MIDTERM MARATHON

For Class 10th Students

Biology

By - Samridhi Sharma Ma'am

Topics to be covered

1. Life processes (Theory + Question Practice)
2. Control and coordination (Theory + Question Practice)

Notes → ? → PW App

Duration → ? 5-6 hours

Ch 1

- Reproduction
- Heredity
- Our Environment

→ One Shot Youtube

Chapter No. - 01

LIFE PROCESSES

Life Processes

Prakriya

Living

The basic and essential activities performed by a living organism to sustain and maintain life.

Nutrition
Process of obtaining and utilization of Food

Respiration
Process of Breaking down the food to produces energy

Transportation
Process of transporting useful and non useful substances from part to another part of the organism

Excretion
Process of removal of metabolic waste

Types of Nutrition

(Autotrophs)

Autotrophic Nutrition

- In autotrophic nutrition organisms prepare their own food
- Photo autotrophic Nutrition
  - → Light energy
  - → Ex- Plants, Cyanobacteria
- Chemo autotrophic Nutrition
  - → Chemical energy
  - → Ex- Nitrosomonas

(Heterotrophs)

Heterotrophic Nutrition

- In autotrophic nutrition organisms do not prepare their own food
- Holozoic Nutrition
- Saprotrophic Nutrition
- Parasitic Nutrition

Whole → Complete

Holozoic Nutrition

- Organism feed by ingesting whole food material.
- Food is digested and absorbed inside the animal body.

Saprotrophic Nutrition

- Organism feed on dead and decaying matter
- Food is digested externally and then nutrients are absorbed.

Parasitic Nutrition

- Organism derive nutrition from plants or animals without killing them.
- Obtain nutrition by living on or inside the host.

Holozoic Nutrition

Examples :

ANIMALS

Herbivores
Carnivores
Omnivores

Unicellular organisms

Amoeba
Paramecium

Saprotrophic Nutrition

Examples :

Most of the fungi

Bread mould [Rhizopus]
Mushroom
Yeast

Decomposers

Parasitic Nutrition

Examples :

Tapeworm
Lice
Ticks
Leech
Ascaris

Chlorophyl absent

Parasitic plant

Cuscuta [Amar-bel]

QUESTION

(PYQ)

An organism which breaks down the food material outside the body and then absorbs it is **(Re) (CBSE, 2023)**

→ digest

Saprotrophic

(A) a plant parasite, Cuscuta

(B) an animal parasite, Tapeworm

(C) a bacteria, Rhizobium

(D) a fungi, Rhizopus

QUESTION

Select the correct statement. (T)

(Re) (NCERT Exemplar)

A. Heterotrophs do not synthesise their own food (T)

B. Heterotrophs utilise solar energy for photosynthesis (F)

C. Heterotrophs synthesise their own food (F)

D. Heterotrophs are capable of converting carbon dioxide and water into carbohydrates (F)

Plants → Leaf → Mesophyll Cells → Chloroplast → Chlorophyll

Photosynthetic Autotrophic Nutrition in Plants

Mechanism of Photosynthesis

$$6CO_2 + 12H_2O \xrightarrow[\text{Sun light}]{\text{Chlorophyll}} \underset{\text{(Glucose)}}{C_6H_{12}O_6} + 6O_2 + 6H_2O$$

(i) Absorption of light energy by chlorophyll.

↓

(ii) Conversion of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen.

[Photolysis of Water]

↓

(iii) Reduction of carbon dioxide to carbohydrates. {glucose}

↓ store

Starch

Plants : glucose ⟶ Starch

Animals : glucose ⟶ Glycogen
(Human beings)

QUESTION

Which of the following equations is the summary of photosynthesis?

(A) $6CO_2 + 12H_2O \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$

(B) $6CO_2 + H_2O + \text{Sunlight} \rightarrow C_6H_{12}O_6 + O_2 + 6H_2O$

(C) $6CO_2 + 12H_2O + \text{Chlorophyll} + \text{Sunlight} \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$

(D) $6CO_2 + 12H_2O + \text{Chlorophyll} + \text{Sunlight} \rightarrow C_6H_{12}O_6 + 6CO_2 + 6H_2O$

QUESTION

#H.Q

Oxygen gas, a by- product of photosynthesis is released by splitting of:

A. Carbon dioxide

B. Glucose

C. Water → H, O

D. None of the above

QUESTION

What is the internal energy reserve in plants and animals? (Un) (CBSE, 2023)

(PYQ).

food storage kis form mein hota hai?

ANSWER

Carbohydrates which are not used immediately are stored in the form of

In Plants – Starch

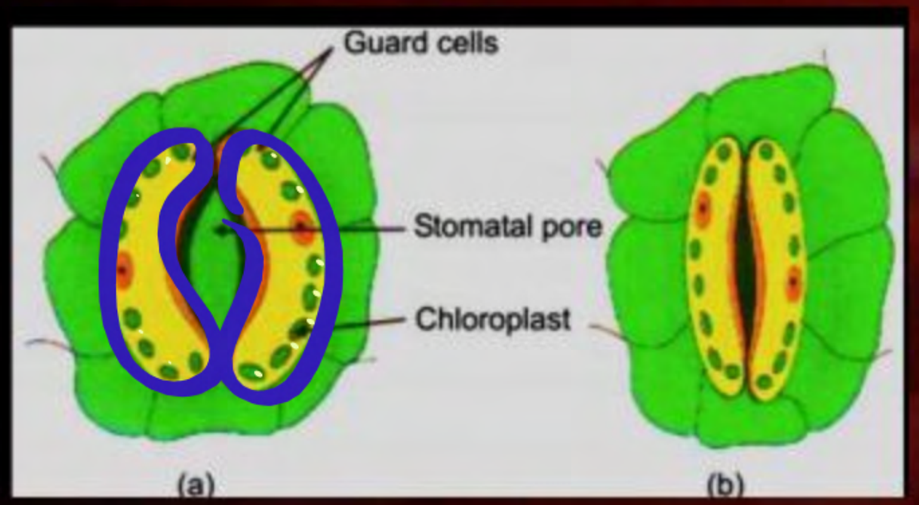
In animals – Glycogen

Stomata

Stomata are tiny/microscopic pores like structure present on surface of leaves

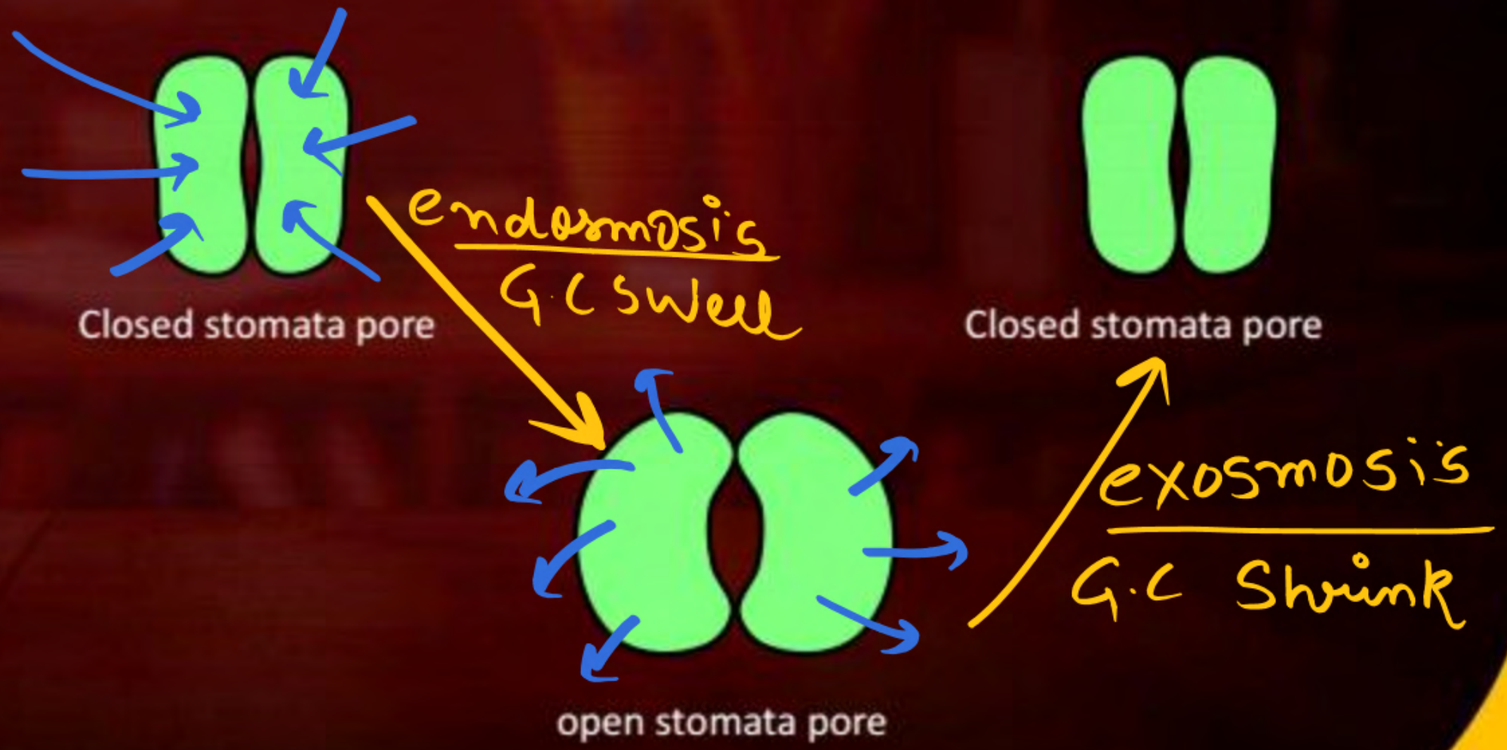
Role of Stomata

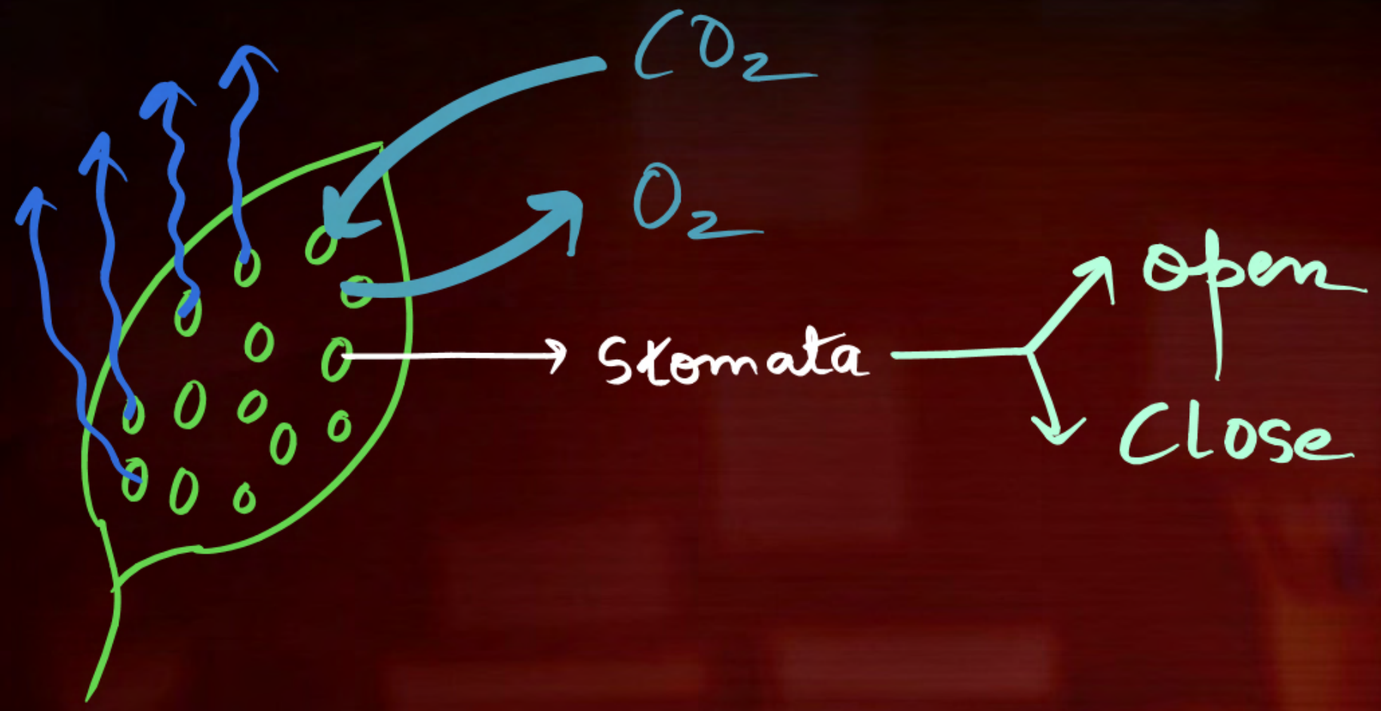
- Exchange of gases
- Transpiration



OPEN STOMATAL PORE CLOSED STOMATAL PORE

Opening and closing of stomata




CO_2
O_2
Stomata
Open
Close

QUESTION

Opening and closing of stomata is due to: (Re) (CBSE, 2023)

(PYQ)

A. High pressure of gases inside the cells.

B. Movement of water in and out of the guard cells.

C. Stimulus of light in the guard cells.

D. Diffusion of CO_2 in and out of the guard cells.

QUESTION

Which one of the following conditions is true for the state of stomata of a green leaf shown in the given diagram? **(An) (CBSE, 2022 Term I)**

A. Large amount of water flows into the guard cells.

B. Gaseous exchange is occurring in large amount.

C. Large amount of water flows out from the guard cells.

D. Large amount of sugar collects in the guard cells.

Closed Stomata

QUESTION

In the given diagram of a closed stomata: (1), (2), (3) and (4) respectively are

(Re) (CBSE, 2023)

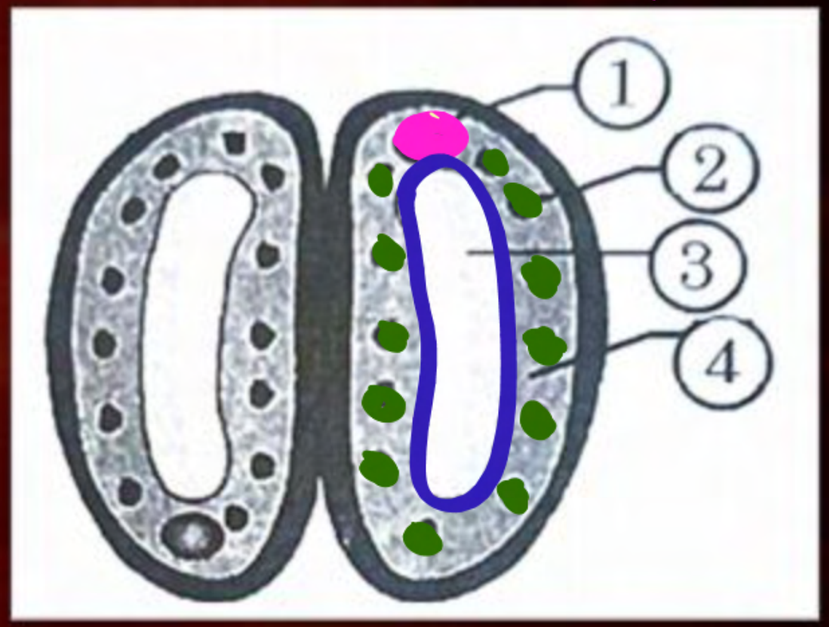
(PYQ).

