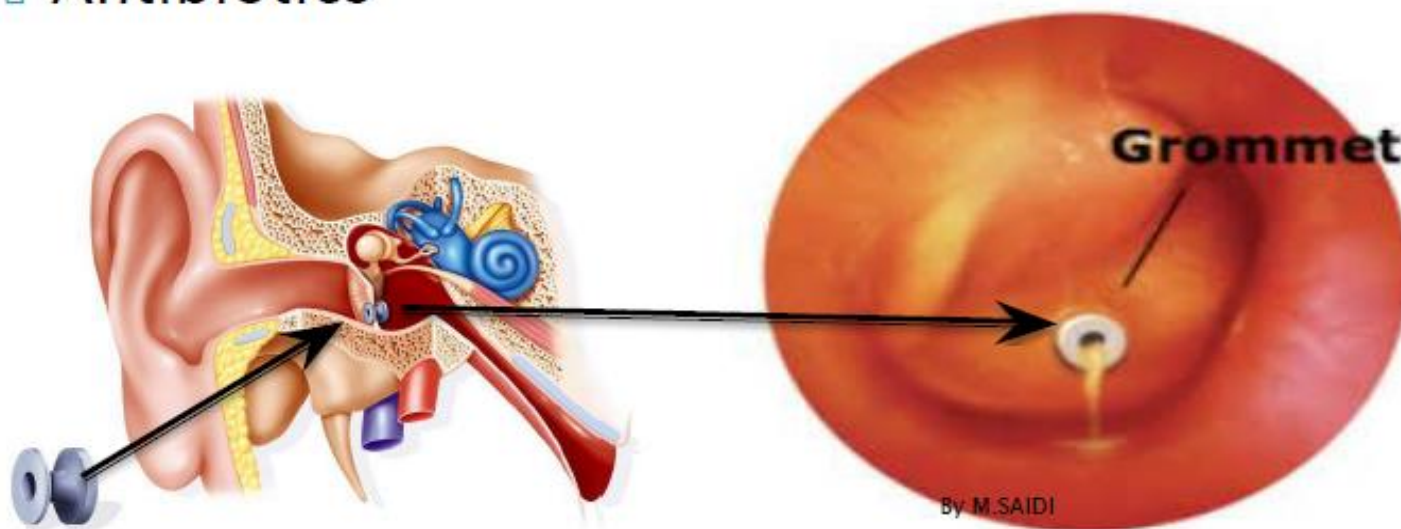
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HEARING DEFECTS



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- ❑ 1. Middle ear infection
- ❑ Excess fluid in the middle ear caused by pathogen infection (bacteria)
- ❑ Treatment
- ❑ Inserting grommets
- ❑ Antibiotics



2. Deafness

refers to a total or partial hearing loss!