A. Nucleus, chloroplast, guard cell, vacuole

B. Nucleus, chloroplast, vacuole, guard cell

C. Chloroplast, nucleus, vacuole, guard cell

D. Vacuole, guard cell, nucleus, chloroplast



Photosynthesis in Desert Plants

Xerophytes

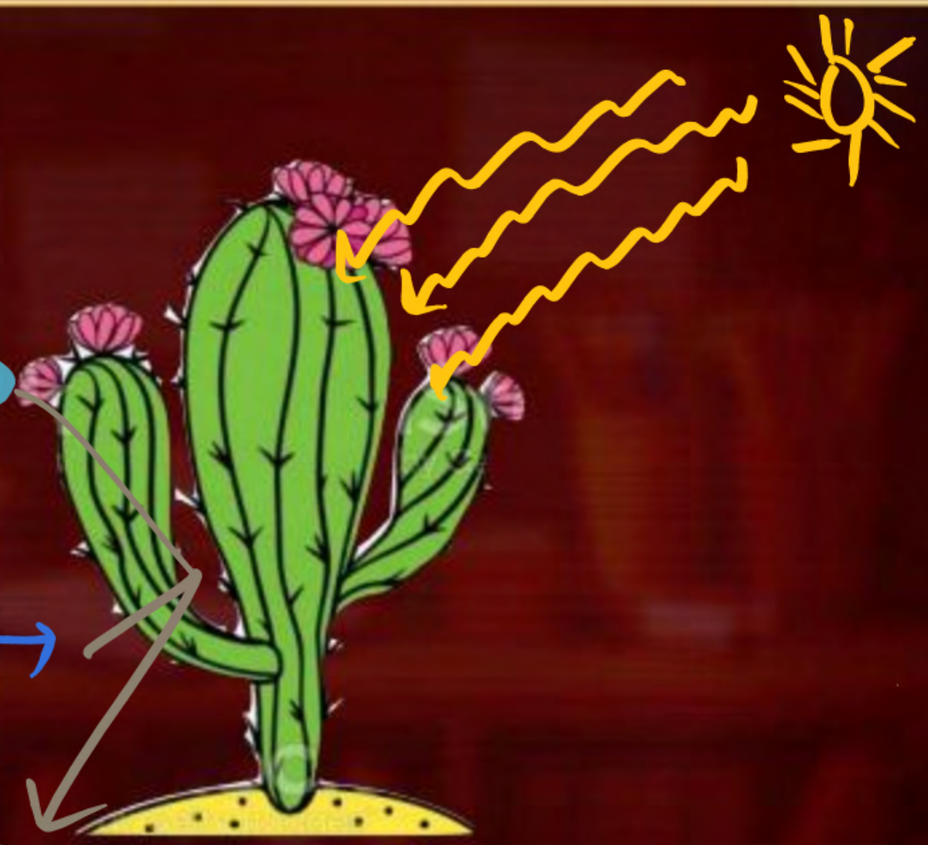
NIGHT

Stomata open

CO_2

H_2O

Soil → Root



DAY

Stomata closed

Intermediate Compound: Malic Acid → convert → Glucose {food}

Holozoic Nutrition

INGESTION

↓

DIGESTION

↓

ABSORPTION

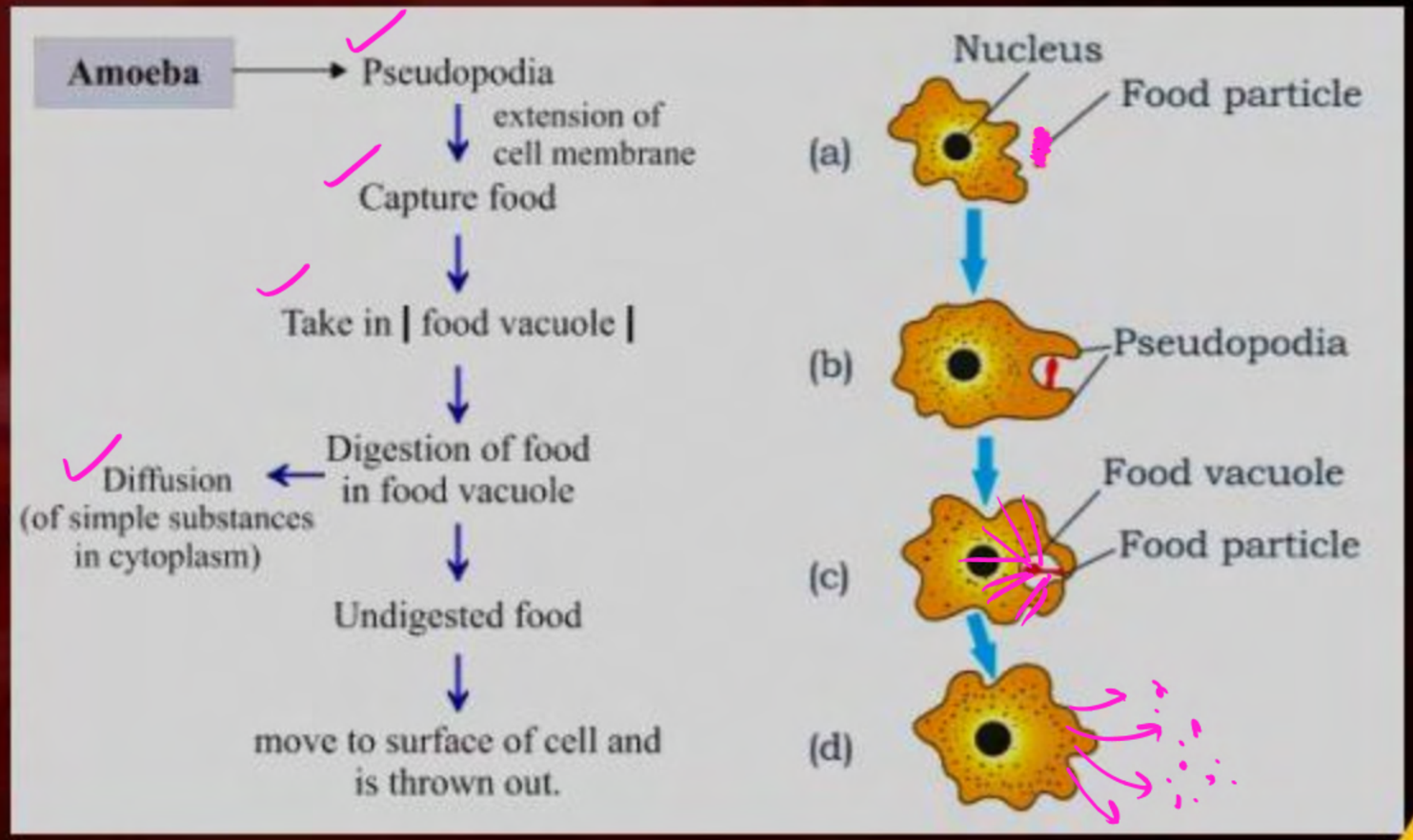
↓

ASSIMILATION

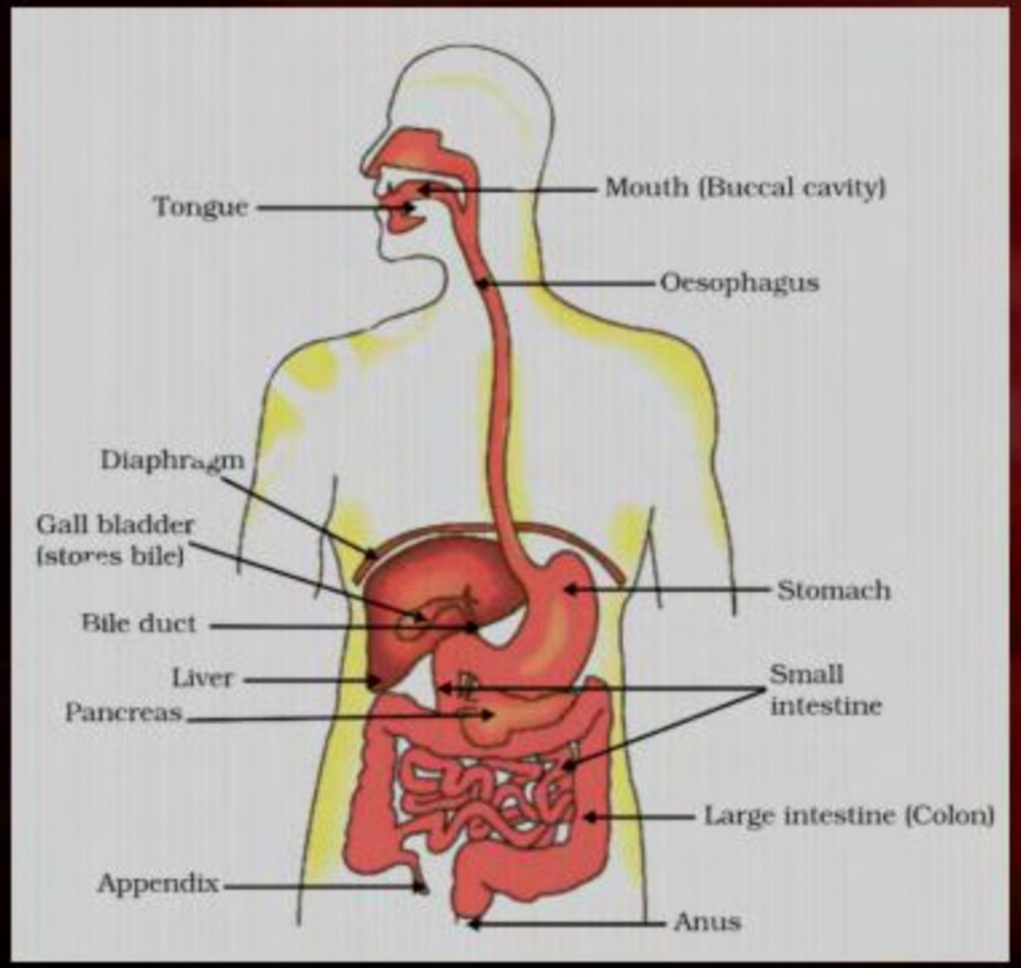
↓

EGESTION

Nutrition in Amoeba



Nutrition in Human Beings



Human digestive system

- **Alimentary Canal (Mouth to anus)**
  - Mouth
  - Buccal cavity
  - Oesophagus
  - Stomach
  - Small Intestine
  - Large Intestine
  - Anus
- **Associated glands**
  - Salivary glands
  - Liver
  - Pancreas

Ingestion

Mouth (Buccal/oral cavity)	• Teeth • Tongue • Salivary gland	• Chewing and crushing of food, • Rolling , tasting & Swallowing of food, • salivary amylase (Converts starch into maltose)
Oesophagus/ Food pipe	**Peristaltic movement (Contraction and relaxation of muscles)** pushes food towards stomach	Passage of food from mouth to stomach
Stomach	Gastric glands **Gastric juice** • Pepsin • Hydrochloric acid • Mucus	• Pepsin help in Breakdown of protein • HCl provides acidic medium • HCl kill bacteria and other germs in food. • Protects inner lining of stomach.

Gastric glands

↓

gastric Juice

1. Pepsin → protein breakdown
2. HCl
3. Mucus

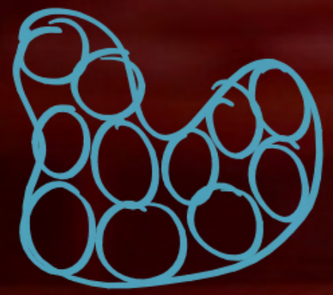
Mouth → Salivary gland → Saliva

↓

"Salivary amylase"

Complex Sugar

Starch



→ Maltose

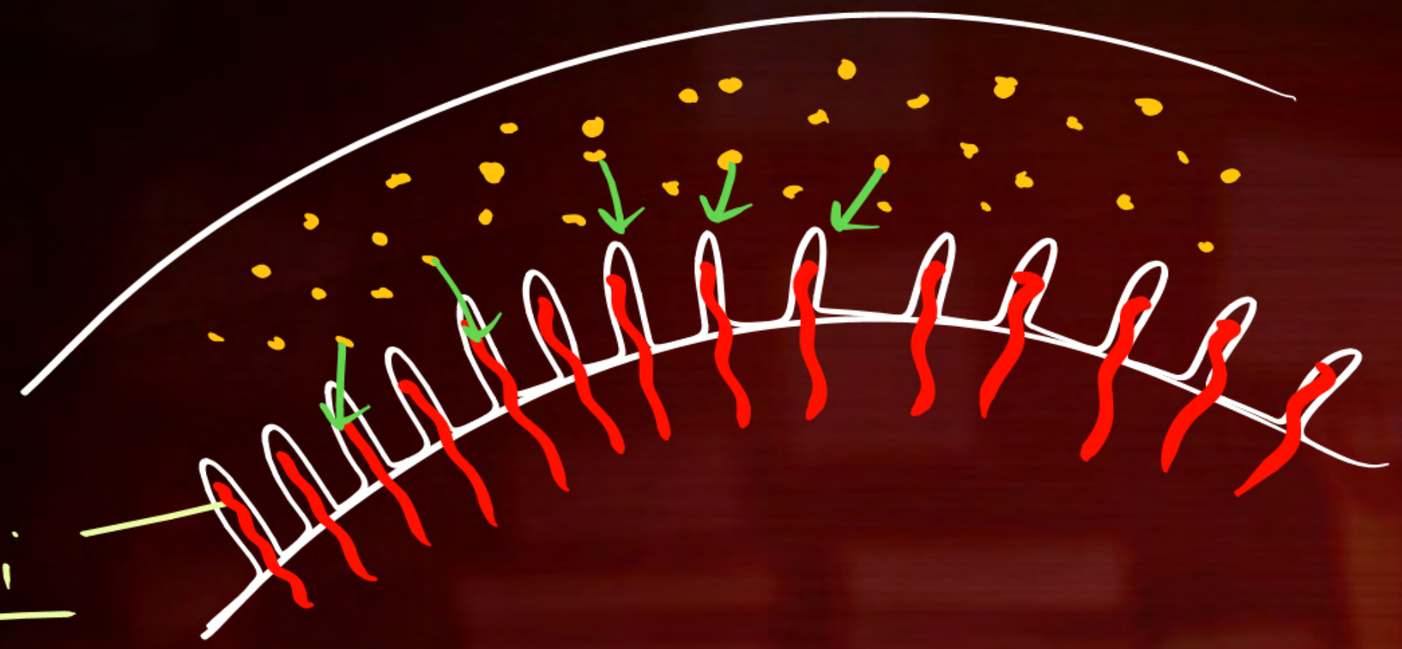
Simple Sugar

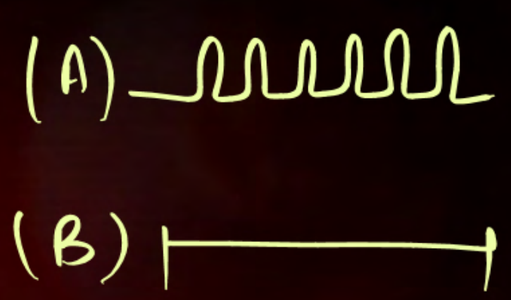
① **Liver** ② **Pancreas** **Small intestine** • Intestinal glands secrete intestinal juices.	*Liver - Bile juice (stored in gall bladder)* *Pancreas- Pancreatic juice* Intestinal glands *Intestinal Juice* *Villi* (Finger like projections in supplied with blood vessels)	Bile Juice : • Emulsification of fats • Makes food alkaline Pancreatic Juice • P. Amylase helps in digestion of carbohydrates • Trypsin helps in digestion of protein • Lipase helps in digestion of emulsified fats Intestinal Juice • Final digestion of food Villi • Helps in absorption of digested food by increasing surface area.

Final digestion of food → In Small intestine

- Carbohydrates → Glucose
- Protein → Amino Acids
- Fats → Fatty acid + Glycerol

Bile juice
Emulsification of fat
Lipase





Villi → Blood Vessels → Blood $\xrightarrow{\text{food}}$ Cells

Cells → Energy
Cells → Growth
Cells → development
Cells → Repair of tissues

Large intestine (Colon)	Absorption of water
Rectum	Temporary collection of waste
Anus	Helps in Egestion (Removal if undigested and Unabsorbed food)

QUESTION

Which is the correct sequence of parts in human alimentary canal?

(Re) (NCERT Exemplar)

A. Mouth → stomach → small intestine → oesophagus → large intestine

B. Mouth → oesophagus → stomach → large intestine → small intestine

C. Mouth → stomach → oesophagus → small intestine → large intestine

D. Mouth → oesophagus → stomach → small intestine → Large intestine

QUESTION

#B.Q

Assertion (A): The inner walls of the small intestine have finger like projections called villi which are rich in blood. (T)

Reason (R): These villi have a large surface area to help the small intestine in completing the ~~digestion~~ of food. (F)

Absorption

(Re) (CBSE, 2023)

A. Both (A) and (R) are true and (R) is the correct explanation of (A).

B. Both (A) and (R) are true but (R) is not the correct explanation of (A).

C. (A) is true but (R) is false.

D. (A) is false but (R) is true.

QUESTION

• Herbivore → longer small intestine
• Carnivores → Shorter small intestine

Consider the following statements about small intestine and select the one which is NOT correct: (F) **(An) (CBSE 2023)** (PYQ)

(A) The length of the small intestine in animals differs as it depends on the type of food they eat. (T)

(B) The small intestine is the site of complete digestion of food. (T) Cellulose

(C) The small intestine receives secretions from liver and pancreas. (T)

(D) The villi of the ~~small~~ large intestine absorb water from the unabsorbed food before it gets removed -from the body via the anus. (F)

QUESTION

The most important function of villi in the small intestine is (PYQ)

A. to provide strength to the intestine

B. to provide space for capillaries and lacteals

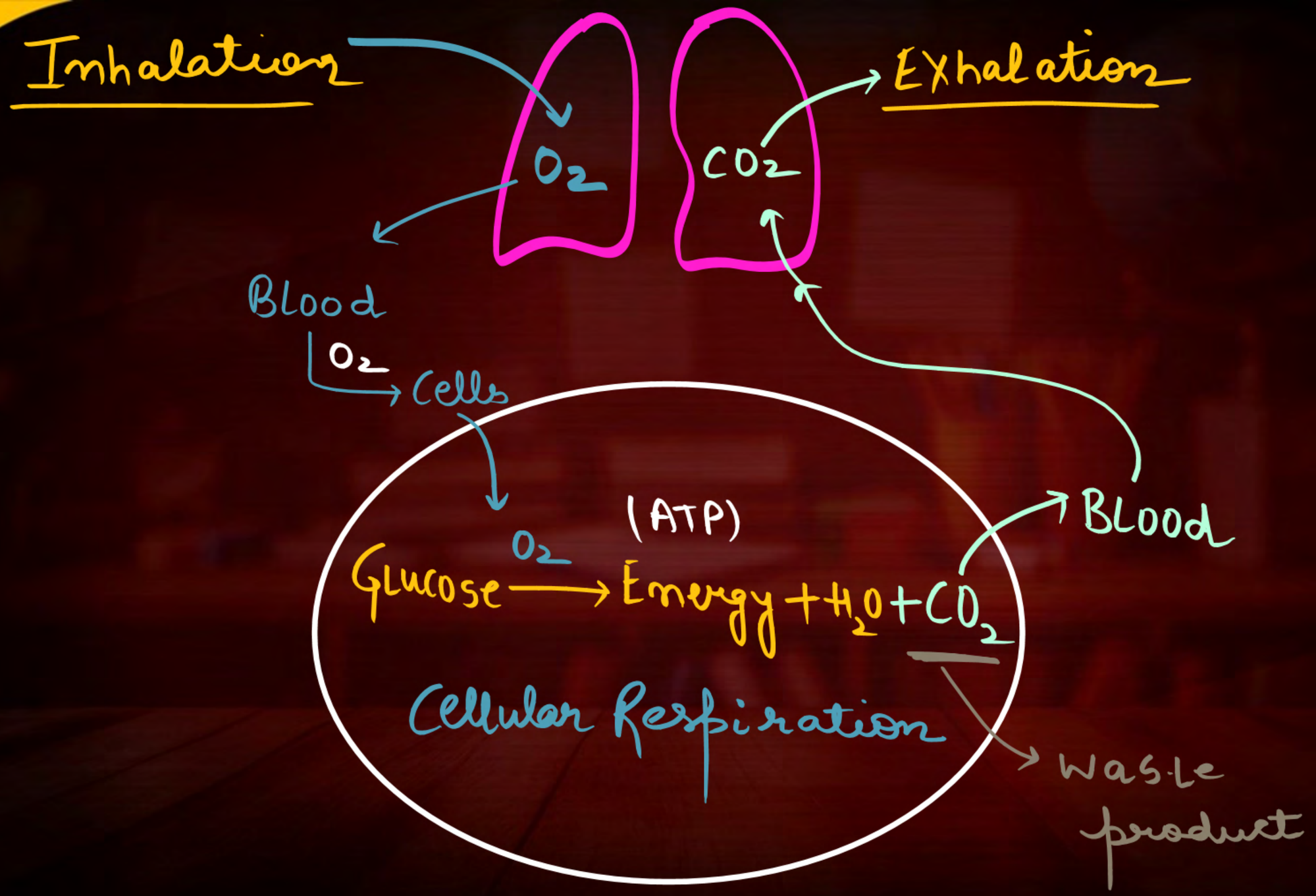
C. to provide increased surface area for absorption of digested food

D. to provide habitat for bacteria

Breathing Vs Respiration

Breathing	Respiration
• Process of Inhaling and exhaling the air in and out of the lungs.	• Process of breaking down of glucose to produce energy.
• It takes place in lungs	• It takes place in all cells.
• It is a physical process	• It is a chemical process.
• Energy is not produced.	• Energy is produced in the form of ATP.

[Adenosine Triphosphate]


Inhalation
O_2
CO_2
Exhalation
Blood
O_2
Cells
(ATP)
O_2
Glucose → Energy + H_2O + CO_2
Cellular Respiration
Blood
Waste product

Types of Respiration

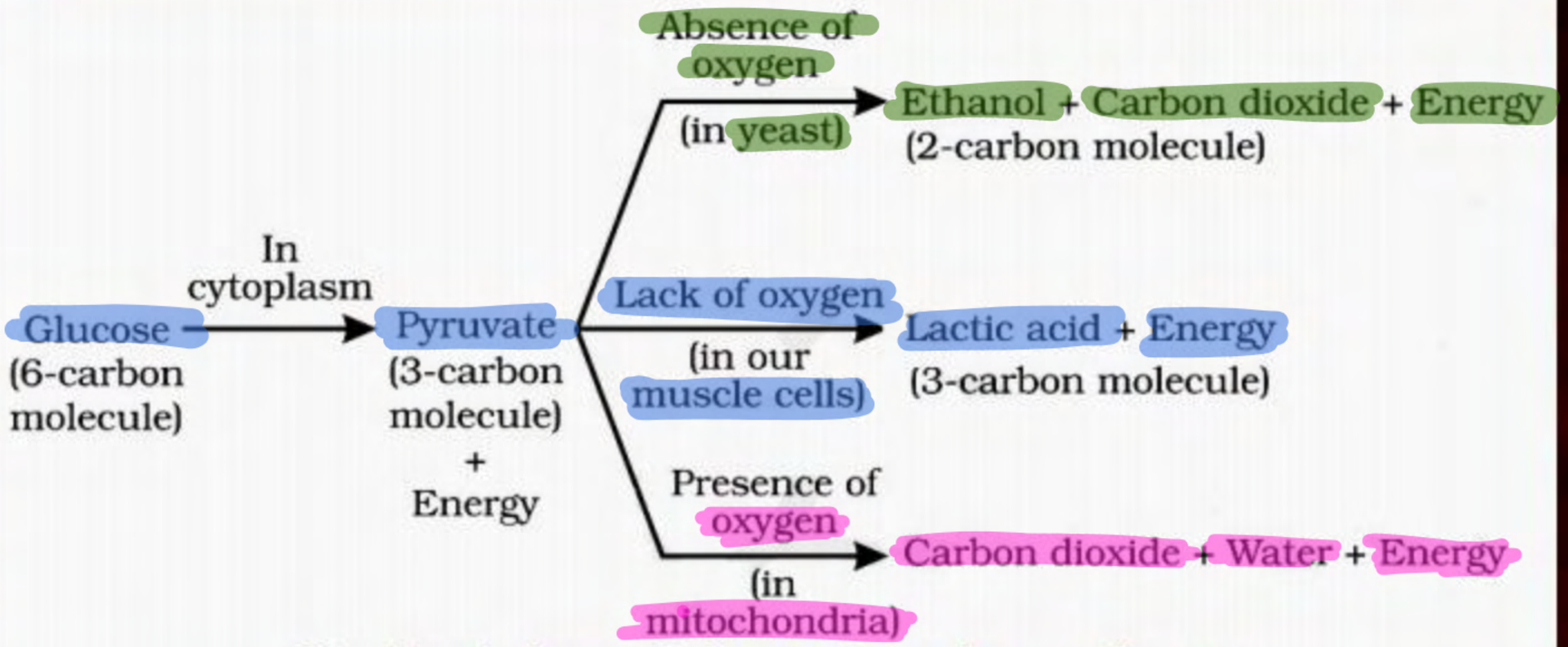


Fig: Break-down of glucose by various pathways

Respiration

1. Aerobic Respiration
   - ↓ presence of O_2

Anaerobic Respiration → also called "Fermentation"
- ↓ Absence of O_2

2. → Alcoholic fermentation
   - ↳ ethanol → Yeast cell

3. → Lactic Acid fermentation
   - ↳ form → Skeletal Muscles

Aerobic Respiration	Anaerobic respiration
• O_2 required	• O_2 not required
• It occurs in cytoplasm and mitochondria	• It occurs in Cytoplasm only
• Complete breakdown of glucose takes place	• Incomplete breakdown of glucose takes place
• End products are CO_2 and H_2O	• End products are CO_2 and ethanol or lactic acid

more Energy is produced

Less energy

QUESTION

Ethanol

Assertion (A): The anaerobic respiration which takes place in yeast, has one of the end products as an ~~acid.~~ Alcohol (F)

Reason (R): During anaerobic respiration, there is incomplete breakdown of glucose. (T)

(Un) (CBSE, 2023)

(PYQ)

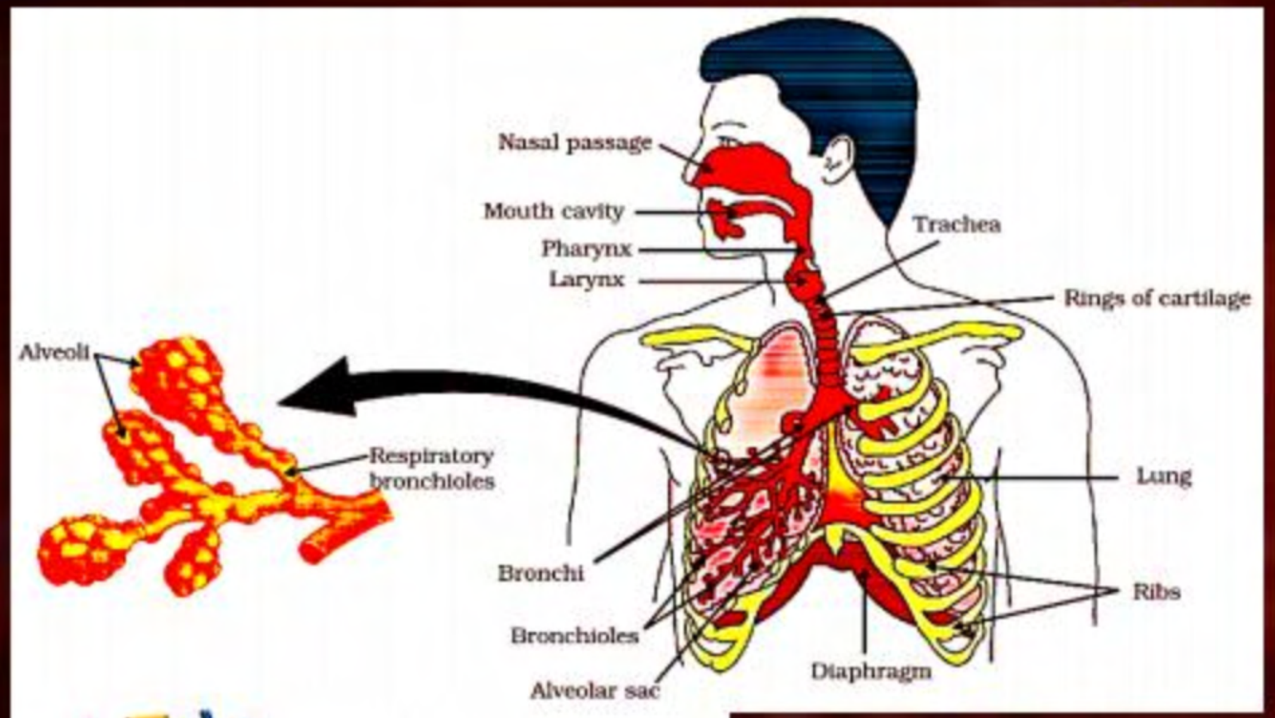
A. Both A and R are true, and R is the correct explanation of A.

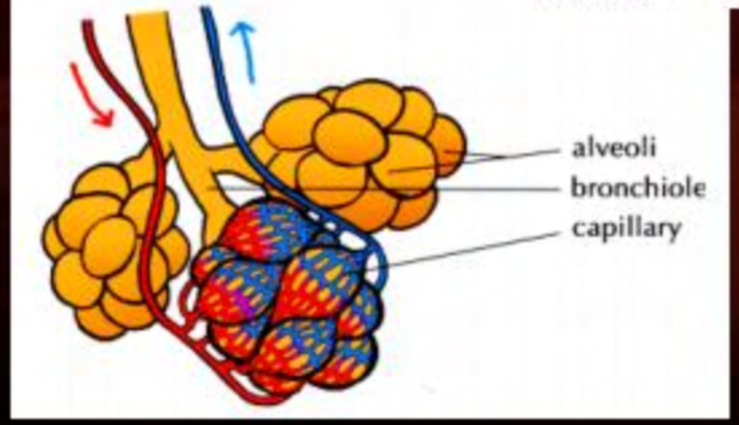
B. Both A and R are true, but R is not the correct explanation of A.

C. A is true, but R is false.

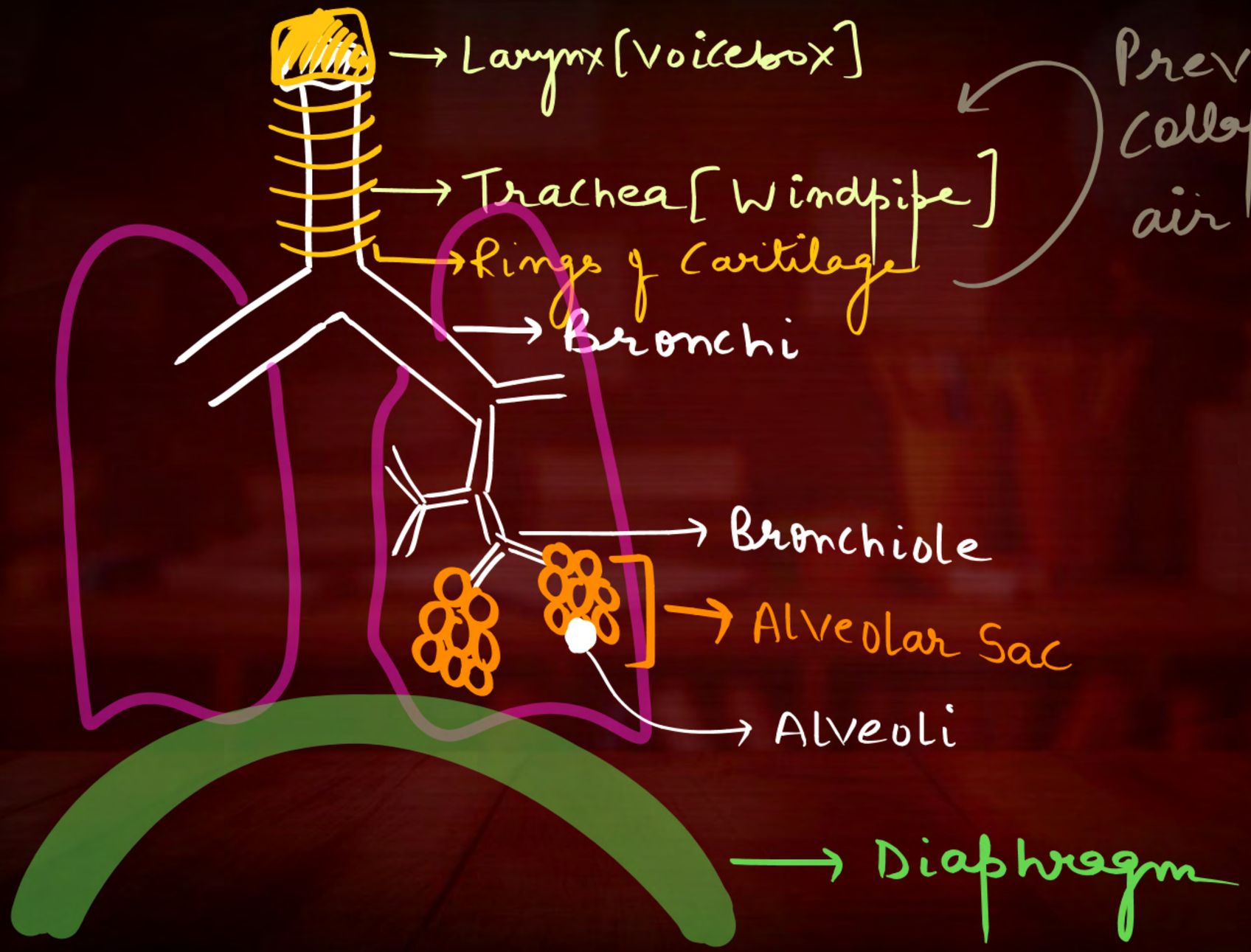
D. A is false, but R is true.

Breathing in Human Beings





Breathing in Human Beings



Prevent collapse of air passage

Alveoli

→ Ballon-Like

→ Sile of Exchange of gases

→ Thin-walled

→ Richly Supplied Blood Vessel

Transport of Oxygen and Carbon Dioxide

OXYGEN

Erythrocyte (RBC)

→ Hemoglobin (Respiratory pigment)

- → Bind '4' O_2 molecules
- → O_2 Transport
- → Provide Red Colour to RBC

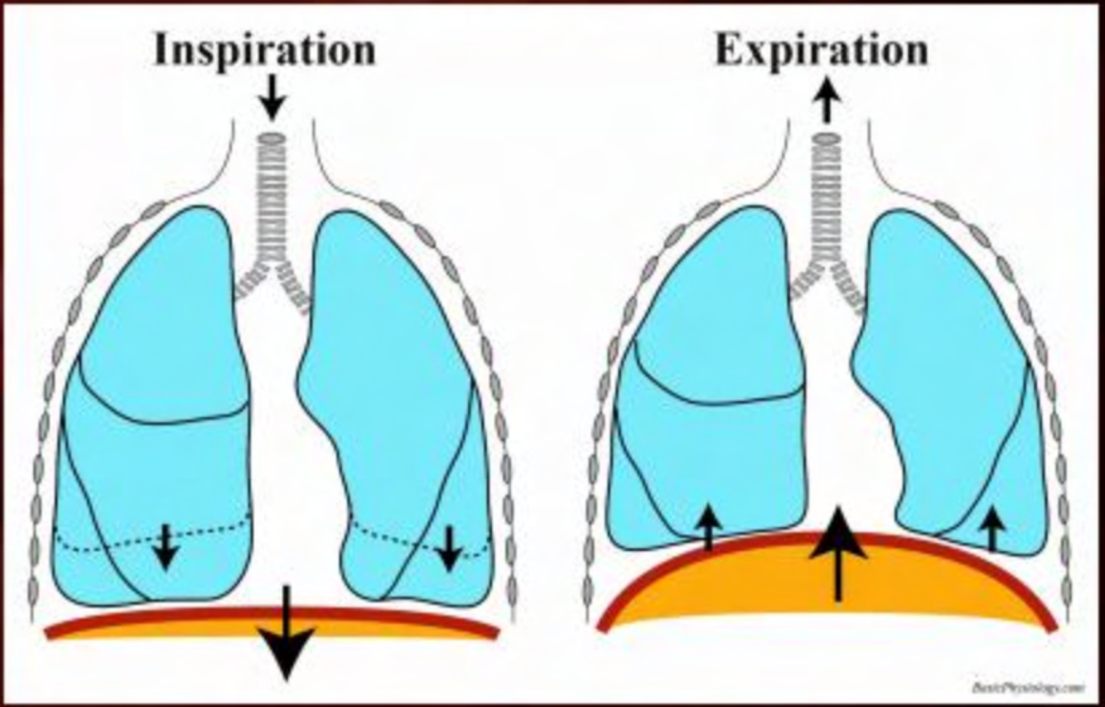
CARBONDIOXIDE

- → More Soluble in blood
- → Transported in dissolved form

Affinity of haemoglobin for various gases

$CO > O_2 > CO_2$

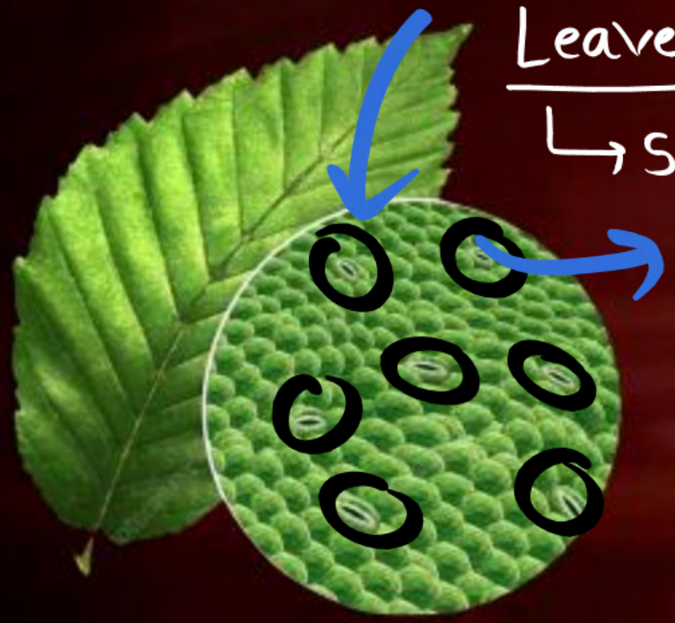
Inhalation / Inspiration	Exhalation / Expiration
• The muscles of the diaphragm contract.	• The muscles of the diaphragm relax.
• The diaphragm goes downward and becomes flat.	• The diaphragm goes upward and becomes dome shaped
• Air enters the lungs through the nose.	• Air goes out the lungs through the nose.



Exchange of Gases in Plants

diffusion

Leaves
↳ Stomata



Woody Stems
↳ Lenticels

operculum [Gill cover]

Inhaling
Water + Oxygen
dissolved in water
CO_2
Mouth Open
Gill Cover Closed
Exhaling
Water + Carbon Dioxide
Mouth Closed
Gill Cover Open

QUESTION

Pyruvate

During deficiency of oxygen in tissues of human beings, ~~pyruvic acid~~ is converted into lactic acid in the: (PYQ)

PYQ

A cytoplasm

B chloroplast

C mitochondria

D golgi body

QUESTION

Which is the correct sequence of air passage during inhalation? **(Re) (NCERT Exemplar)**

A. Nostrils → Larynx → Pharynx → Trachea → Lungs

B. Nasal passage → Trachea → Pharynx → Larynx → Alveoli

C. Larynx → Nostrils → Pharynx → Lungs → Alveoli

D. Nostrils → Pharynx → Larynx → Trachea → Alveoli

QUESTION

#H.W

Which of the following is respiratory pigment for carrying oxygen in humans?

A. Chlorophyll

B. Hemoglobin

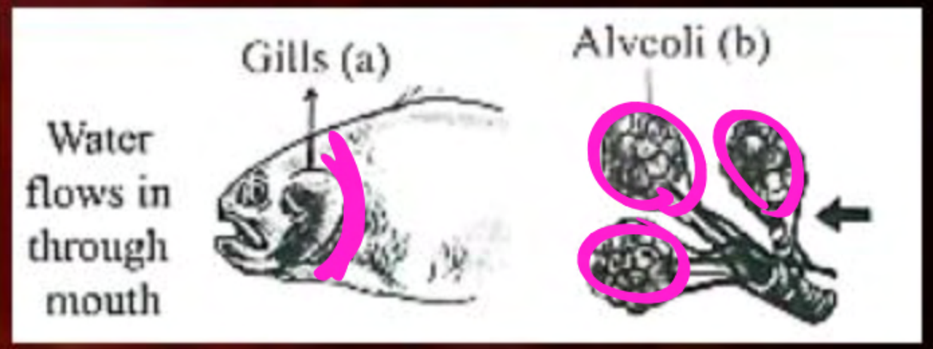
C. Alveoli

D. White blood cells

QUESTION

#B.Q

Respiratory structures of two different animals-a fish and a human being are as shown. Observe (a) and (b) and select one characteristic that holds true for both of them. **(PYQ)**



(PYQ).

(A) Both are placed ~~internally~~ in the body of animal.

(B) Both have thin and moist surface for gaseous exchange.

(C) Both are ~~poorly~~ Richly supplied with blood vessels to conserve energy.

(D) In both the blood returns to the heart after being oxygenated.

QUESTION

(i) State the role of ATP in cellular respiration.

(ii) What ensures sufficient exchange of gases in plants?

(iii) State the conditions on which the direction of diffusion of gases in plant depend upon. **(Re) (CBSE, 2023)**

(PYQ).

ANSWER

(i) The role of ATP in cellular respiration:

Energy storage: ATP stores energy released during respiration

Energy transfer: It captures energy releases during respiration and makes it available for other cellular functions.

(ii) The sufficient exchange of gases in plants is ensured by the presence of stomata on leaves and the large intercellular spaces that facilitate diffusion.

(iii) The direction of diffusion of gases in plants depends upon the concentration gradients of gases (O_2 and CO_2) and environmental conditions, such as light and temperature.

QUESTION

higher

(a) Why is there a difference in the rate of breathing between aquatic organisms and terrestrial organisms? Explain.

(b) Draw a diagram of human respiratory system and label-pharynx, trachea, lungs, diaphragm and alveolar sac on it. **(Un, Cr) (CBSE, 2020)**

(PYQ).

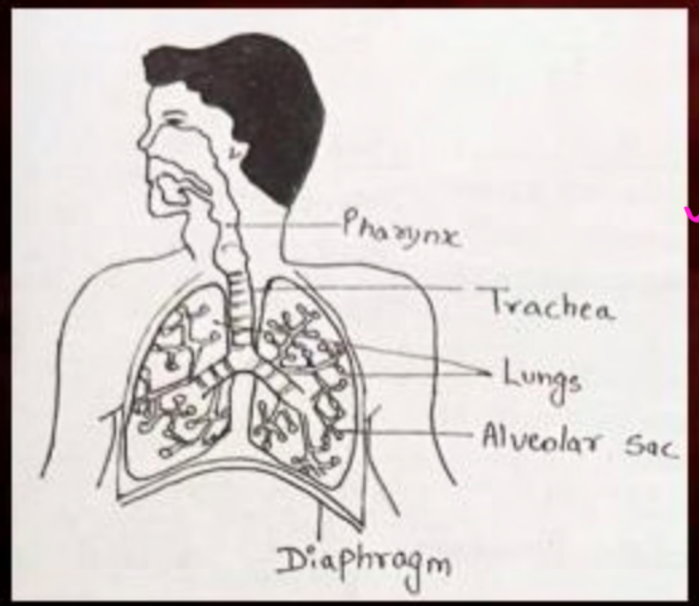
ANSWER

(a) The rate of respiration varies between aquatic and terrestrial organism due to the following reasons:

Aquatic organisms, such as fishes, extract oxygen from water through their gills since it is present in a dissolved state.

Since the amount of dissolved oxygen in water is lower compared to the oxygen in the gaseous form in air. Aquatic organisms need higher breathing rates to fulfil their oxygen requirements.

(b)



Transportation

→ Blood
→ Lymph

Circulatory System

Blood
Red fluid connective tissue which helps to transport substances

Blood vessels
Tubes in which blood flows

Heart
Pumping organ

- Plasma (55%) → Matrix
- Fluid portion of blood contains :
- 91-92% of water, proteins, hormones & clotting factors
- Blood cells (45%)

→ 3-types → RBC, WBC, Platelets

Plasma		Transportation of Digested food, CO_2 Waste, Hormones
Red blood cells		Hemoglobin in RBC helps in Oxygen transport
White blood cells		Produce antibody to kill pathogen Bacteria
Platelets		Clotting of blood

QUESTION

While gardening, Riya accidentally gets a deep cut on her hand. What is the primary function of platelets in that case? **(Re)**

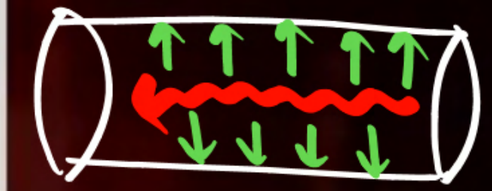
A. To fortify her immune response

B. To aid in oxygen delivery throughout her body

C. To encourage the generation of white blood cells

D. To commence the blood clotting process at the wound site

Sphygmomanometer → Measure blood pressure.

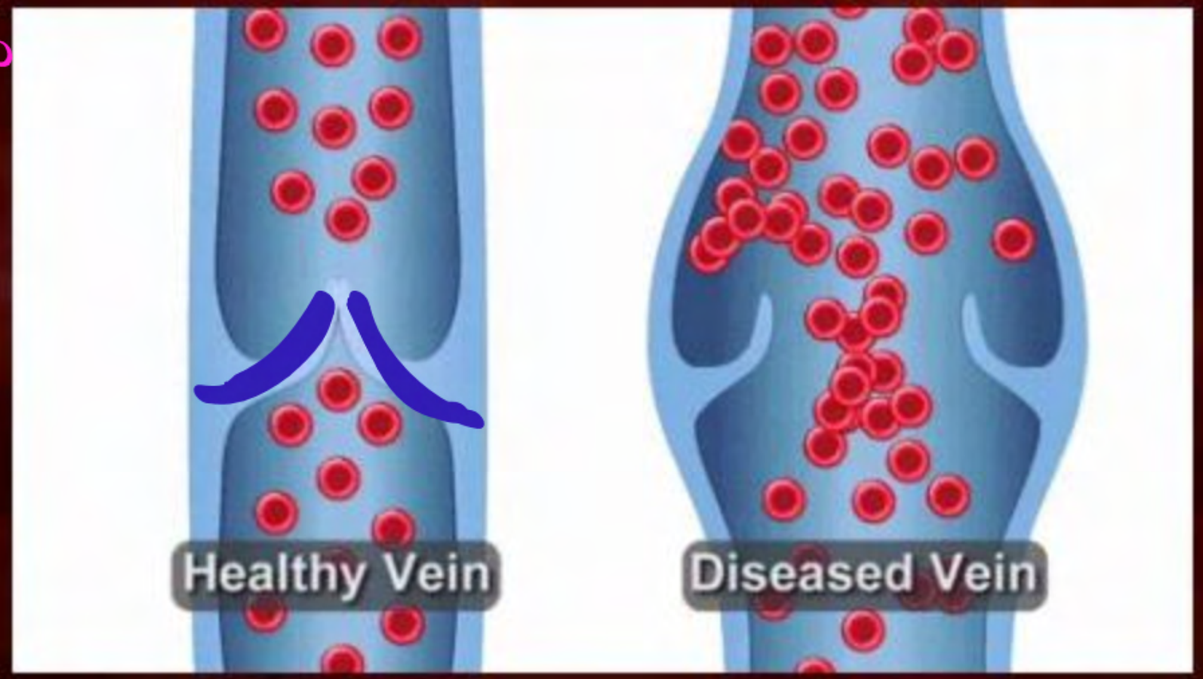


B.P = 120/80

	Arteries	Veins	Capillaries
• Direction of blood flow	Away from the heart	Towards the heart	Helps in exchange of substances
• Oxygen	Oxygenated blood	Deoxygenated blood	Both
• Pressure	High	Low	Medium
• Walls	Thick and elastic	Thin and non elastic	Very thin (one cell thick)

	Arteries	Veins	Capillaries
• Valves	Absent	Present	Absent

Prevent backflow of the blood.



PLEASE NOTE

- Largest artery

  Aorta

- Largest Vein

  Vena Cava

- Only artery which carries deoxygenated blood

  Pulmonary artery

- Only vein which carries oxygenated blood

  Pulmonary vein

QUESTION

Why do arteries have thick and elastic walls whereas veins have valves?

(Ap) (CBSE, APQ, 2023)

High B.P

Prevent backflow blood

ANSWER

- The blood emerges from the heart under high pressure and flows through arteries. Hence, to bear this pressure the arteries have thick and elastic walls.

- Veins have veins have valves to ensure that the blood flows in one direction only.

QUESTION

Write three types of blood vessels. Give one important function of each.

(Re) (CBSE, 2020)

(PYQ).

ANSWER

Blood vessel	Function
Artery	Usually carries oxygenated blood from heart to the body tissues.
Capillary	Allows exchange. of Substances.
Vein	Usually carries deoxygenated blood to heart so that it can be sent to lungs for oxygenation.