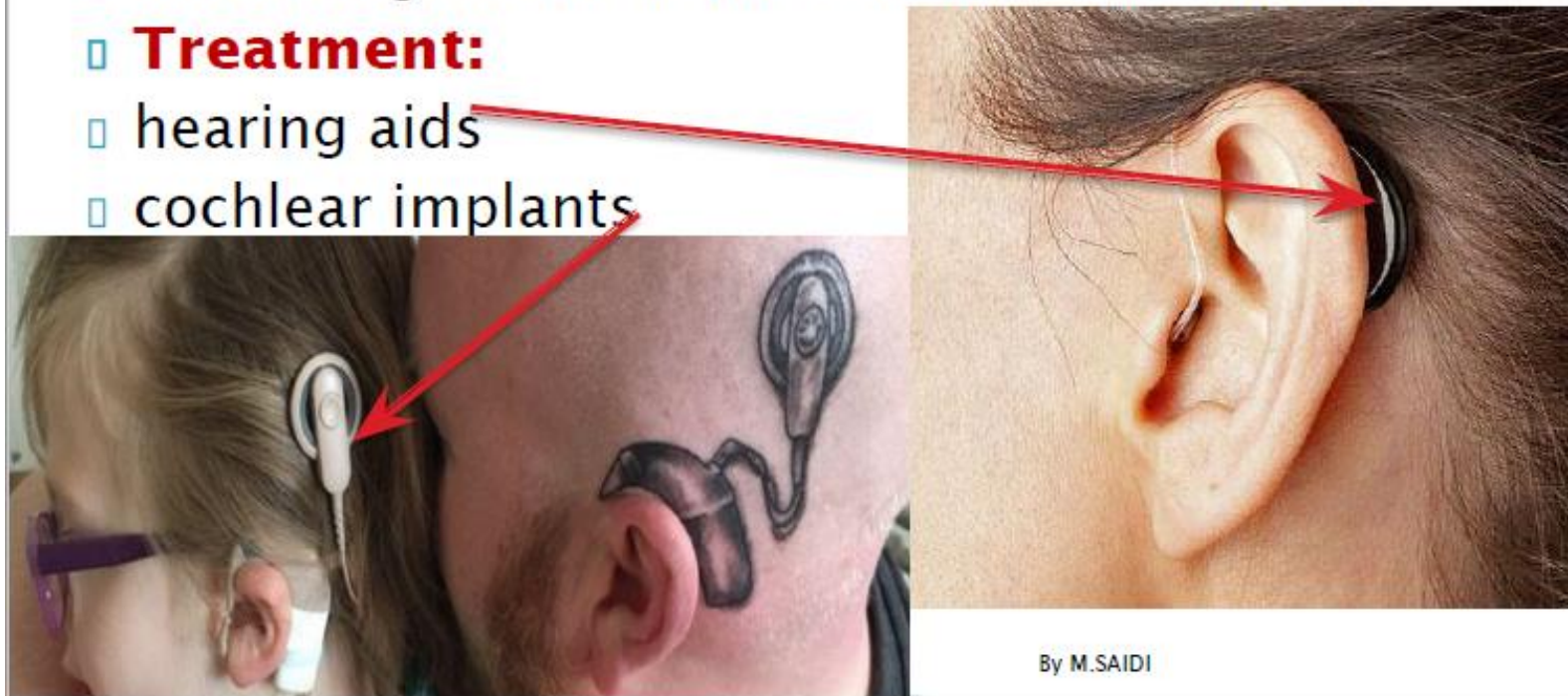
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It is caused by:

- injury to parts of the ear, nerves or parts of the brain responsible for hearing
- hardening of ear tissues such as the ossicles

Treatment:

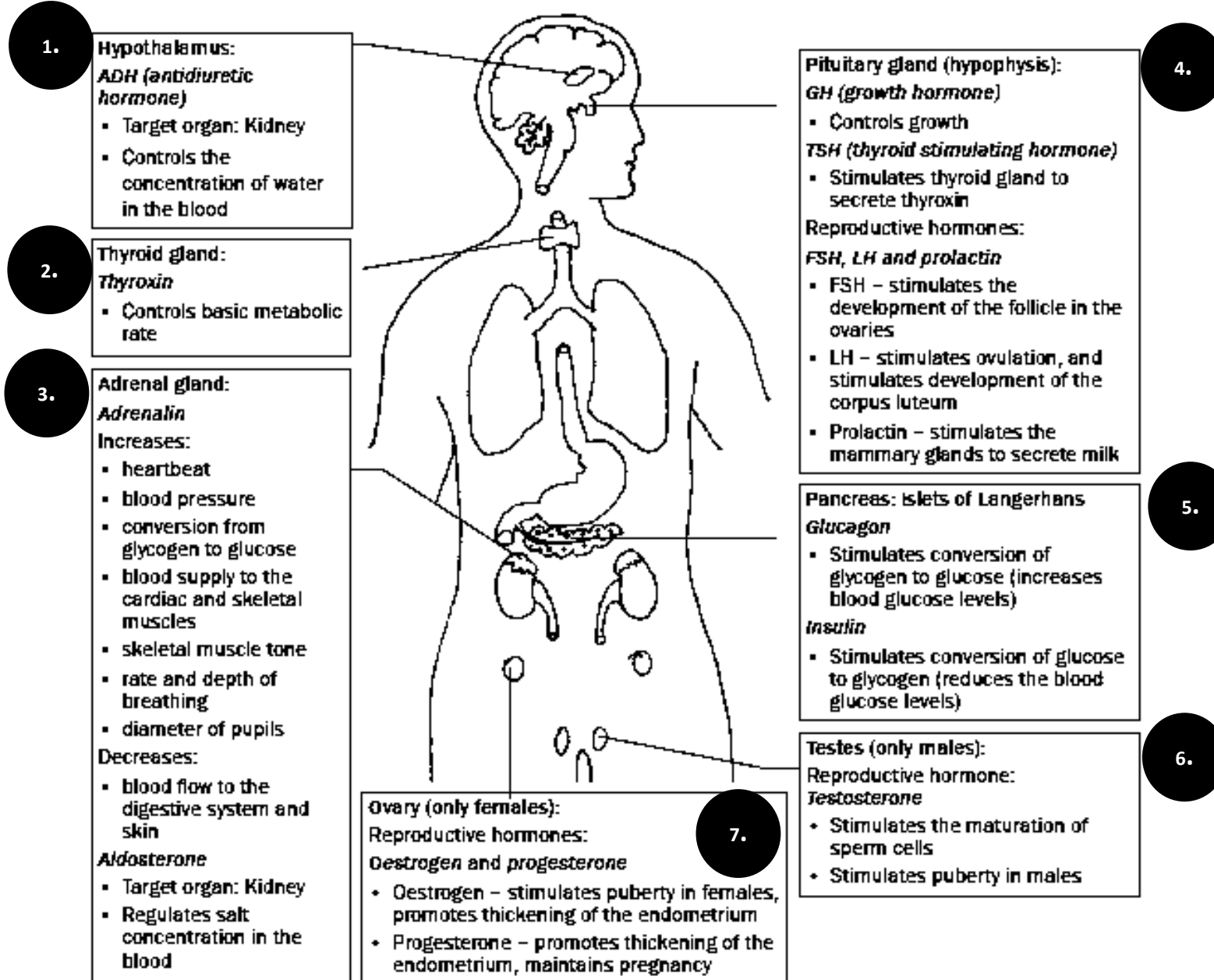
- hearing aids
- cochlear implants



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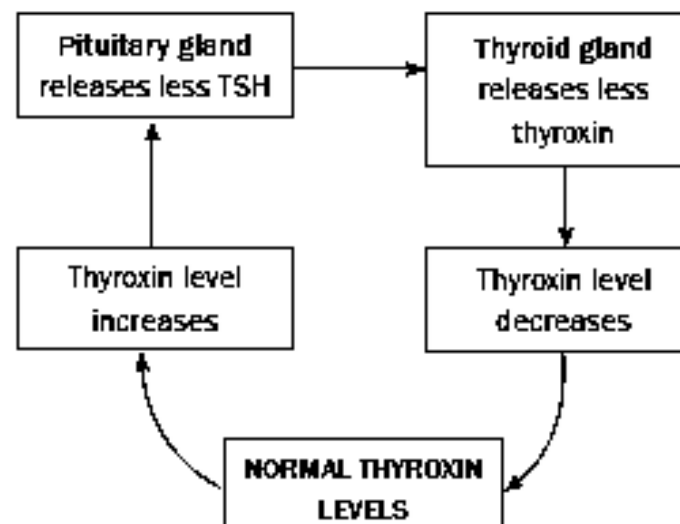
ENDOCRINE SYSTEM

25.