QUESTION

An artery is a vessel that carries blood (PYQ)

(A) with high concentration of oxygen

(B) with high concentration of CO_2

(C) away from the heart

(D) both (A) & (C)

QUESTION

Veins

Assertion (A): Valves are present in the ~~arteries~~. (F)

Reason (R): Arteries carry oxygenated blood from - heart to different body parts except pulmonary artery. (T)

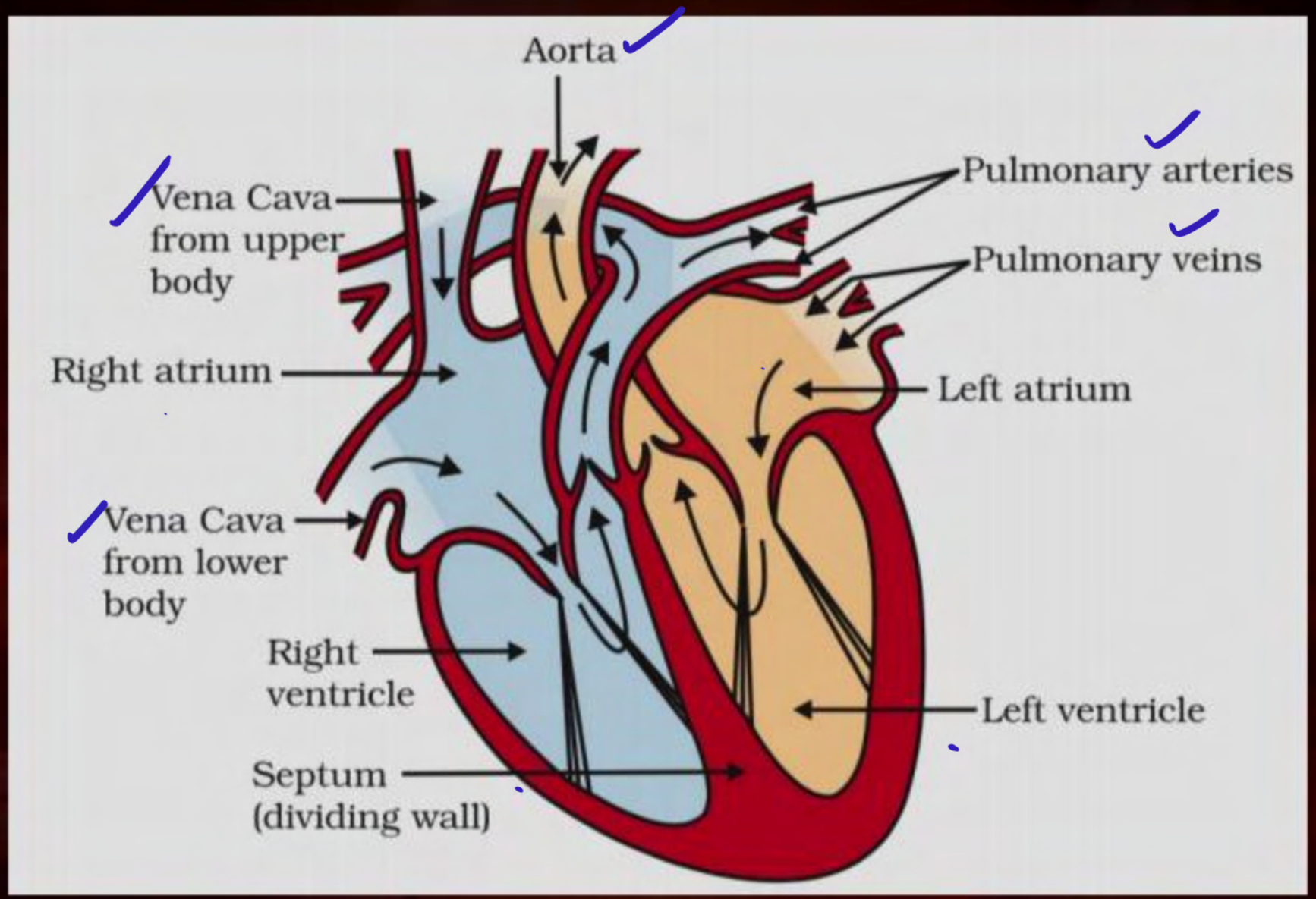
(PYQ)

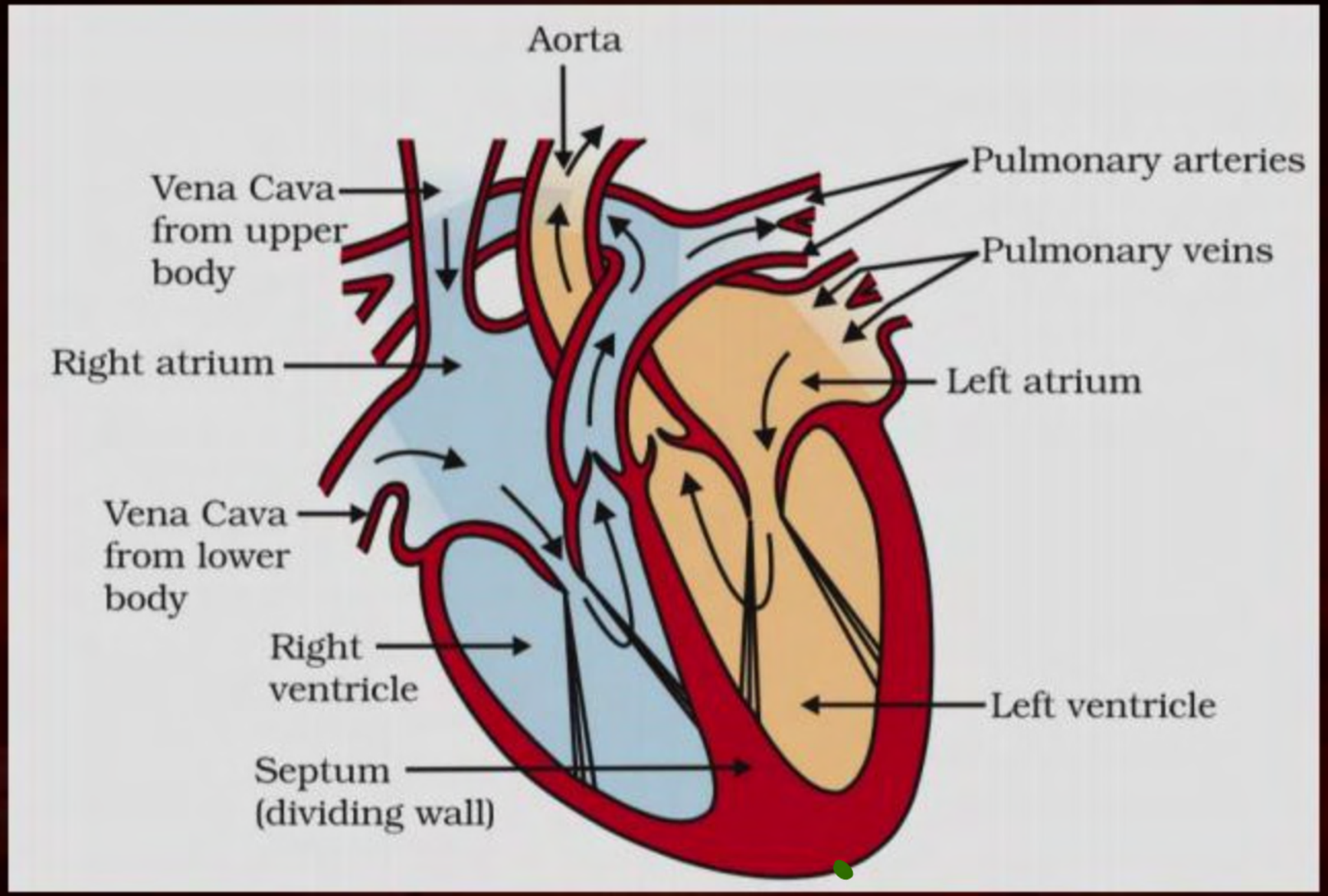
A. Both A and R are true, and R is the correct explanation of A.

B. Both A and R are true, but R is not the correct explanation of A.

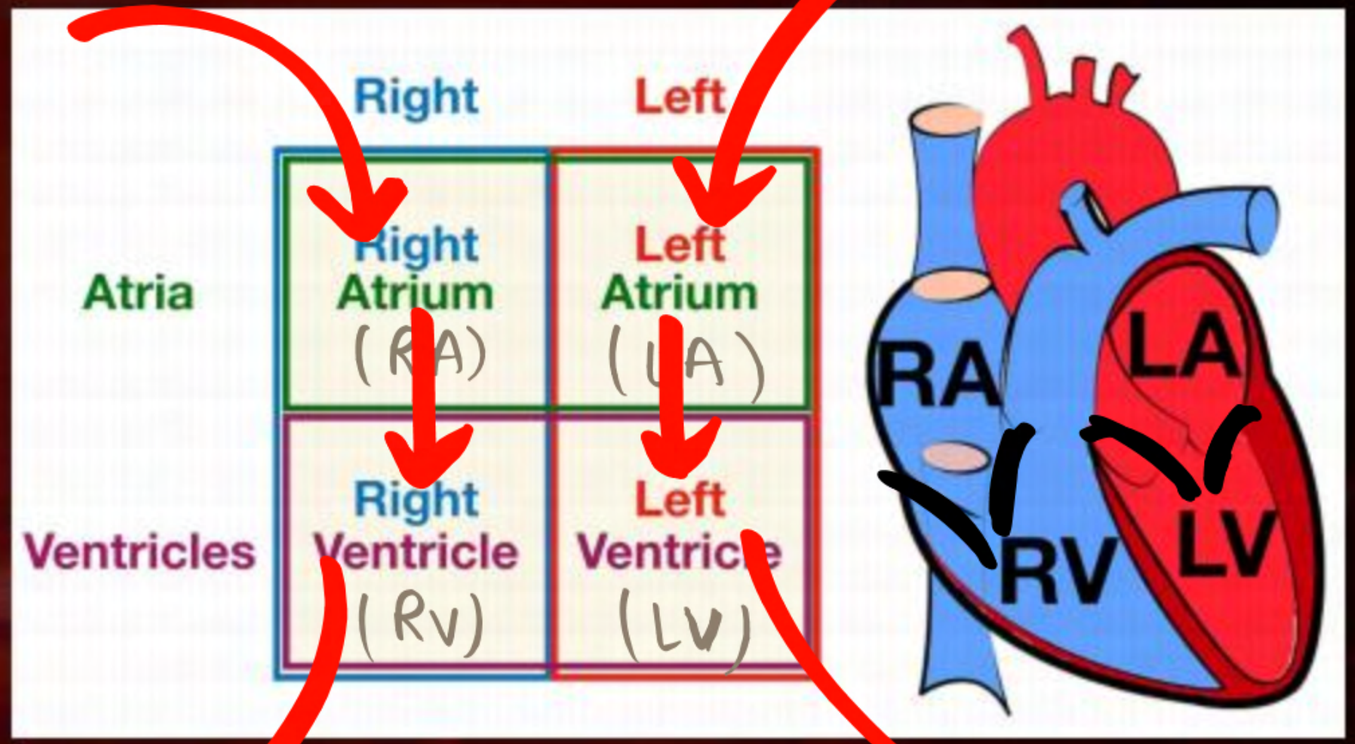
C. A is true, but R is false.

D. A is false, but R is true.


Aorta
Vena Cava from upper body
Pulmonary arteries
Pulmonary veins
Right atrium
Left atrium
Vena Cava from lower body
Right ventricle
Left ventricle
Septum (dividing wall)


Aorta
Vena Cava from upper body
Pulmonary arteries
Pulmonary veins
Right atrium
Left atrium
Vena Cava from lower body
Right ventricle
Left ventricle
Septum (dividing wall)

ATRIUM/AURICLE	VENTRICLES
Upper chambers	Lower chamber
Thin walled	Thick walled
Receives blood	Pumping of blood



L O

L → Left side

O → Oxygenated blood

R D

• R → Right side

• D → Deoxygenated blood

QUESTION

During contraction, what prevents the backflow of blood inside the heart?

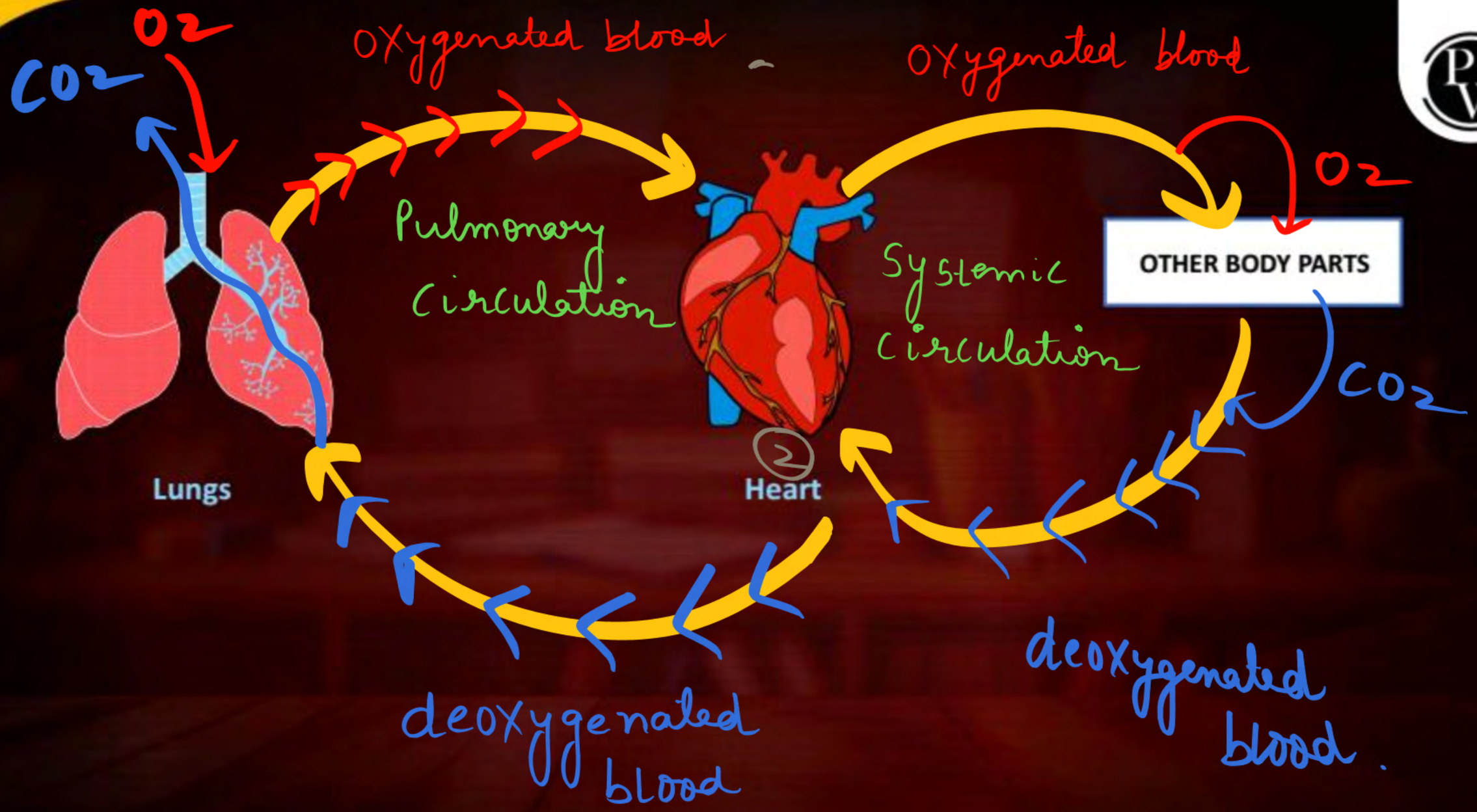
(A) Valves in heart

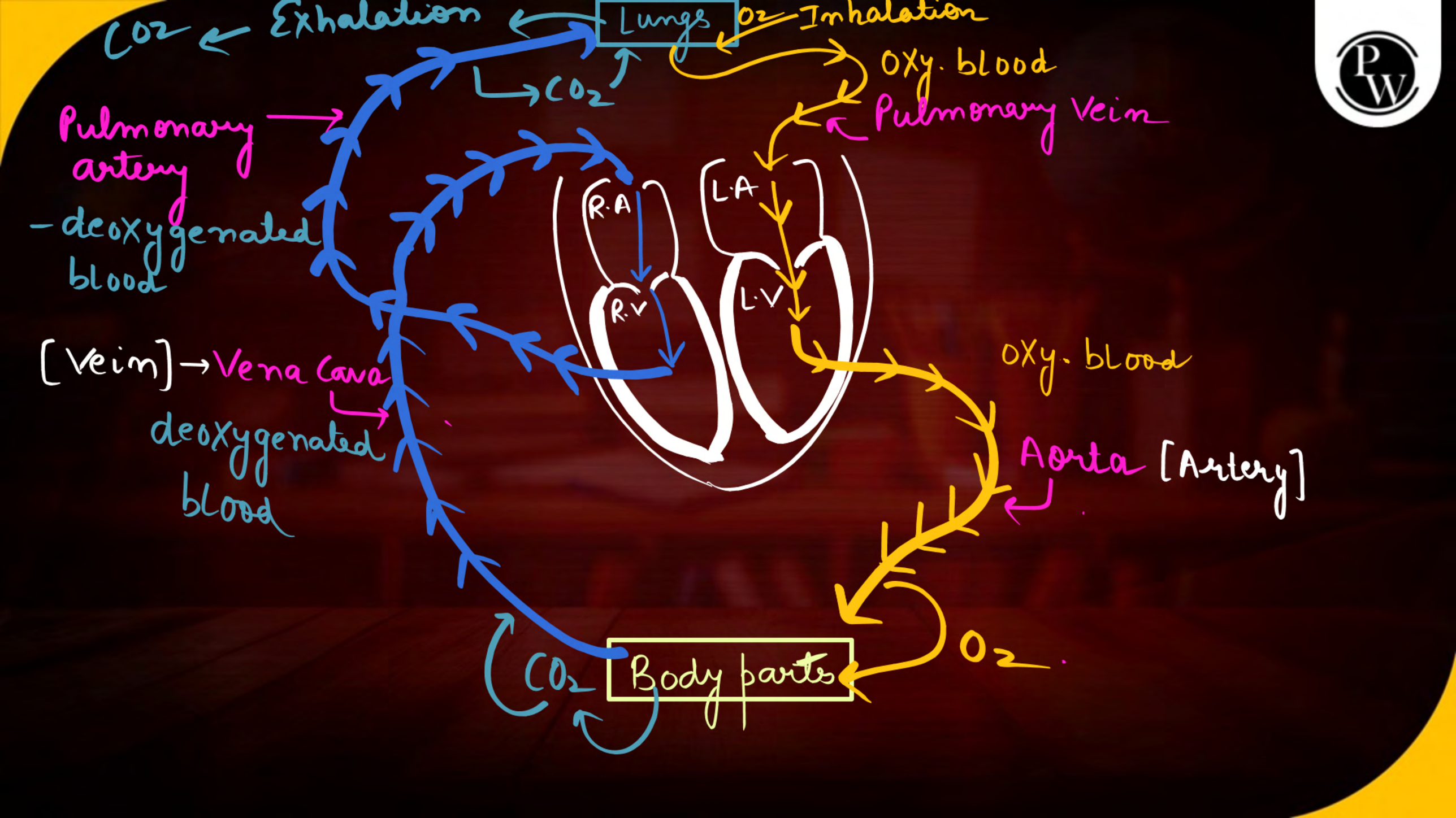
(B) Thick muscular walls of ventricles

pump blood with pressure.

(C) Thin walls of atria

(D) Thick walls of atria


CO2
O2
Oxygenated blood
Oxygenated blood
Pulmonary circulation
Systemic circulation
O2
OTHER BODY PARTS
CO2
Lungs
Heart
deoxygenated blood
deoxygenated blood


CO2 ← Exhalation
Lungs
O2 Inhalation
OXy. blood
Pulmonary Vein
CO2
Pulmonary artery
- deoxygenated blood
R.A
L.A
R.V
L.V
[Vein] → Vena Cava
deoxygenated blood
OXy. blood
Aorta [Artery]
O2
CO2
Body parts

Double circulation

Blood enters TWICE into heart to complete the full circuit/cycle

Single circulation

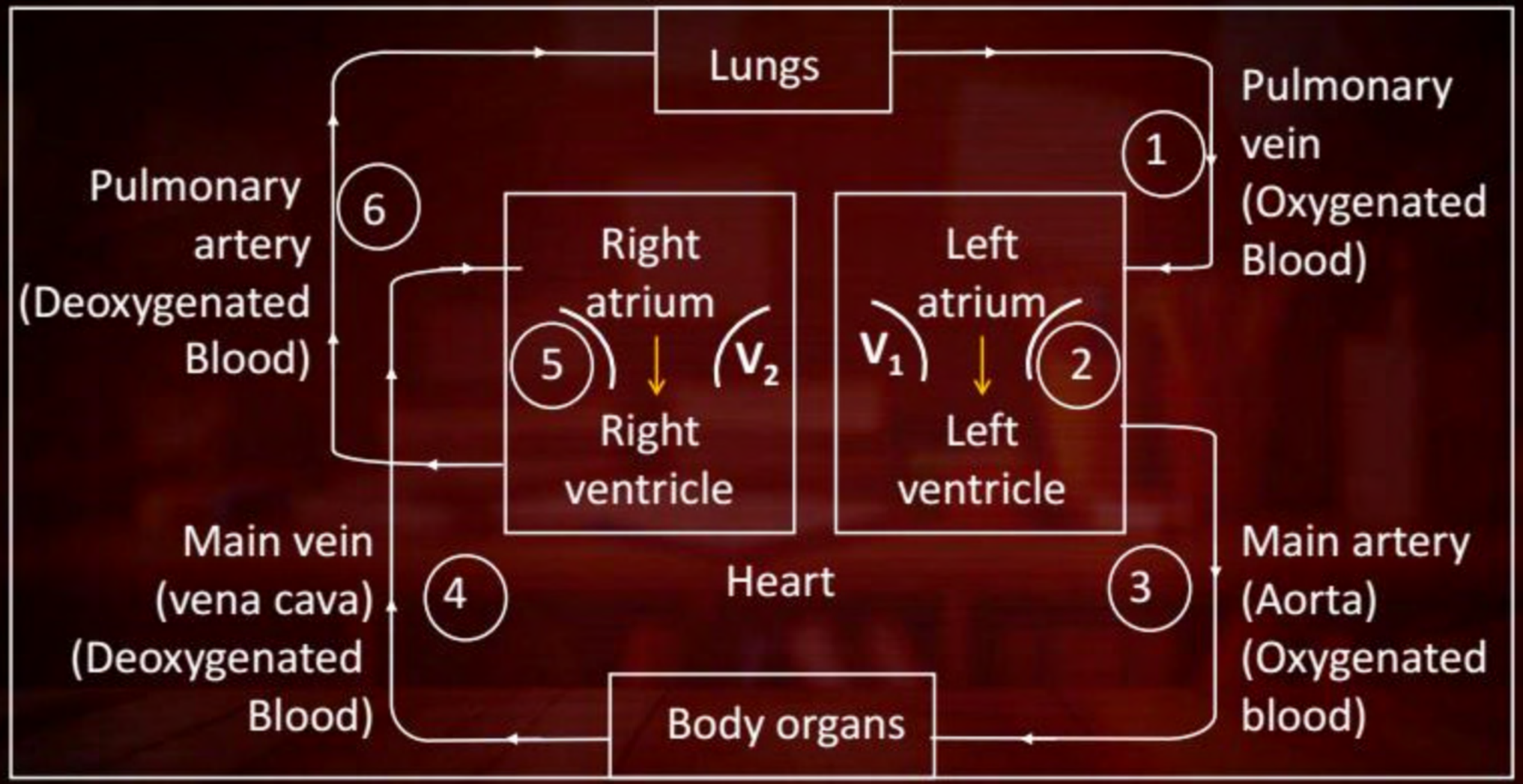
Blood enters only ONCE in heart to complete the full circuit/cycle

Class	Chambers in heart	Type of circulation	Temperature maintenance
Pisces (Fishes)	2	Single circulation	No (Cold blooded)
Amphibians	3	Incomplete Double circulation	No (Cold blooded)
Reptiles	3	Incomplete Double circulation	No (Cold blooded)
Aves (Birds)	4	Complete double circulation	Yes (Warm blooded)
Mammals	4	Complete double circulation	Yes (Warm blooded)

Reptile ⟶ Crocodile

↓

4-Chambered


Lungs
Pulmonary vein (Oxygenated Blood)
1
Pulmonary artery (Deoxygenated Blood)
6
Right atrium
5
V_2
Right ventricle
Left atrium
V_1
2
Left ventricle
Main vein (vena cava) (Deoxygenated Blood)
4
Heart
3
Main artery (Aorta) (Oxygenated blood)
Body organs

QUESTION

Select the wrong statement from the following:

(F)

(A) Upper right chamber of the heart carries deoxygenated blood. (T)

(B) Pulmonary vein carries deoxygenated blood. (F)

(C) Blood pressure is measured using a sphygmomanometer. (T)

(D) All the reptiles except crocodiles have three chambered hearts. (T)

QUESTION

(i) What is double circulation?

(ii) Why is the separation of the right side and the left side of the heart useful? How does it help birds and mammals? **(Ap) (CBSE, 2023)**

(PYQ).

ANSWER

(i) Double circulation involves the blood passing the heart twice in one complete cycle. It includes separate pulmonary and systemic circulation.

(ii) The separation of the right side and the left side of the heart is useful to

- Prevent mixing of oxygenated and deoxygenated blood.
- Allows a highly efficient supply of oxygen to the body.
- This separation is useful in birds and mammals as they have high energy needs.
- Need to maintain their body temperature.

Respiration

QUESTION

(a) Write the correct sequence of steps followed during journey of oxygen rich blood from lungs to various organs of human body.

(b) What happens when the system of blood vessels develop a leak?

(Un) (CBSE, 2020)

Clotting of blood

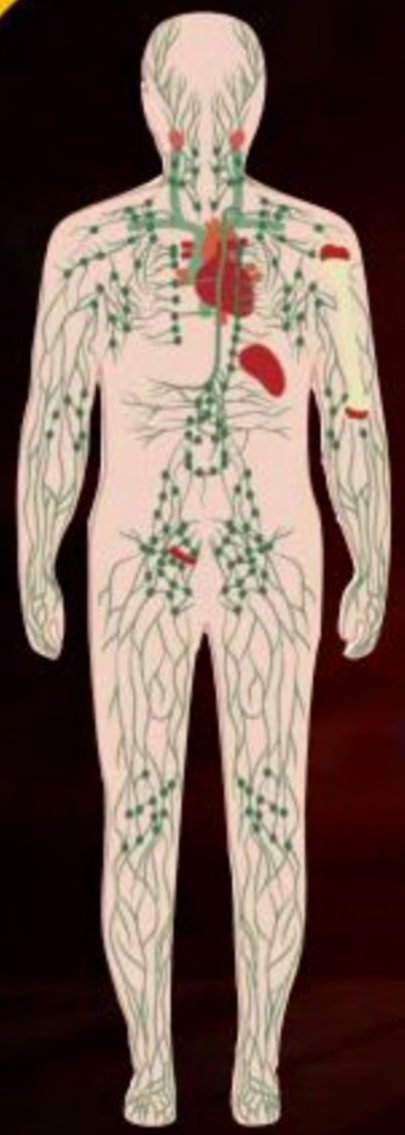
lungs → Pulmonary Vein → Left Atrium → Left Ventricle → Aorta → Body parts.

ANSWER

(a) Sequence of steps followed by oxygenated blood during circulation are:

1. The pulmonary veins carry the oxygenated blood from both the lungs to the left atrium.
2. From here, the blood enters the left ventricle.
3. Left ventricle pumps blood to the aorta.
4. From the aorta, this oxygen-rich blood is distributed to various body organs through arteries.
5. Oxygen and nutrients are exchanged in the capillaries at the target organs.

(b) When a blood vessel system develops a leaf or a vessel is damaged, In response, platelets in the blood increase their numbers to reduce blood loss and form a clot over the site of the leak.



- **Lymph / Tissue fluid**

  A colourless fluid formed due to leakage of plasma, white blood cells and proteins from blood.

  → Lymphocytes [WBC]

Functions of Lymphatic System:

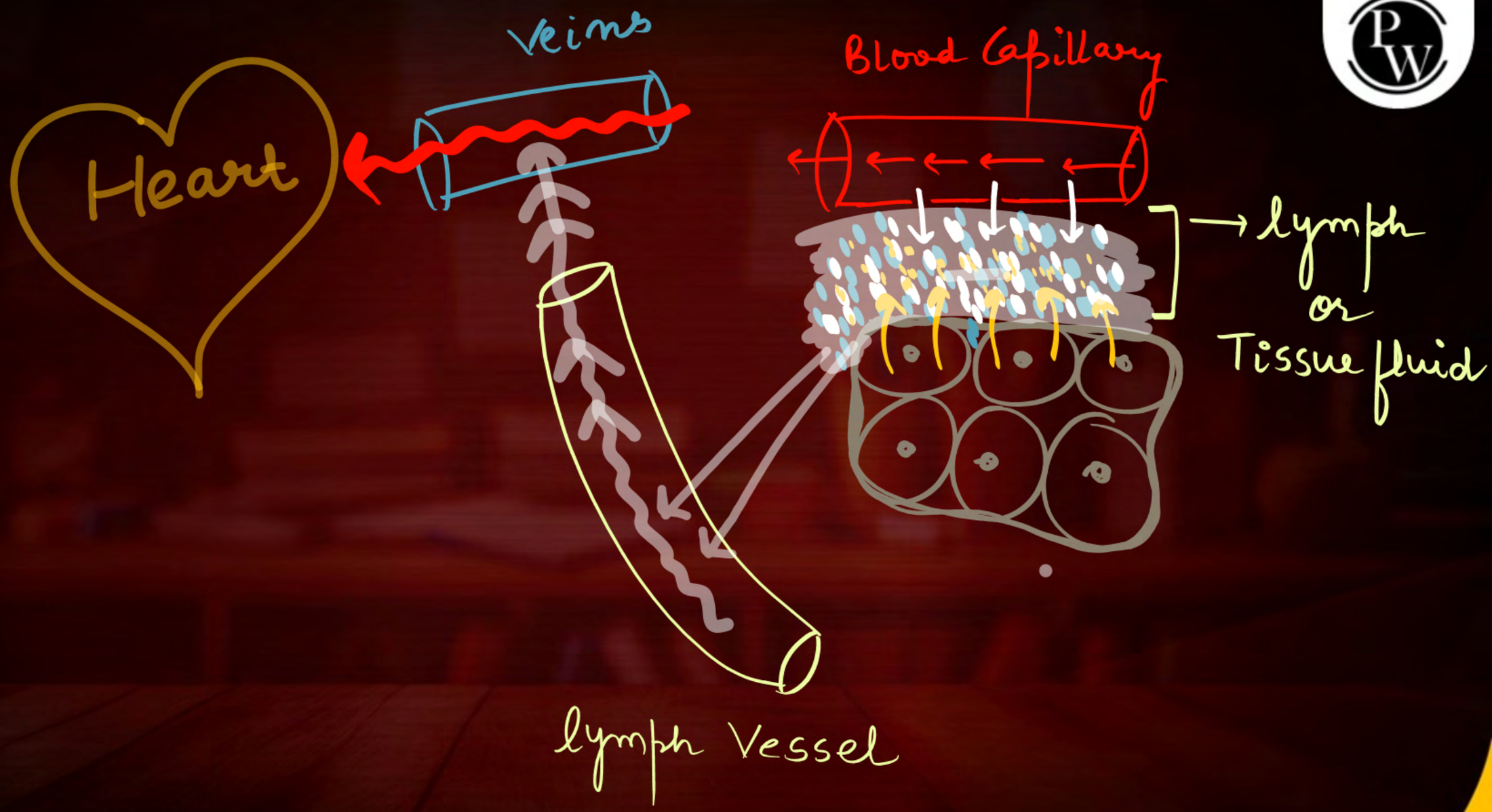
a) Lymph facilitates absorption of fats and fat- soluble nutrients back to the circulatory system.

b) It removes excess fluids from body tissues and maintains the balance of fluid between the blood and tissues.

c) It helps to provide immunity against pathogens

↓

WBC

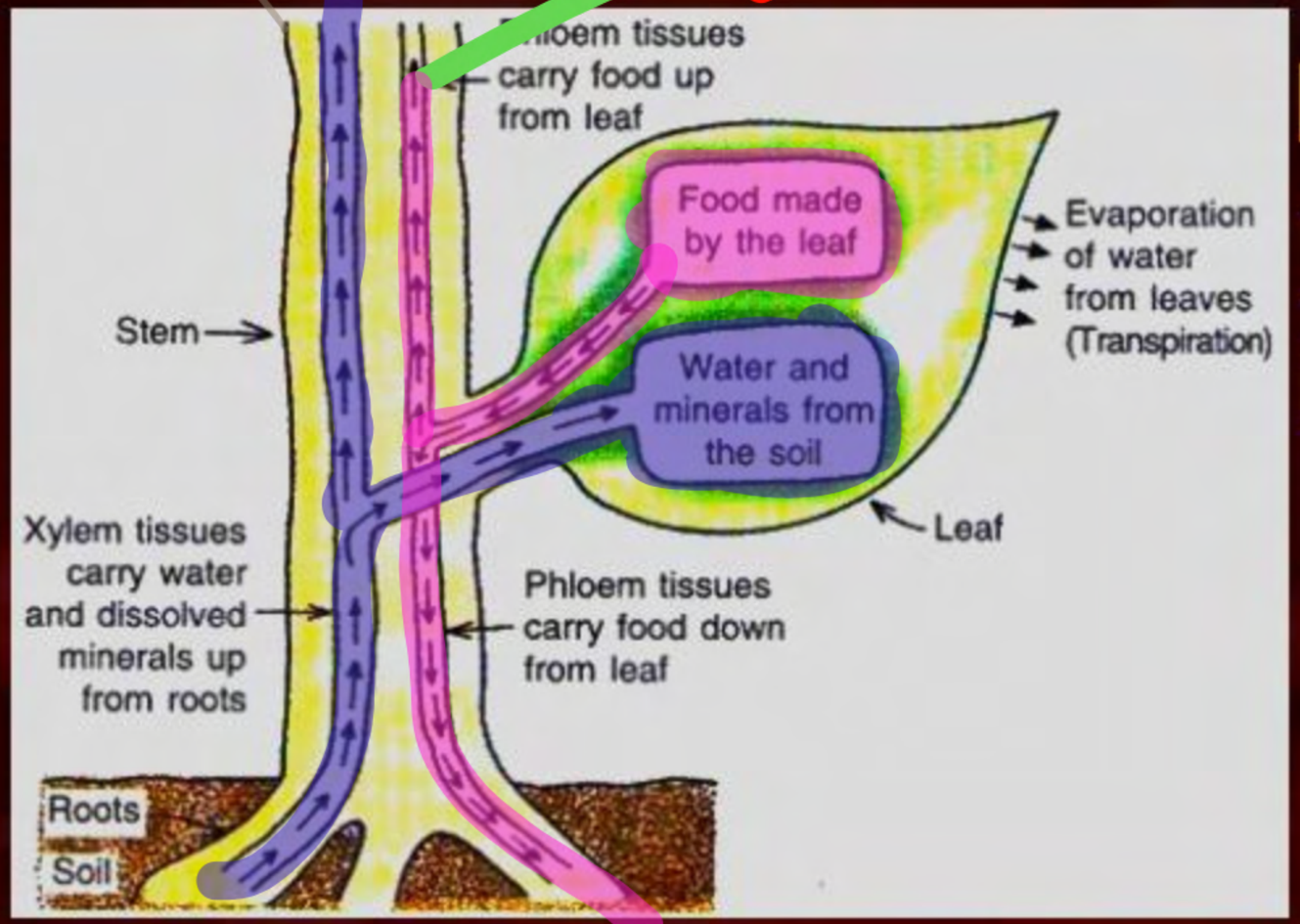

Heart
Veins
Blood Capillary
lymph
or
Tissue fluid
lymph Vessel

Transportation in Plants

Xylem
↓
Water and mineral salts
↓
Ascent of sap

↳ NO ATP Required

* Root pressure
* Transpirational pull



Phloem
↓
Food
↓
Translocation

↳ ATP required

Xylem

dead
- Vessels
- Tracheids
- Xylem fibres

Living
- Xylem parenchyma

Vessels + Tracheids → Transport of water & Mineral

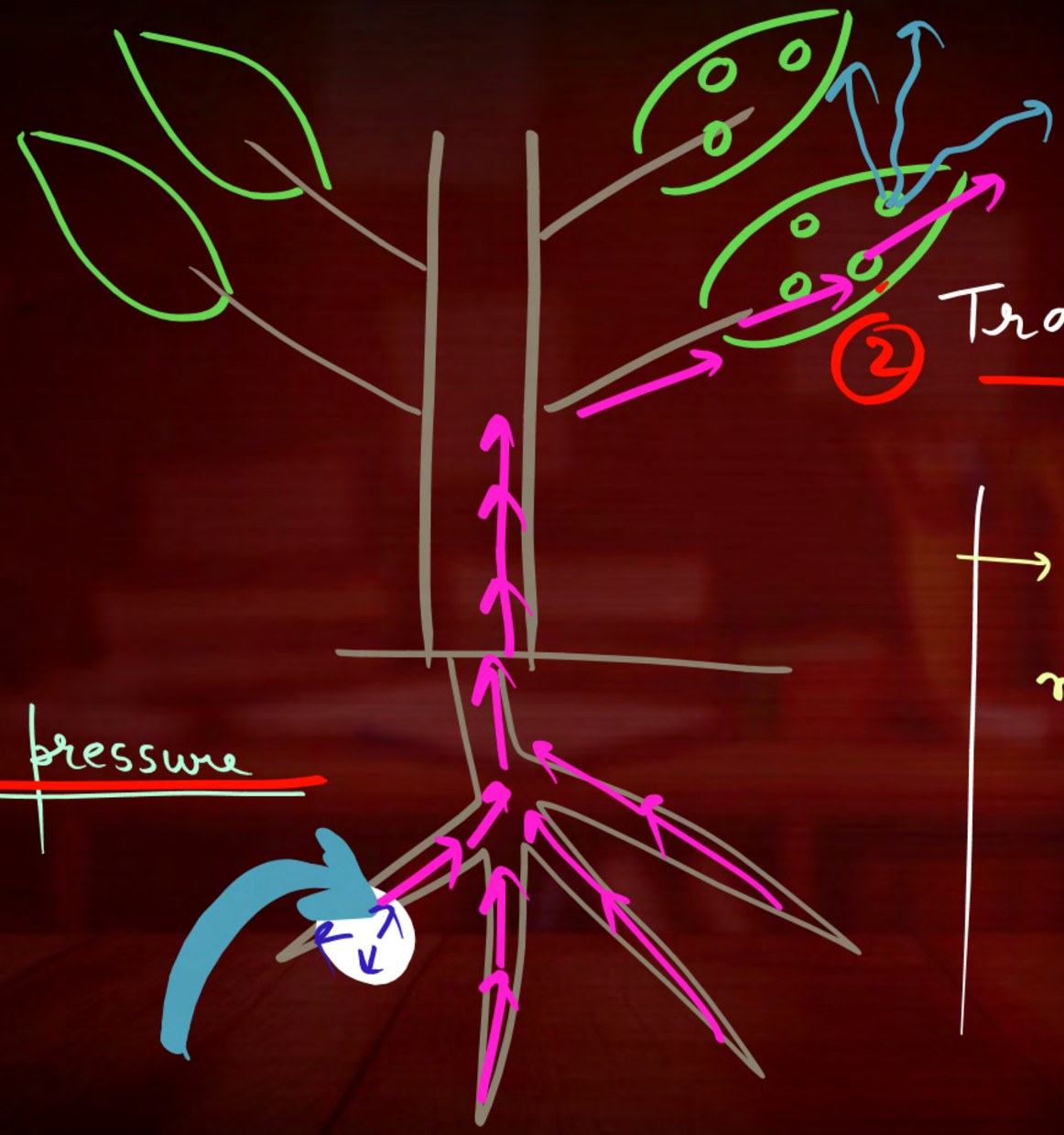
Phloem

Living
- Sieve tubes
- Companion cell
- Phloem parenchyma

dead
- Phloem fibres

Sieve tubes + Companion cell → food transport

Transport of materials in xylem	Transport of materials in phloem
• Xylem tissue helps in the transport of water and minerals.	• Phloem tissue helps in the transport of food.
• Water is transported upwards from roots to aerial parts of plants.	• Food is transported in both upward and downward directions.
• Transport in xylem requires physical forces such as transpiration pull and root pressure.	• Transport of food in phloem requires energy in the form of ATP.



Transpiration

↓

② Transpirational / Suction pull

→ Absorption & upward movement of water

① Root pressure

QUESTION

Identify the two components of phloem tissue that help in transportation of food in plants.

(Re)(CBSE, 2022 Term I)

(PYQ).

(A) Phloem parenchyma & sieve tubes

(B) Sieve tubes & companion cells

(C) Phloem parenchyma & companion cells

(D) Phloem fibres and sieve tubes

Excretion

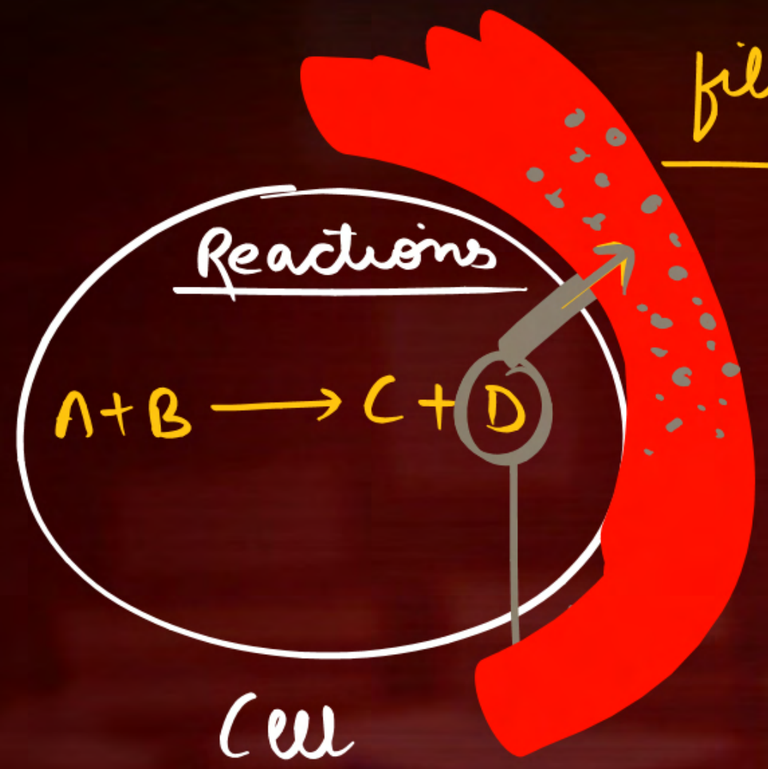
- The biological process involved in the removal of harmful metabolic wastes from the body is called Excretion.