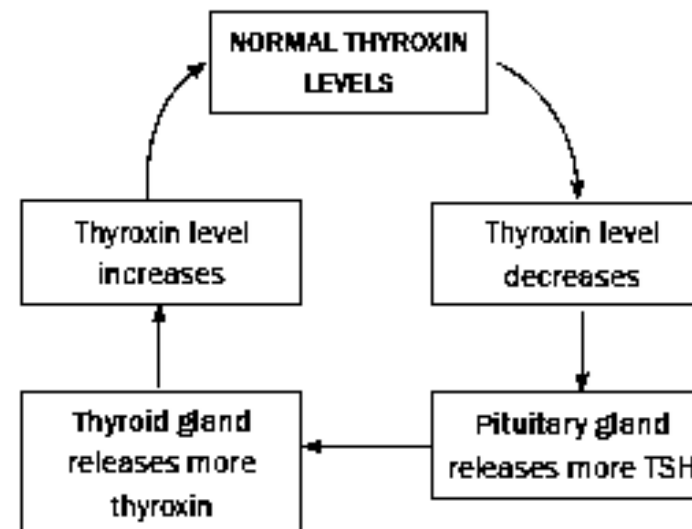


NEGATIVE FEEDBACK OF THYROXIN LEVELS

Step 1:	Thyroxin levels increase above normal limits
Step 2:	Pituitary gland is stimulated
Step 3:	Pituitary gland produces less TSH
Step 4:	Low TSH level stimulates the thyroid gland
Step 5:	The thyroid gland secretes less thyroxin
Step 6:	The thyroxin level thus decreases
Step 7:	Thyroxin level returns to normal



Situation 2	
Step 1:	Thyroxin levels decrease below normal limits
Step 2:	Pituitary gland is stimulated
Step 3:	Pituitary gland produces more TSH
Step 4:	High TSH level stimulates the thyroid gland
Step 5:	The thyroid gland secretes more thyroxin
Step 6:	The thyroxin level thus increases
Step 7:	Thyroxin level returns to normal



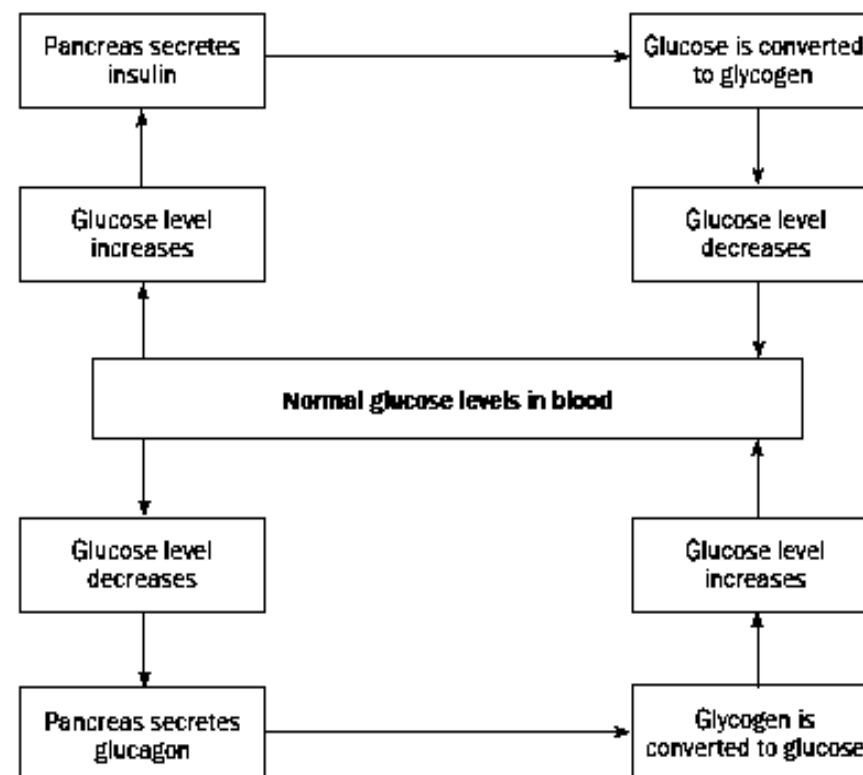
NEGATIVE FEEDBACK OF GLUCOSE LEVELS

When the glucose level in the blood increases above normal levels:

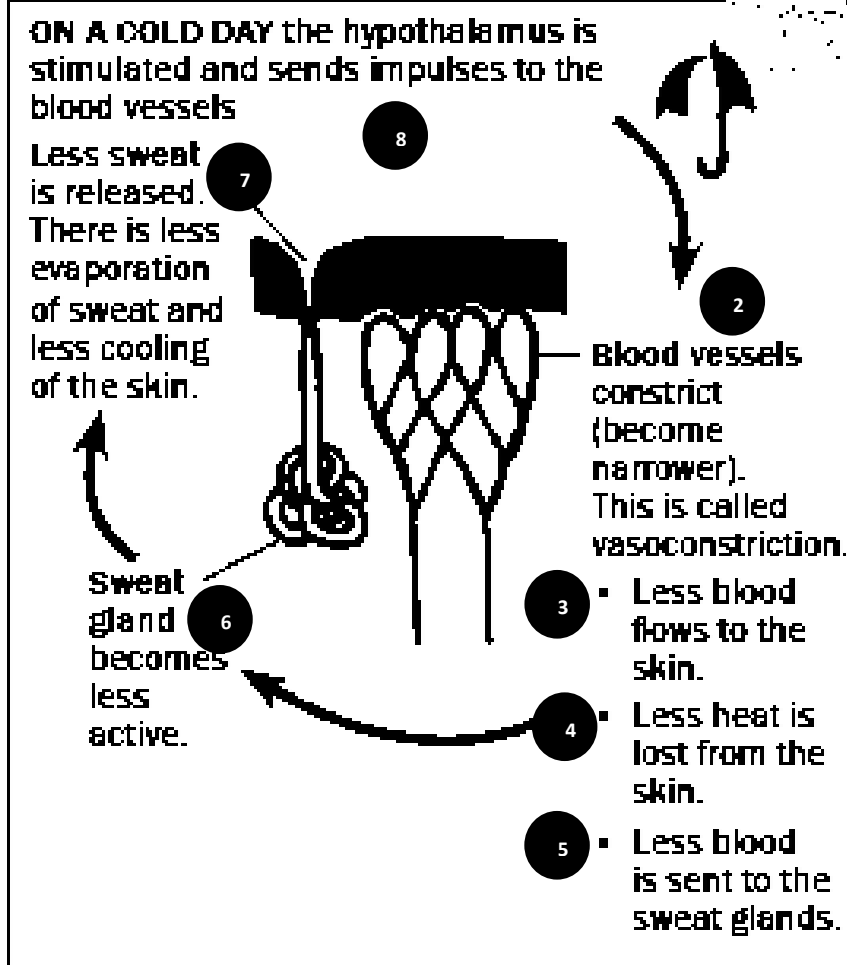
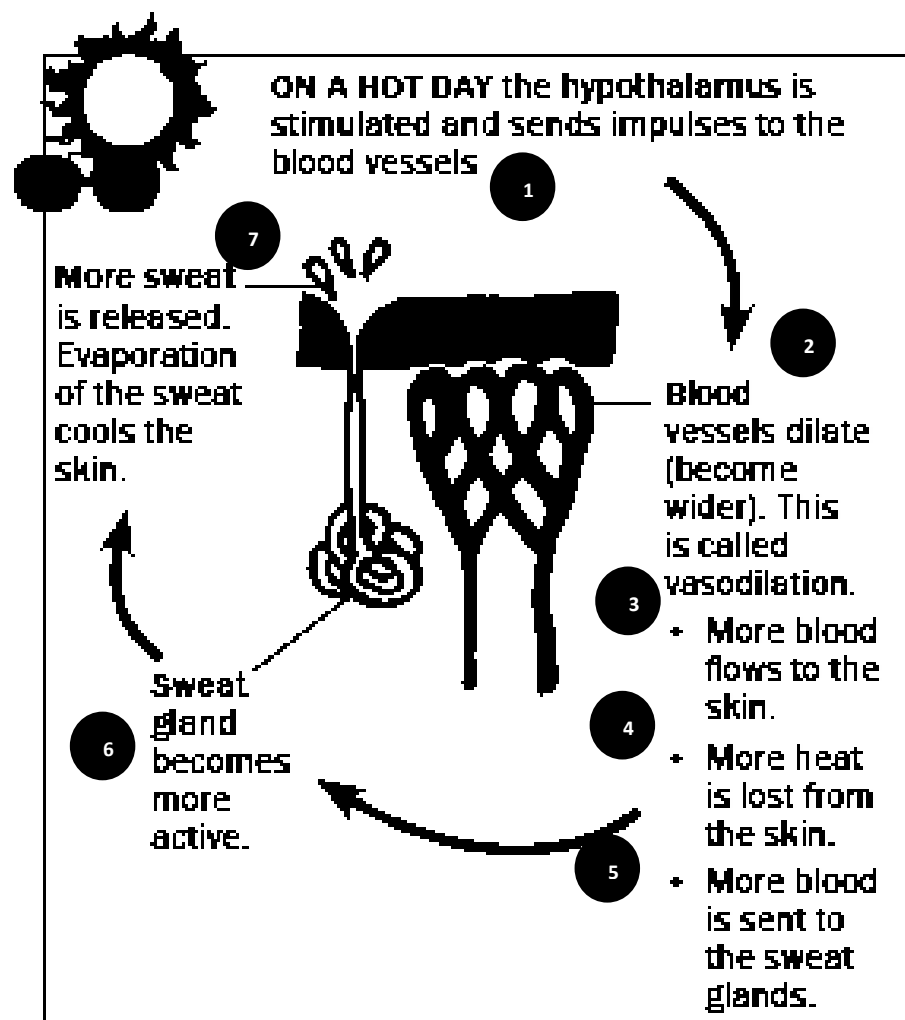
Step 1	Glucose levels in the blood increase above normal levels
Step 2	The pancreas is stimulated
Step 3	to secrete insulin into the blood
Step 4	Insulin travels in the blood to the liver
Step 5	where it stimulates the conversion of excess glucose to glycogen which is then stored
Step 6	The glucose level in the blood now decreases
Step 7	and returns to normal