Waste products

- Urea, Uric acid, Ammonia etc.
- CO_2
- Excess Water

Urine Pathway

- **Kidney**
  Produce urine, water balance,
- **Ureter**
  Transports urine towards urinary bladder
- **Urinary bladder**
  Temporarily stores urine
- **Urethra**
  Transport urine out of the body

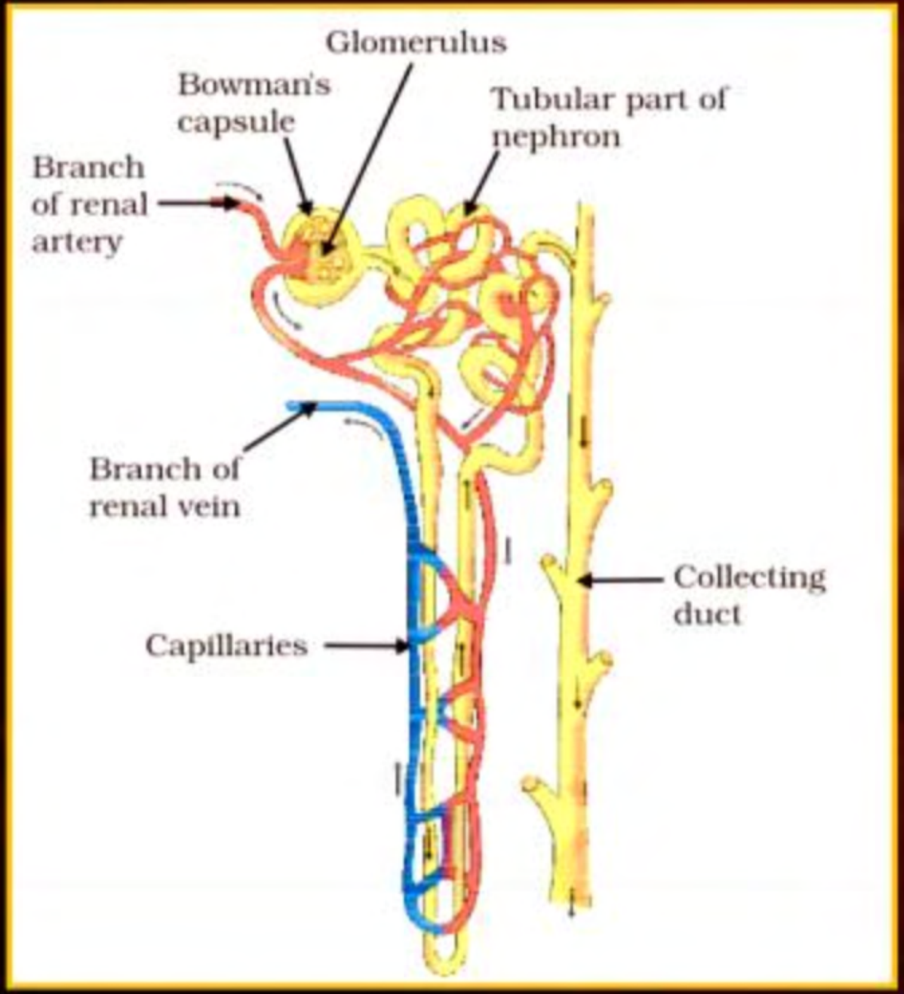


filtration of blood → Kidney → Urine

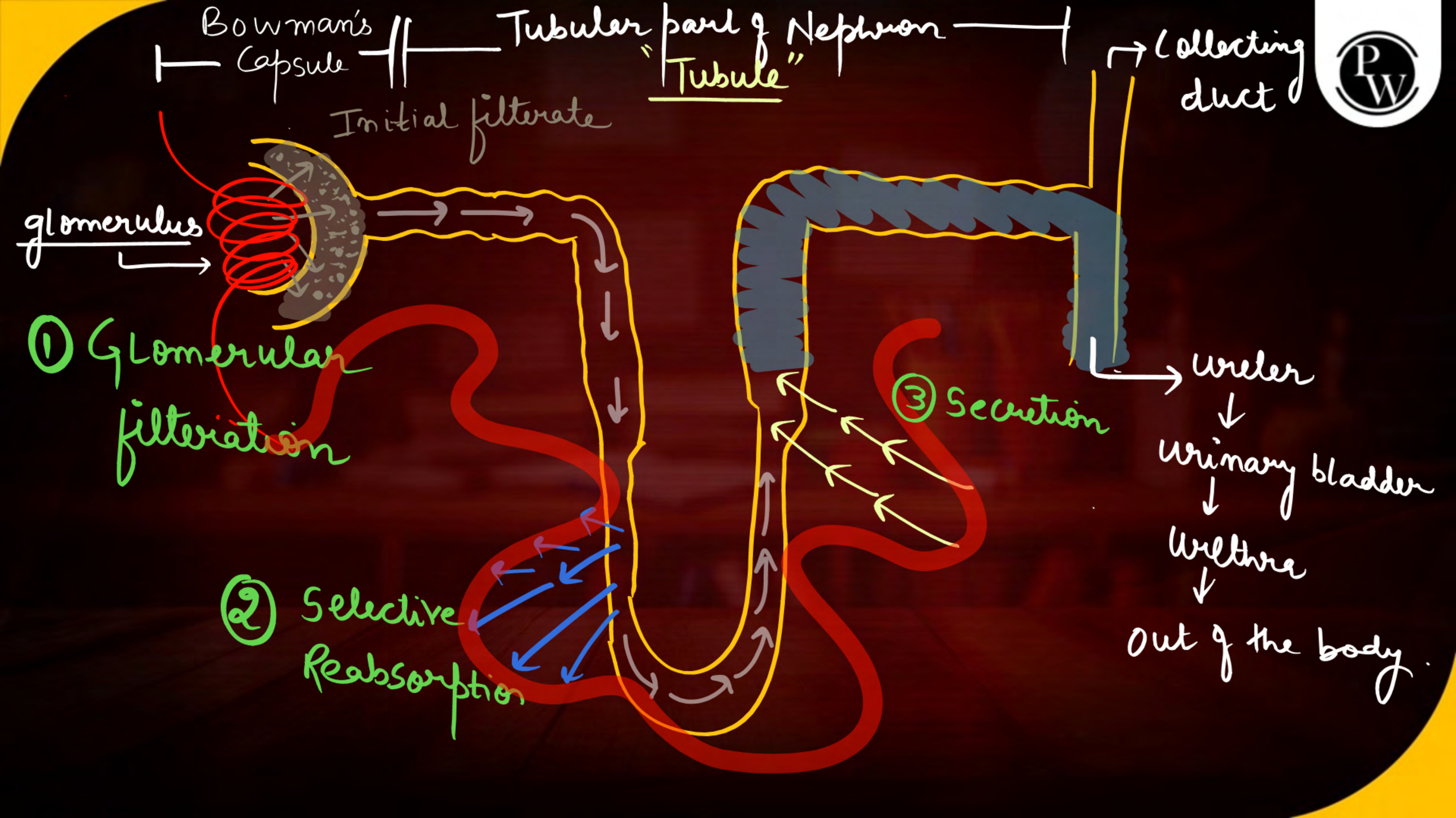
Metabolic Waste
- Nitrogenous Waste
  - Ammonia
  - Urea
  - Uric Acid
- CO_2
- Water

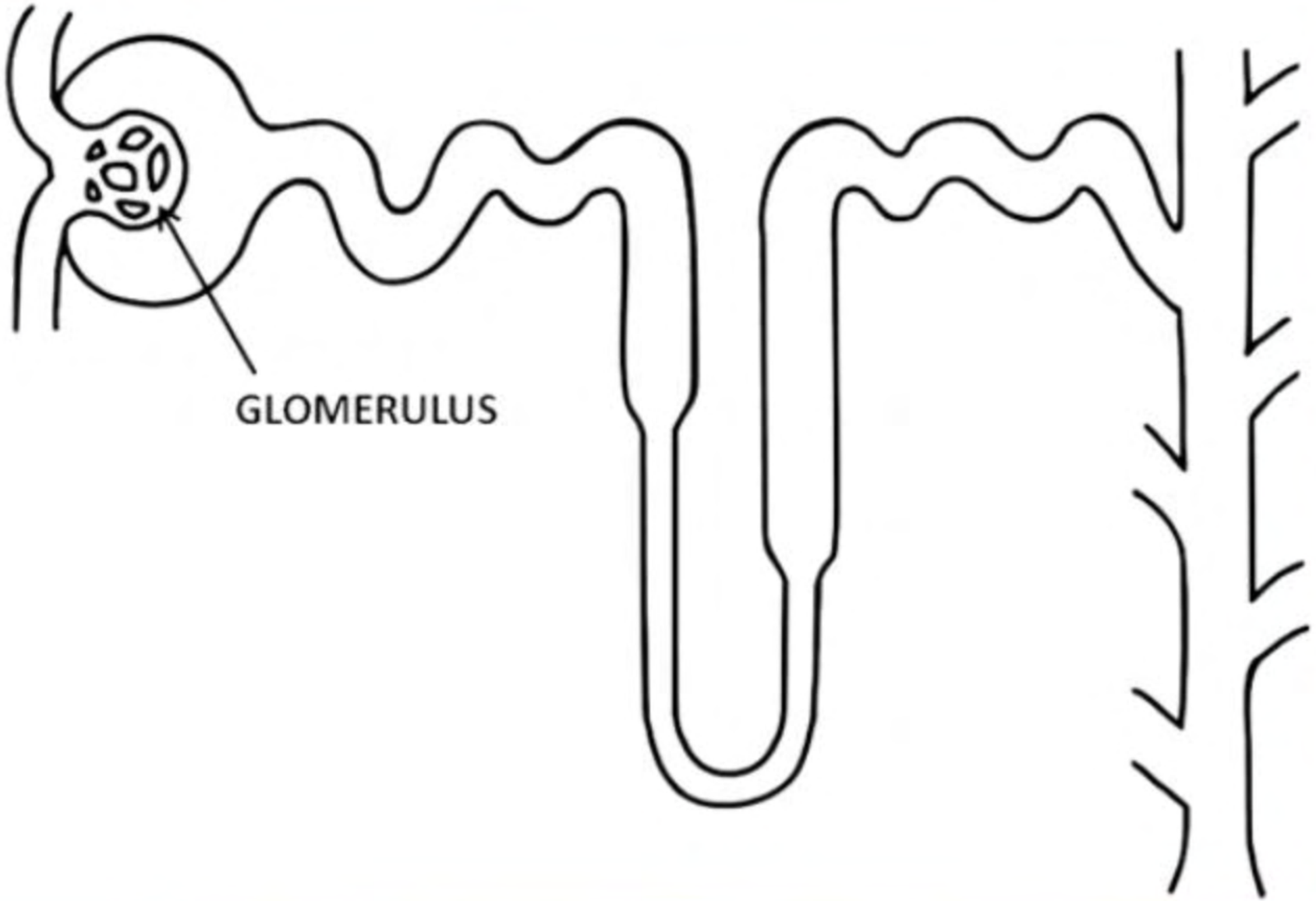
Nephron

Nephrons



- Structural and functional unit of kidney.
- Helps in filtration of blood.
- Millions of nephron in each kidney


Bowman's Capsule
Tubular part of Nephron
"Tubule"
Collecting duct
Initial filtrate
glomerulus
① Glomerular filtration
② Selective Reabsorption
③ Secretion
ureter
urinary bladder
urethra
out of the body.


GLOMERULUS

QUESTION

Describe the process of urine formation in kidneys. (Un)

Steps of Formation of urine

1

Glomerular filtration

Nitrogenous wastes, glucose, water, amino acid, excessive salts from the blood are filtered and initial filtrate enters into Bowman Capsule of the nephron.

2

Selective Reabsorption

Useful substances like glucose, amino acids, salts and a major amount of water from the filtrate are reabsorbed back by capillaries surrounding the nephron.

3

Tubular Secretion

Urea, extra water and salts are secreted into the tubule which open up into the collecting duct & then into the ureter.

Plants use different strategies for excretion of different products

- Oxygen and carbon dioxide is diffused through stomata.
- Excess water is removed by transpiration.
- Plants can even loose some of their old parts like old leaves and bark of tree.
- Many plant waste products are stored in cellular vacuoles.
- Other waste products like latex, raisins and gums are stored in old xylem cells.
- Plants also secrete some waste substances into the soil around them.

QUESTION

The filtration units of kidneys are called. (Re) (NCERT Exemplar)

A Ureter

B Urethra

C Neurons

D Nephrons

QUESTION

Which part of the nephron in human kidney, serves the function of reabsorption of certain substances?

(PYQ)

A. Glomerulus

B. Bowman's Capsule

C. Tubules

D. Collecting duct

QUESTION

Identify the correct path of urine in the human body. (Re)

A. Kidney → urinary bladder → urethra → ureter

B. Urinary bladder → ureter → kidney → urethra

C. Kidney → ureter → urethra → urinary bladder

D. Kidney → ureter → urinary bladder → urethra

QUESTION

What is the primary purpose of the Bowman's capsule in the human kidney? (Un)

A. Production of urine

B. Absorption of glucose

C. Collection of blood filtrate

D. Secretion of hormones

QUESTION

Which statement best describes the role of the urinan bladder in the excretory system?

A. Filters waste from the blood

B. Stores urine until expulsion

C. Reabsorbs essential nutrients

D. Produces urine

QUESTION

Name the part of the human excretory system where nephrons are found. Write the structure and function of nephrons. **(Re)**

Kidney

ANSWER

(a) Part of the excretory system where nephrons are found:
Kidneys

(b) Structure:

Functional units of the kidney

- Consist of a Bowman's capsule and a long renal tubule.

Function:

- Filtration of blood
- Reabsorb essential nutrients and water, and excrete waste products.

QUESTION

B.Q

Amount of urine produced generally decreases in summers as compared to other seasons if we don't keep ourselves sufficiently hydrated. Justify.

(Ap) (CBSE, APQ, 2023)

Sweating

ANSWER

The amount or urine produced is regulated by selective reabsorption in the renal tubule of the nephron.

During summers, the body loses more water through sweat to regulate temperature. Consequently, less water is available for urine production, leading to a decreased volume of urine if hydration is not maintained.

QUESTION

(a) Define excretion.

(b) Name the basic filtration unit present in the kidney.

(c) Draw excretory system in human beings and label the following organs of excretory system which perform following functions:

(i) Form urine.

(ii) Is a long tube which collects urine from kidney.

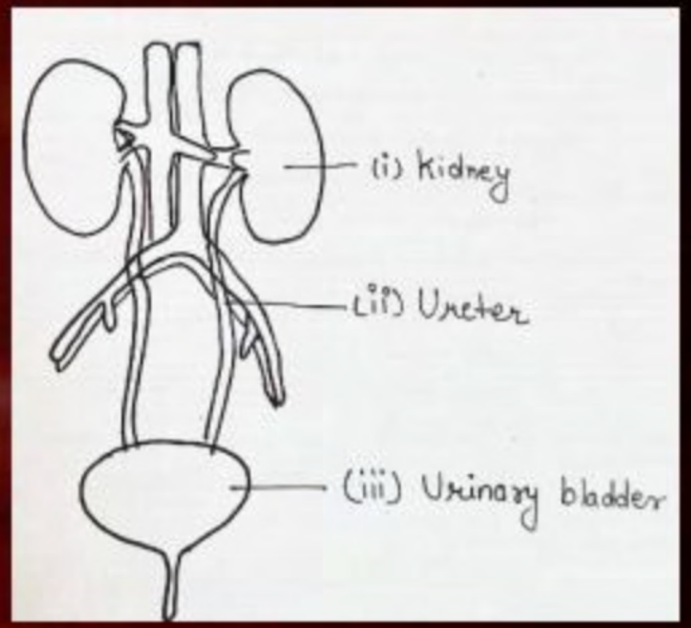
(iii) Store urine until it is passed out.

(Cr) (CBSE, 2020)

ANSWER

(a) The process by which metabolic waste is eliminated from an organisms is called Excretion. This is primarily carried out by the lungs, Kidneys and skin.

(b) The basic filtration unit present in Kidney is Nephron.



KDHBH

Chapter No. - 02

CONTROL AND COORDINATION

Brain
Legs {Muscle}
Eye
Ear

CONTROL AND COORDINATION

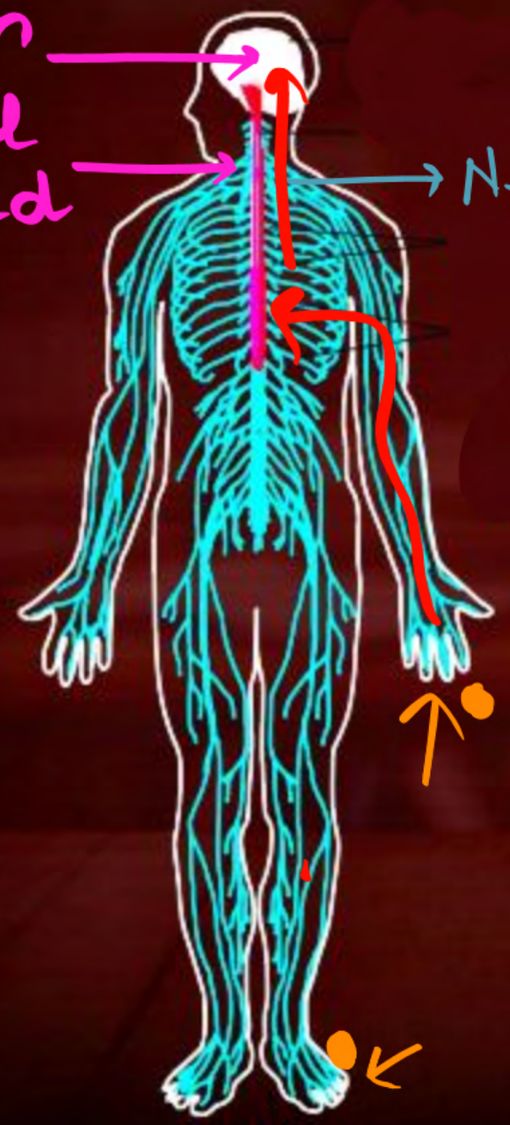
- COORDINATION IN ANIMALS
  - (1) NERVOUS SYSTEM (Associated with Neurons)
  - (2) ENDOCRINE SYSTEM (Associated with hormones)
- COORDINATION IN PLANTS
  - PLANT MOVEMENTS
  - PLANT HORMONES