When the glucose level in the blood decreases below normal levels:

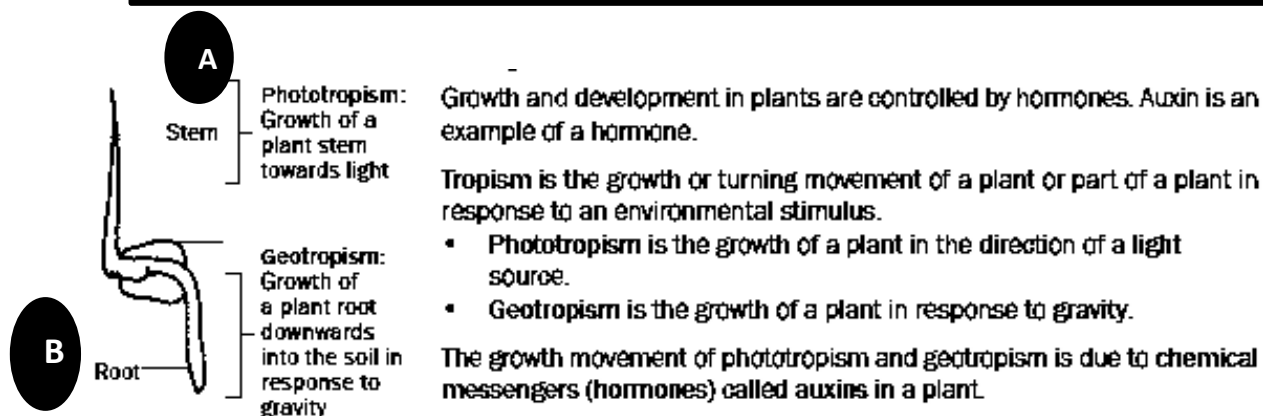
Step 1	Glucose levels in the blood decrease below normal levels
Step 2	The pancreas is stimulated
Step 3	to secrete glucagon into the blood
Step 4	Glucagon travels in the blood to the liver
Step 5	where it stimulates the conversion of stored glycogen to glucose
Step 6	The glucose level in the blood now increases
Step 7	and returns to normal



THERMOREGULATION



TROPISM IN PLANTS



	Role of auxins in phototropism	Role of auxins in geotropism
1	Produced at the tip of stem/shoot	Produced at the tip of roots
2	Auxins move downward evenly	Auxins move upwards evenly
3	This even distribution brings about equal growth on all sides of the stem	This even distribution brings about equal growth on all sides of the root
4	As a result the stem grows upward	As a result the root grows downward
5	When the stem is exposed to unilateral light (light from one side only)	When the root is placed horizontally (only one side exposed to gravity)
6	The auxin concentration will be high on the dark side – light destroys auxins	The auxin concentration will be high on the lower side of the root - gravity attracts auxins
7	More growth occurs on the dark side because auxins stimulate growth on the dark side	More growth occurs on the upper side of the root because auxins on the lower side inhibit growth
8	As a result the stem bends towards the light	As a result the root bends downwards