NERVOUS SYSTEM

(CNS) CENTRAL NERVOUS SYSTEM

1. Brain
2. Spinal Cord

Brain
Spinal Cord

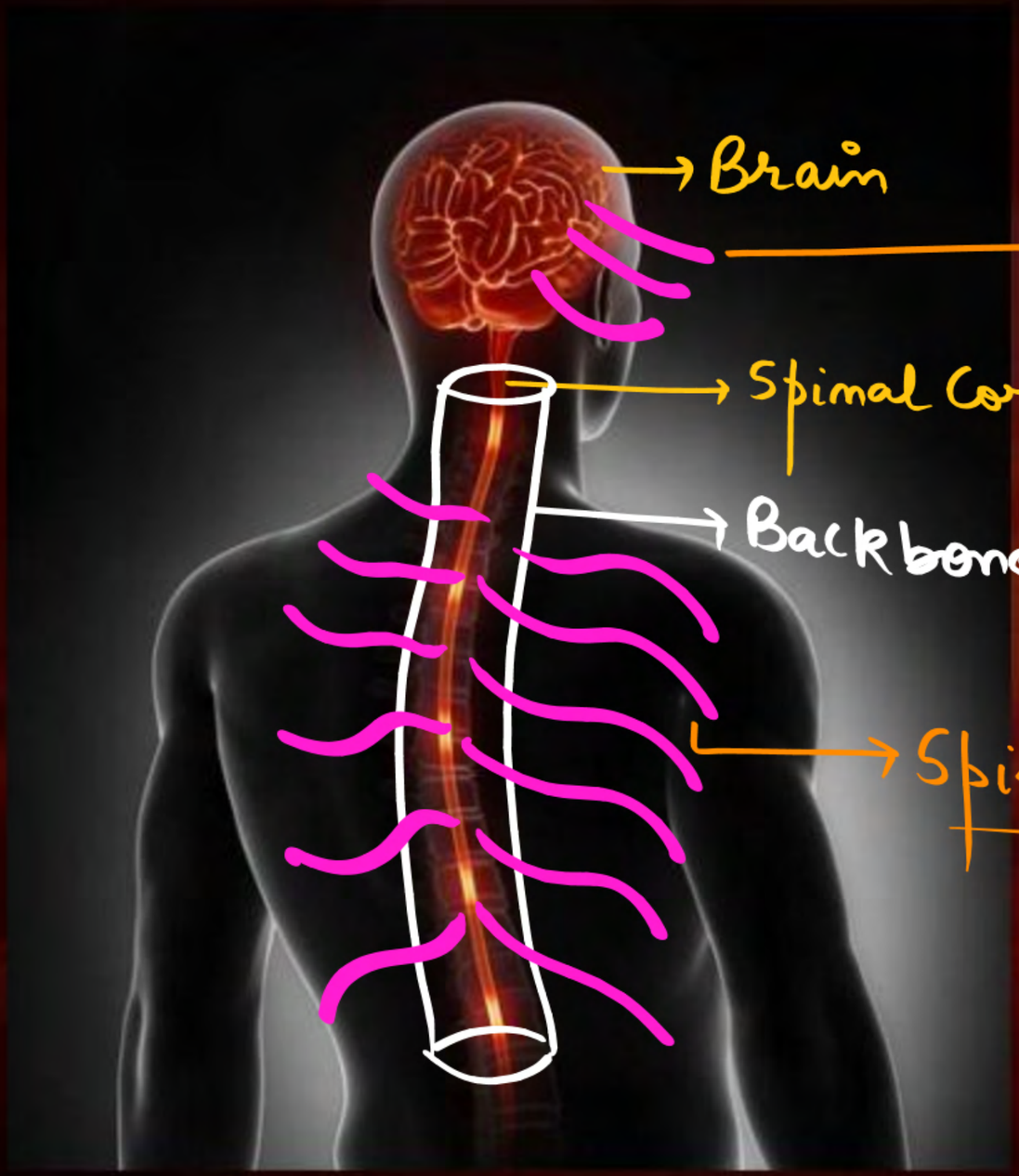


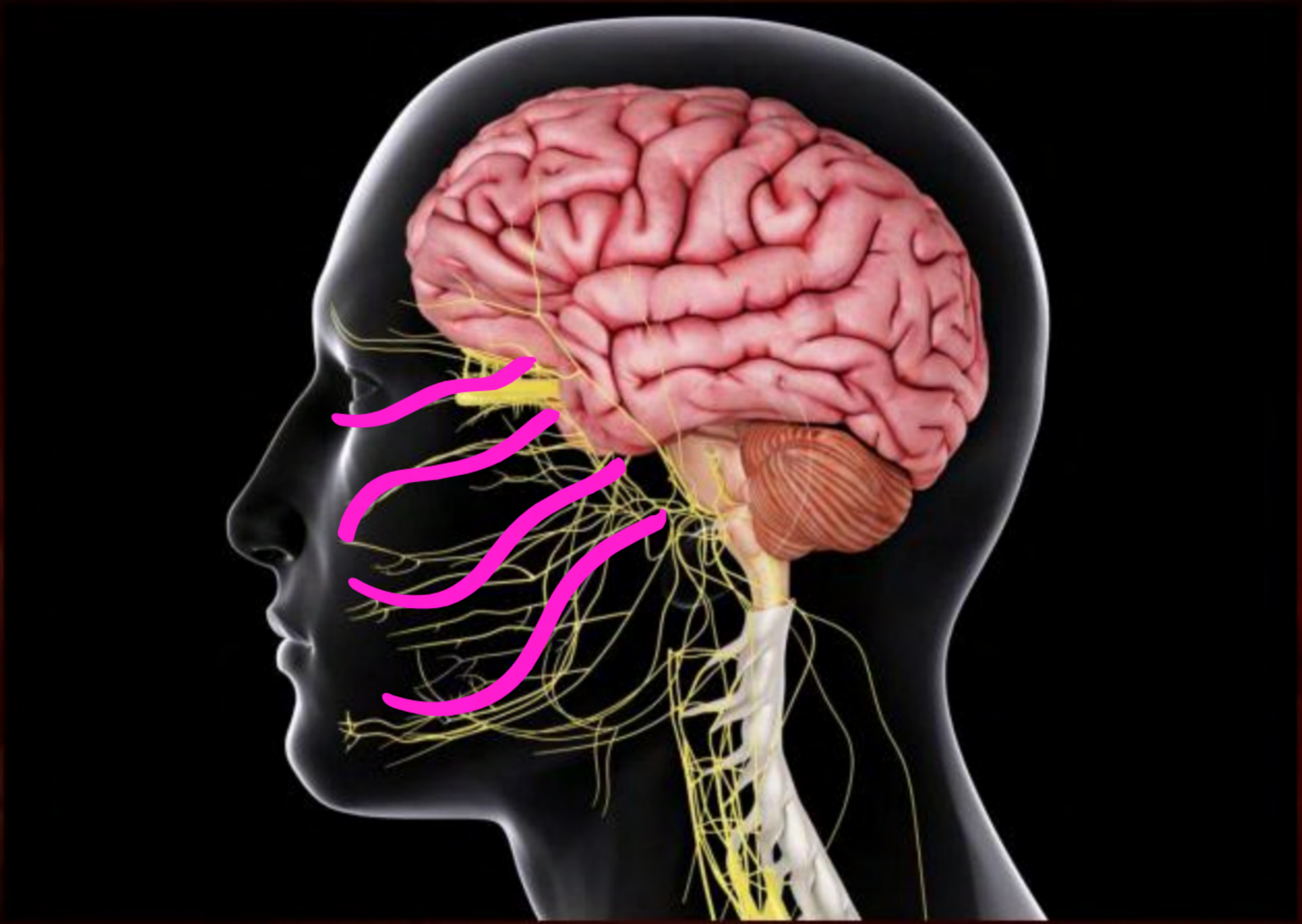
Nerves

(PNS) PERIPHERAL NERVOUS SYSTEM

Nerves

- **Cranial Nerves**
  - arise from brain
  - 12 pairs
- **Spinal Nerves**
  - arise from Spinal Cord
  - 31 pairs


Brain
Cranial nerves
Spinal Cord
Backbone / Vertebral Column
Spinal nerves



Key terms to Understand the Functioning of Nervous System

Stimulus	• Any the change, factor or agent which causes a change in activity or behaviour of an organism.
Receptors	• Receptors are the cells, tissues or organs that receive the stimulus
Effector	• Effector are tissues, glands or muscles which act in response to stimulus received
Response	• Response is the reaction towards a stimulus by an organism.

Muscles → Movement of hand

Insulin → glucose Level decreased

Pancreas

Effector

bitter
sour
salty
sweet

BASIC SENSORY RECEPTORS IN HUMAN

Receptor	Sense Organ	Stimuli
Photo receptors	Eyes	Light
Olfactory receptors	Nose	Smell
Gustatory receptors	Tongue	Taste
Phono receptors	Ear	Sound
Thermoreceptors	Skin	Heat / Cold
Nociceptors	Skin	Pain

QUESTION

#TTQ

Which of the following statements is correct about receptors?

(Re) (NCERT Exemplar)

A. Gustatory receptors detect taste while olfactory receptors detect smell. (T)

B. Both gustatory and olfactory receptors detect smell. (F)

C. Auditory receptors detect ~~smell~~ Sound and olfactory receptors detect taste. (F)

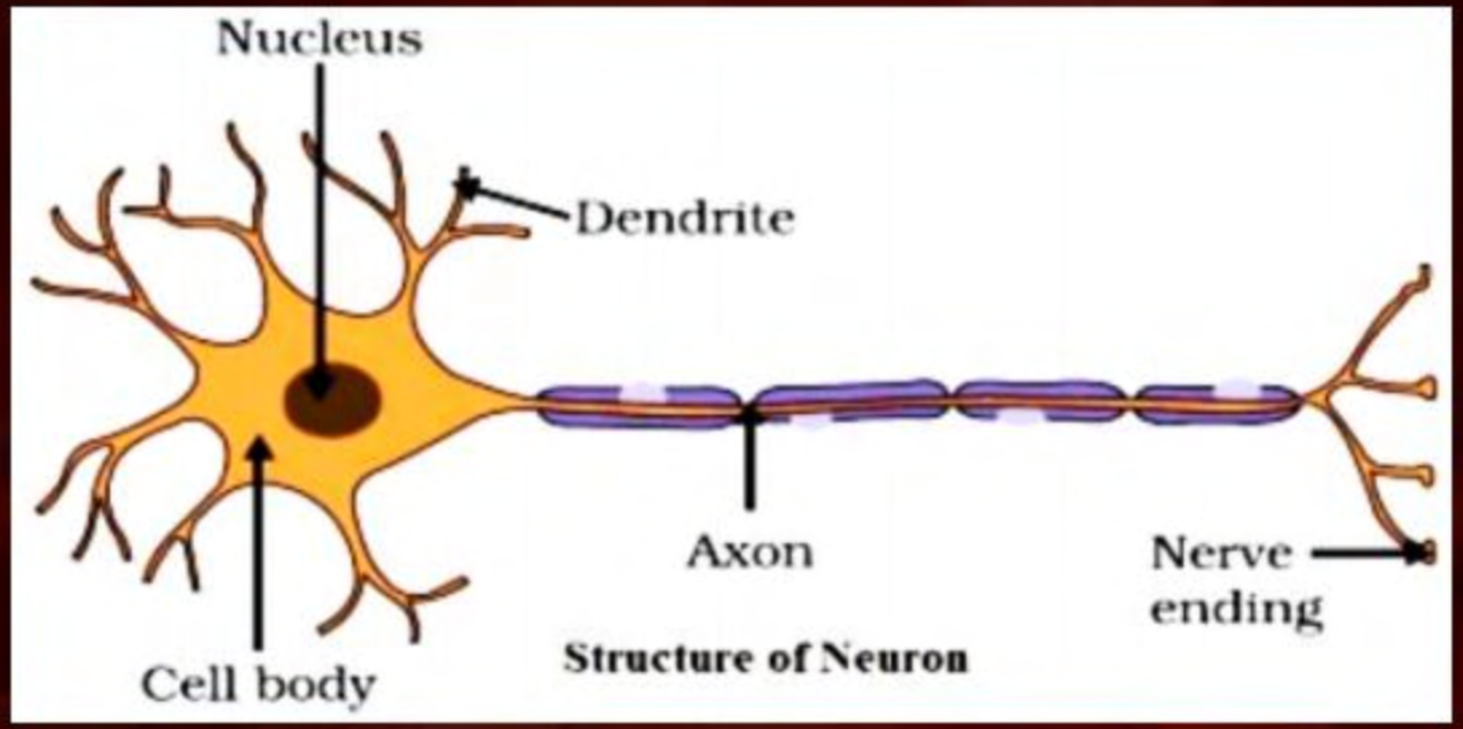
D. Olfactory receptors detect taste and gustatory receptors smell. (F)

Cell → Tissue → organ → organ System → organism

✓ Neuron or ✓ Nerve cell → Nervous Tissue → [• Brain, • Spinal Cord] → Nervous System

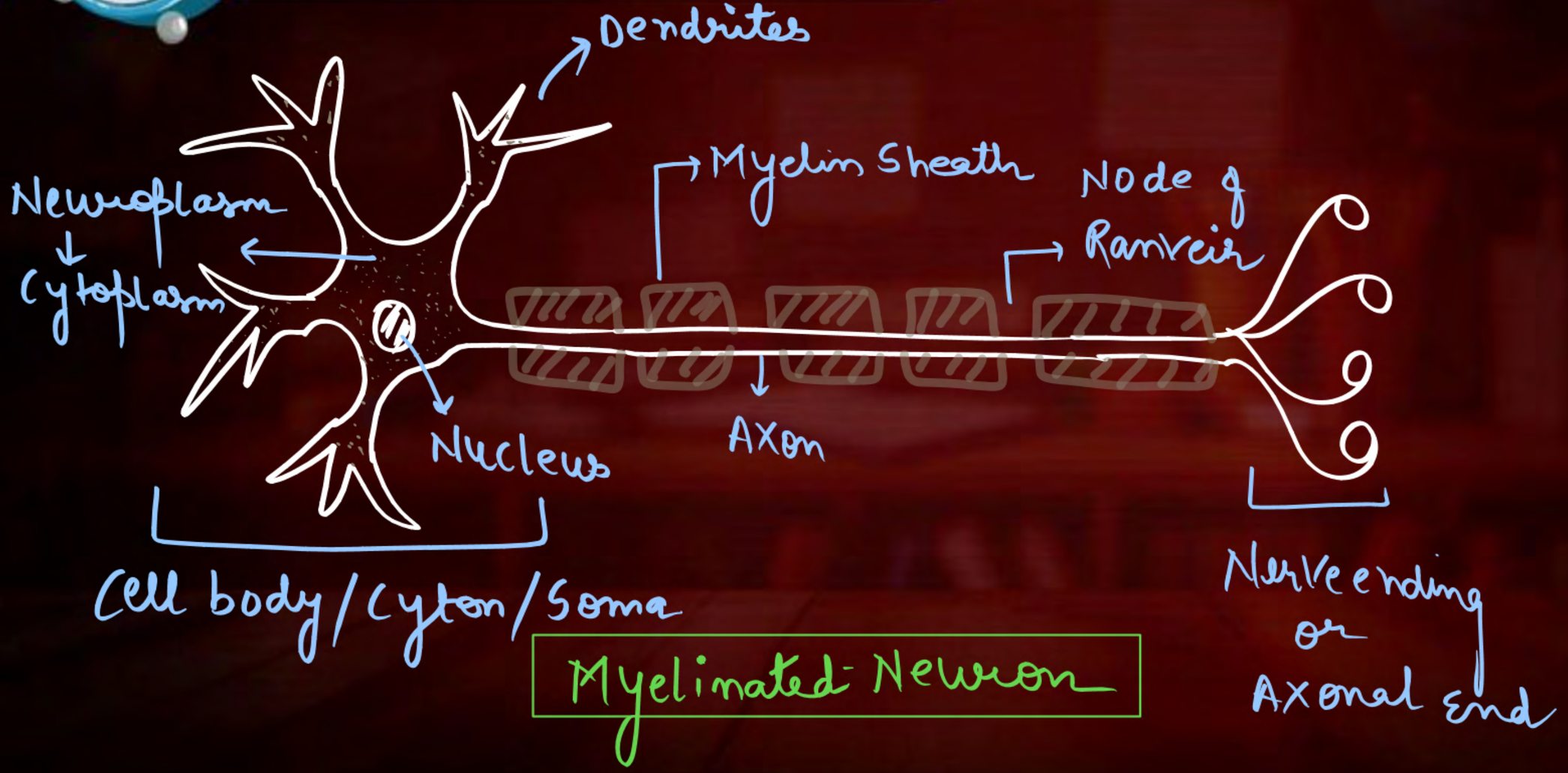
Neuron / Nerve Cell

- ~1m long
- long & branched
- Transmission Signal/information/ Nerve impulse



Structure of Neuron

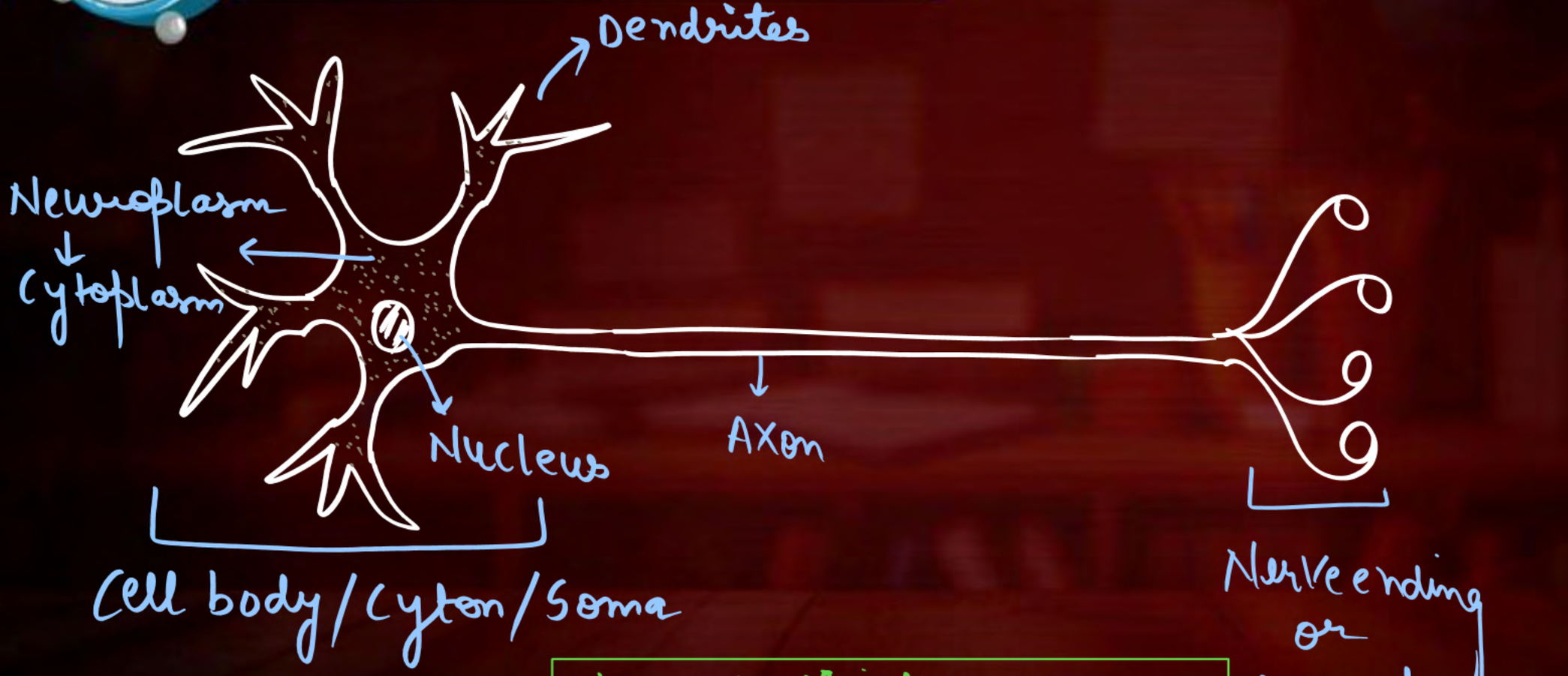
Neuron / Nerve cell



Myelinated Neuron

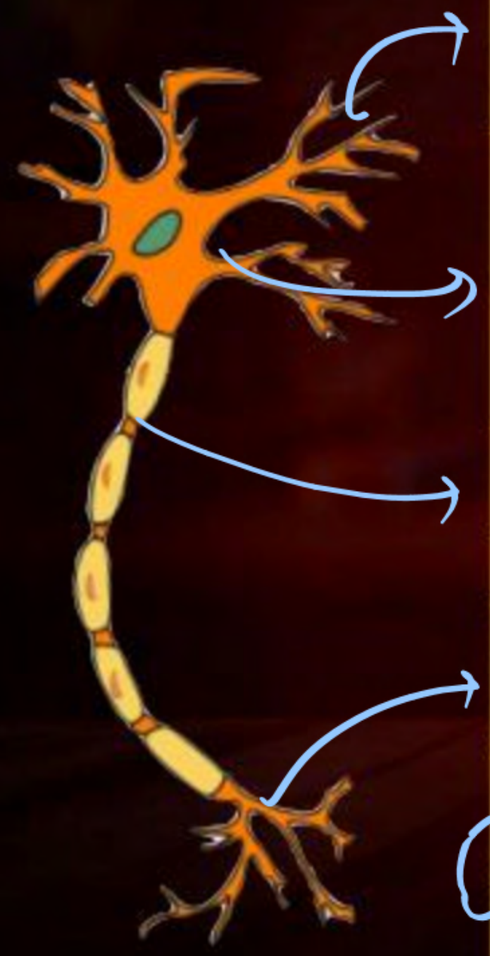
Dendrite → Cell Body → Axon → Nerve ending

Neuron / Nerve cell



Non-Myelinated Neuron

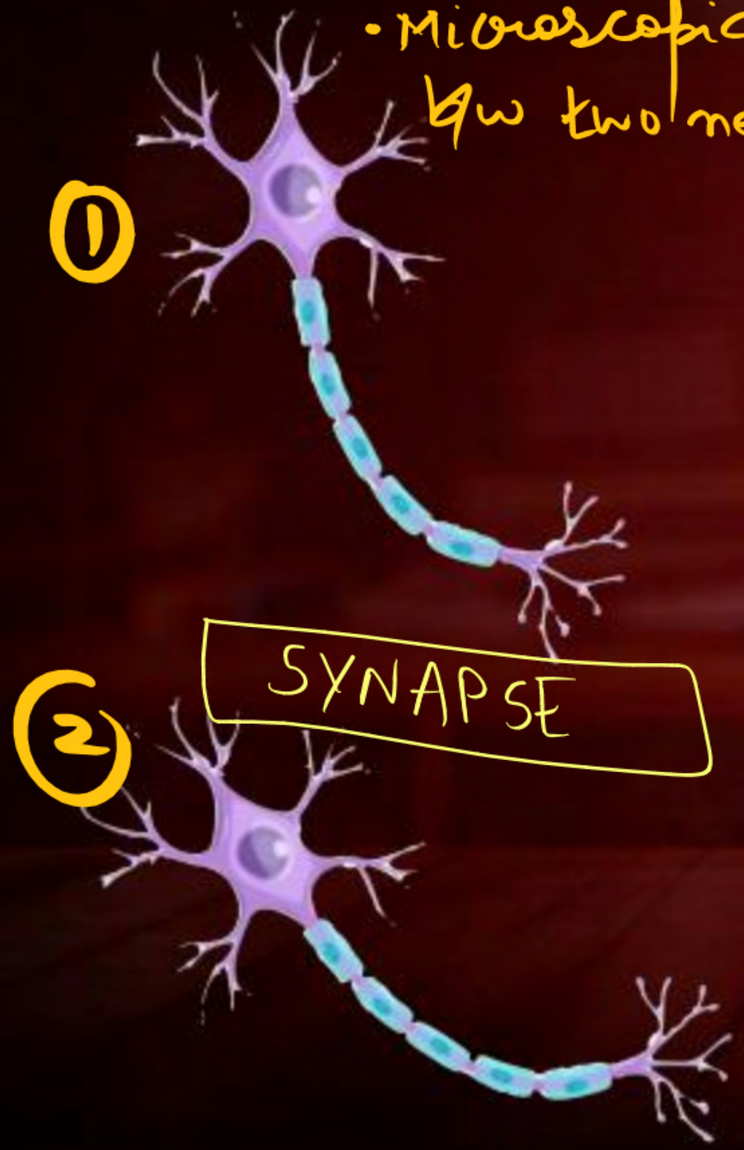
NEURON



Part	Details
Dendrites	Branched structure that collects information from previous neuron and passes on to the cell body.
Cell body	It is the broad, rounded part of the neuron that contains the nucleus, abundant cytoplasm (neuroplasm) and other organelles like mitochondria, endoplasmic reticulum, Golgi body etc.
Axon	It is a long tube-like structure that carries information from the cell body to the nerve endings .
Nerve ending	Terminal branched part of axon
Synapse	There is a gap between the nerve endings of one neuron and dendrite of the following neuron where signals are transmitted as chemical signals called neurotransmitters.

SYNAPSE

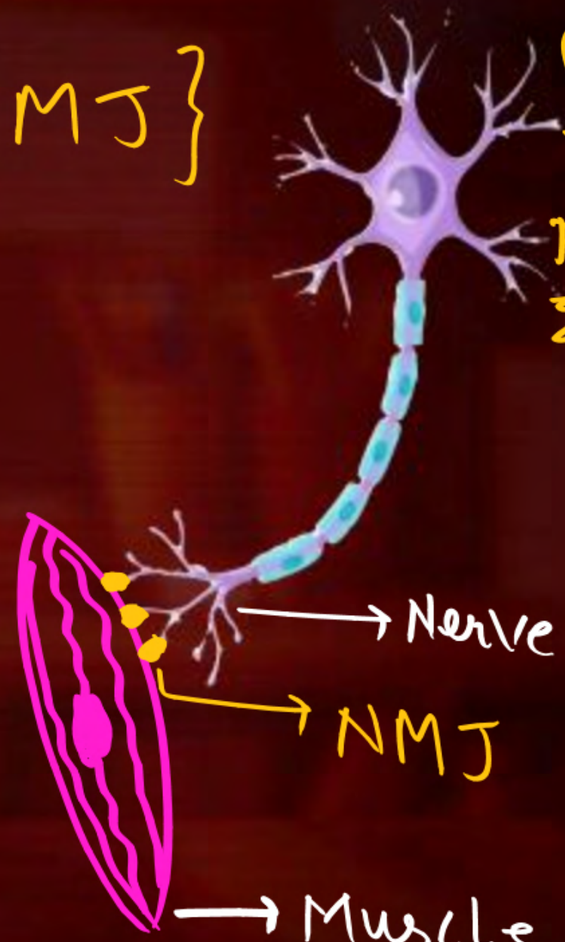
- Microscopic gap b/w two neurons



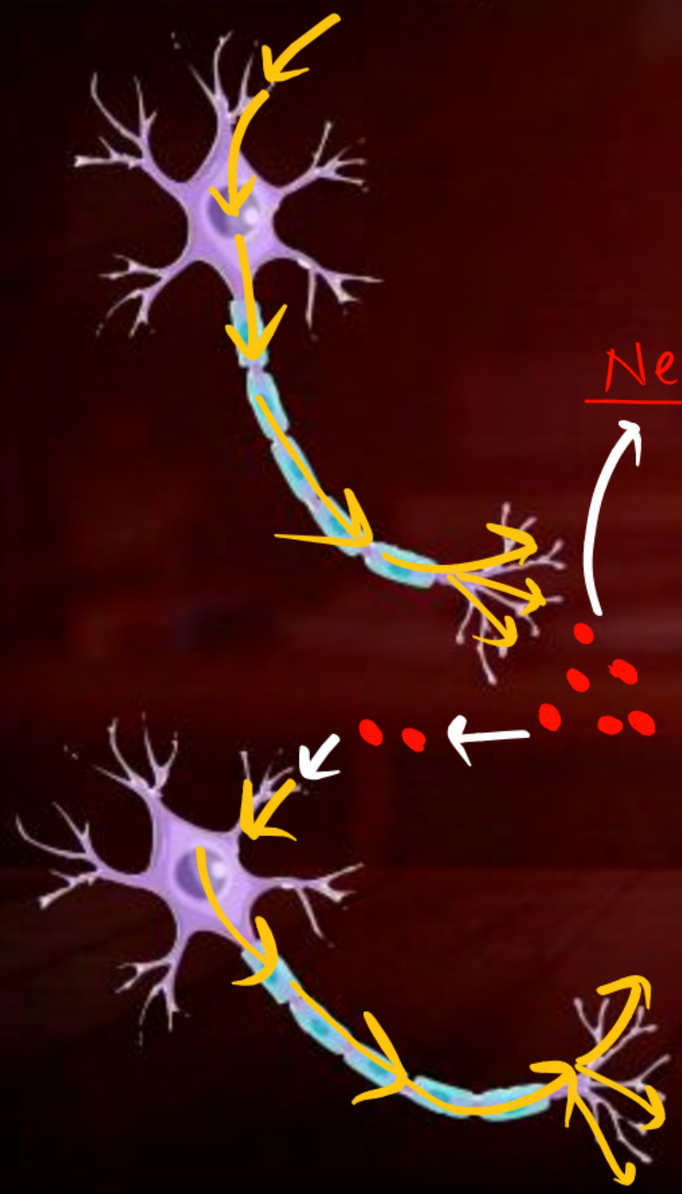
NEUROMUSCULAR JUNCTION

{NMJ}

Point of contact/ Junction b/w motor Neuron & Muscle



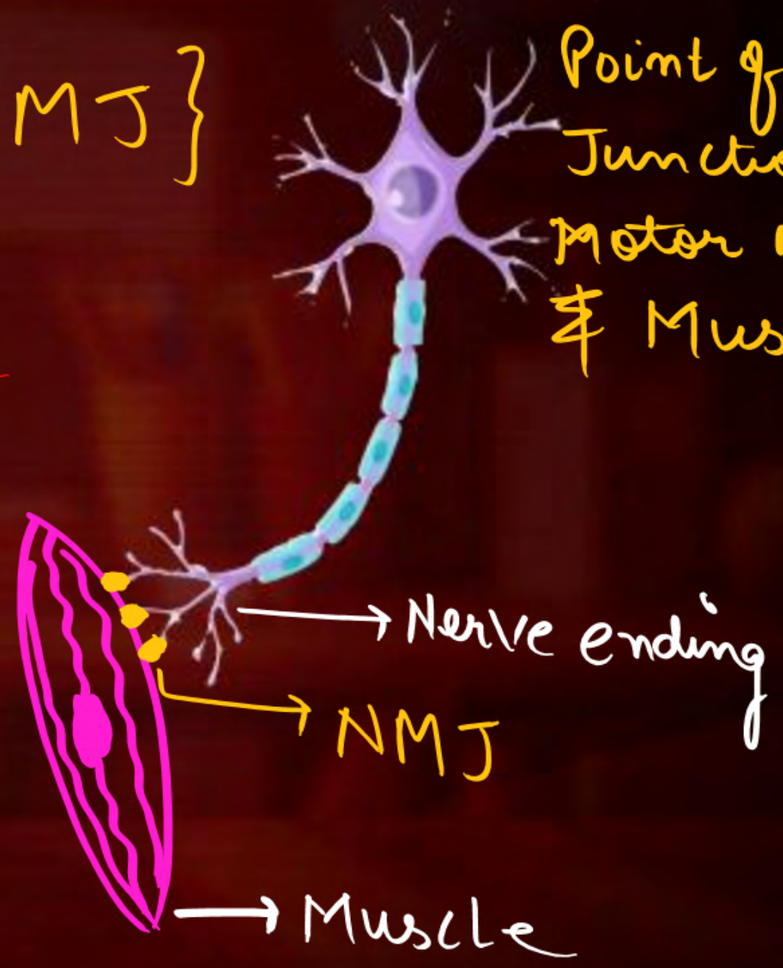
SYNAPSE

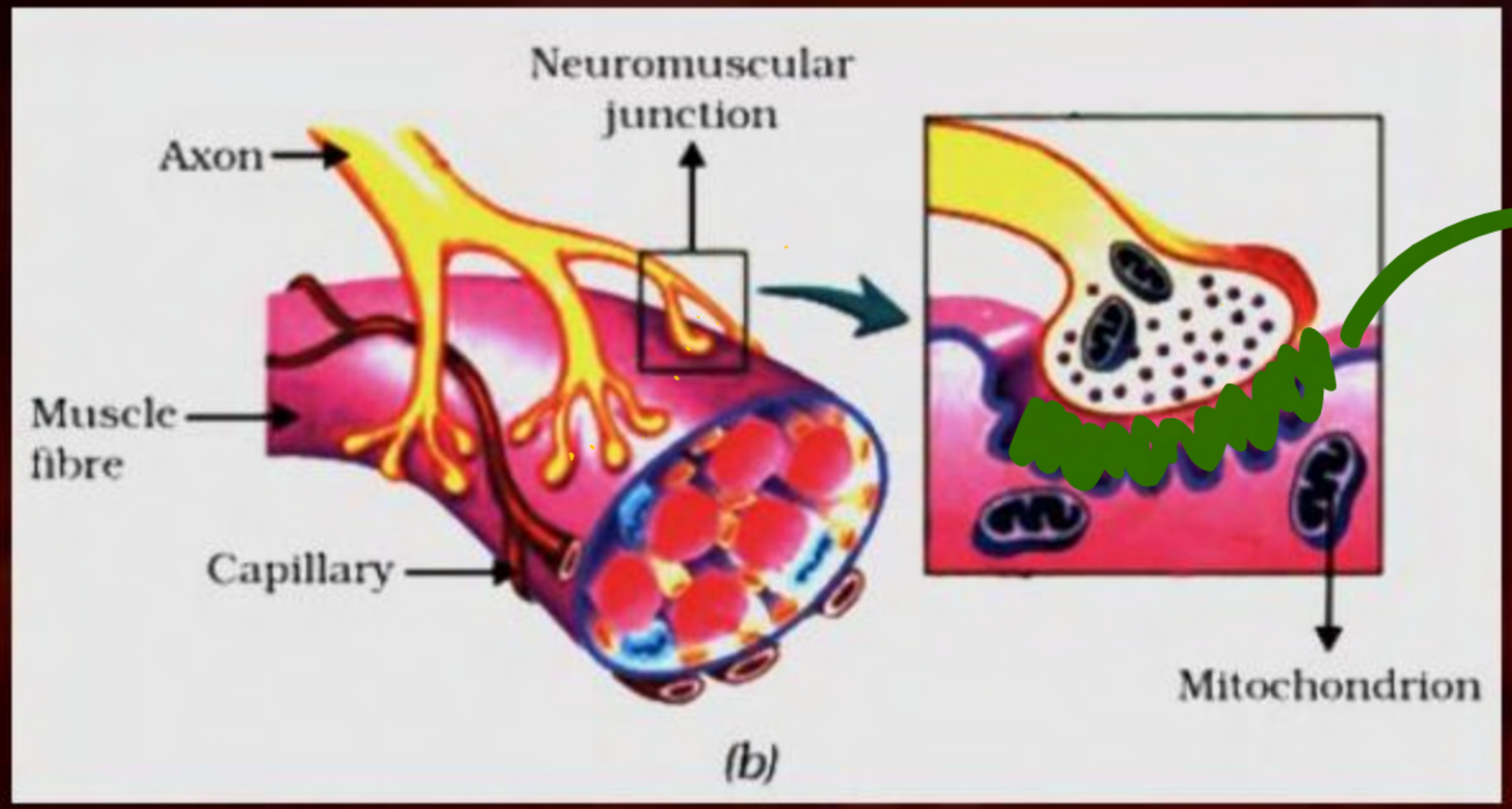


NEUROMUSCULAR JUNCTION

{NMJ}

Point of contact/ Junction b/w motor Neuron & Muscle




Neuromuscular junction
Axon
Muscle fibre
Capillary
Mitochondrion
(b)

NMJ

QUESTION

#TTQ

In a synapse chemical signal is transmitted from _____. (PYQ)

(A) dendrite of one neuron to axonal end of other neuron.

(B) axon to cell body of same neuron.

(C) cell body to axonal end of same neuron.

(D) axonal end of one neuron to dendrite of another neuron.

Types of neurons

Sensory neurons

They help in transmitting nerve impulse from receptor to central nervous system

Receptor → CNS

Interneurons

They connect sensory and motor neuron

S.N → M.N

Motor neurons

They help in transmitting nerve impulse from central nervous system to a muscle or gland

CNS → Effector

Stimulus {Heat}

↓

Thermo Receptor

Sensory Neuron

CNS

• Brain / Spinal Cord

Inter-neuron

or

Relay Neuron

Motor Neuron

Effector {Muscle of hand}

↑

Response {Removal of hand}

NERVOUS ACTIONS

Thinking not involved

Voluntary actions/ movements

- Can Control
- Thinking involved
- Brain involved

- Walking
- Writing
- Dancing
- Jumping

Involuntary actions / movements

- Can't Control
- Thinking not involved
- Brain involved

- Pumping of blood by heart
- Peristaltic movements
- Contraction relaxation of blood vessels

Reflex actions / movements

- Sudden, quick, automatic Response
- Brain not involved

Controlled by Spinal Cord

- Withdrawal of hand when touch a hot object.
- Closing of eyelids when some particles enter the eye.
- Shivering when it is too cold.
- Sneezing

QUESTION

_____ is a microscopic gap between a pair of adjacent neurons.

A neurotransmitter

B dendrites

C axon

D synapse

Reflex Arc

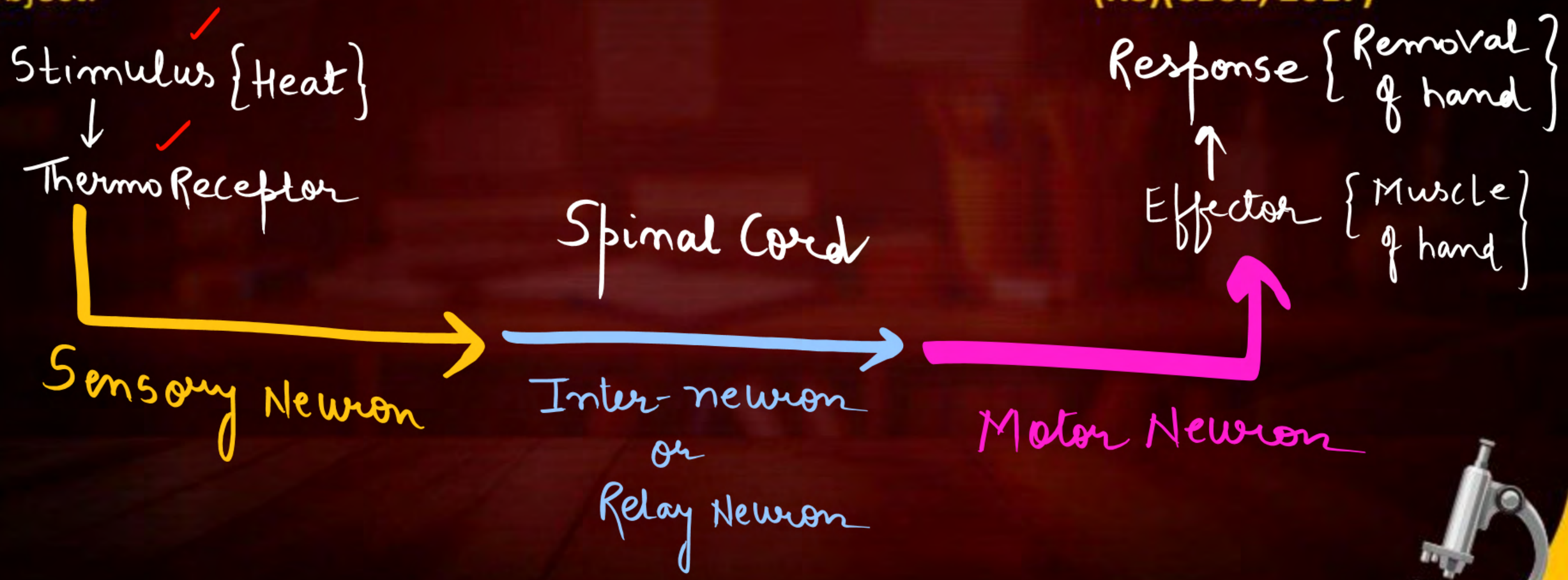
→ Path followed by nerve impulse during reflex action

→ Konsa Rasta follow kiya

Signal ne

QUESTION

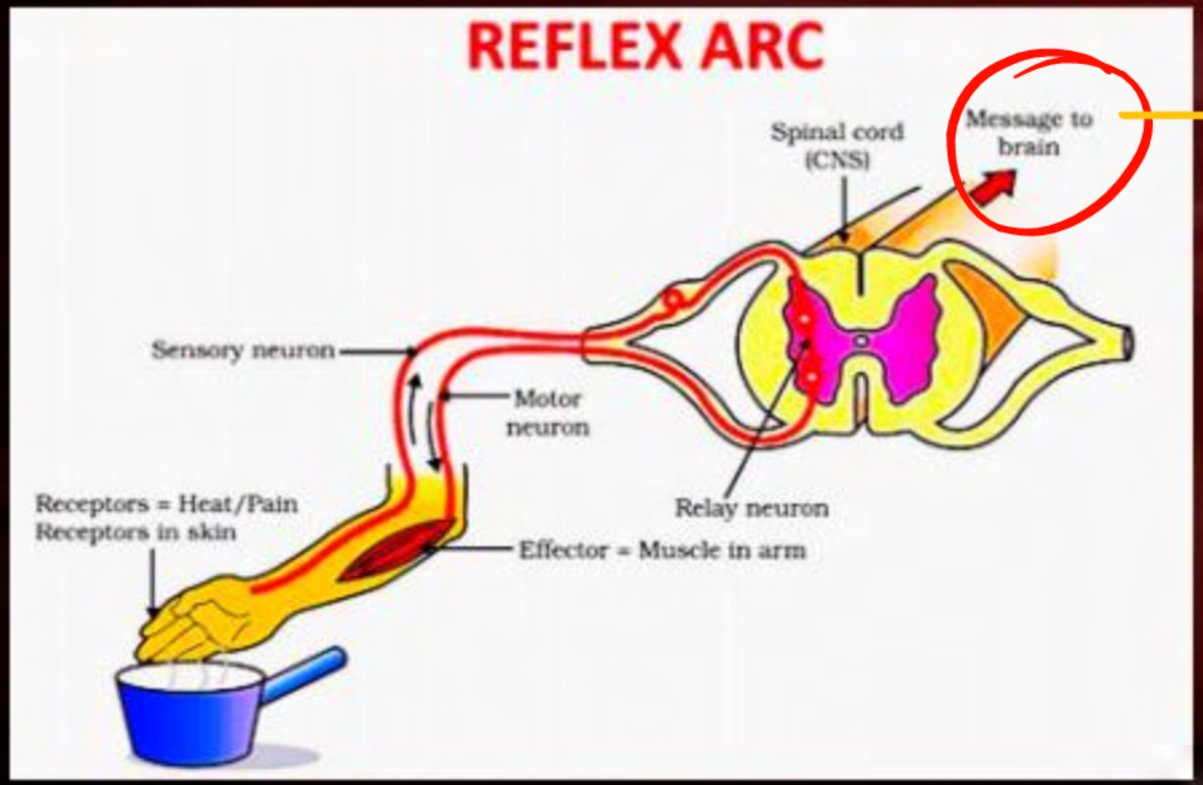
What is reflex arc? Draw a labelled diagram to show reflex are on touching a very hot object. **(Re)(CBSE, 2017)**



ANSWER

Signal

- Reflex arc is the path taken by nerve impulses in a reflex action, an unconscious response to a sudden stimulus.
- In the figure below as hands touch the hot pan, afferent (sensory) neurons transmit the information to the spinal cord where a relay neuron passes it to the efferent (motor) neuron which causes the muscle to contract and pull our hand.



Memory

QUESTION

Which of the following statements are true? **(Re) (NCERT Exemplar)**

(i) Sudden action in response to something in the environment is called reflex action.

(ii) ~~Sensory neurons~~ carry signals from the spinal cord to muscles.

(iii) ~~Motor neurons~~ carry signals from receptors to the spinal cord.

(iv) The path through which signals are transmitted from a receptor to a muscle or a gland is called a reflex arc.

A (i) and (ii)

B (i) and (iii)

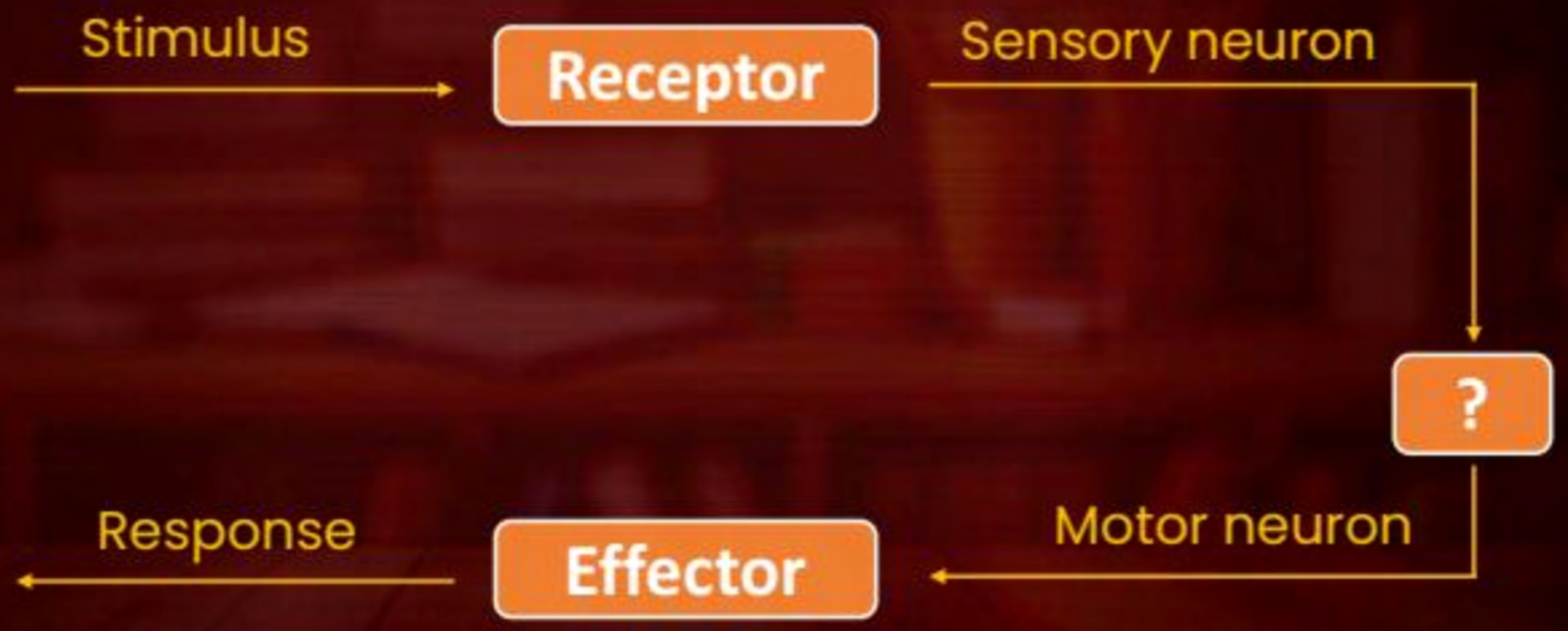
C (i) and (iv)

D (i), (ii) and (iii)

QUESTION

While walking, you accidentally stepped on a sharp stone. You quickly jumped away as a response.

Examine the diagram showing the series of actions taking place in the body and identify the missing term? **(An)**



(A) Spinal cord

(B) Brain

(C) Cranial nerve

(D) PNS

QUESTION

Assertion (A): Reflex action has a very fast response that takes place without thinking.
Reason (R): Reflex action is controlled by the spinal cord. **(Un)**

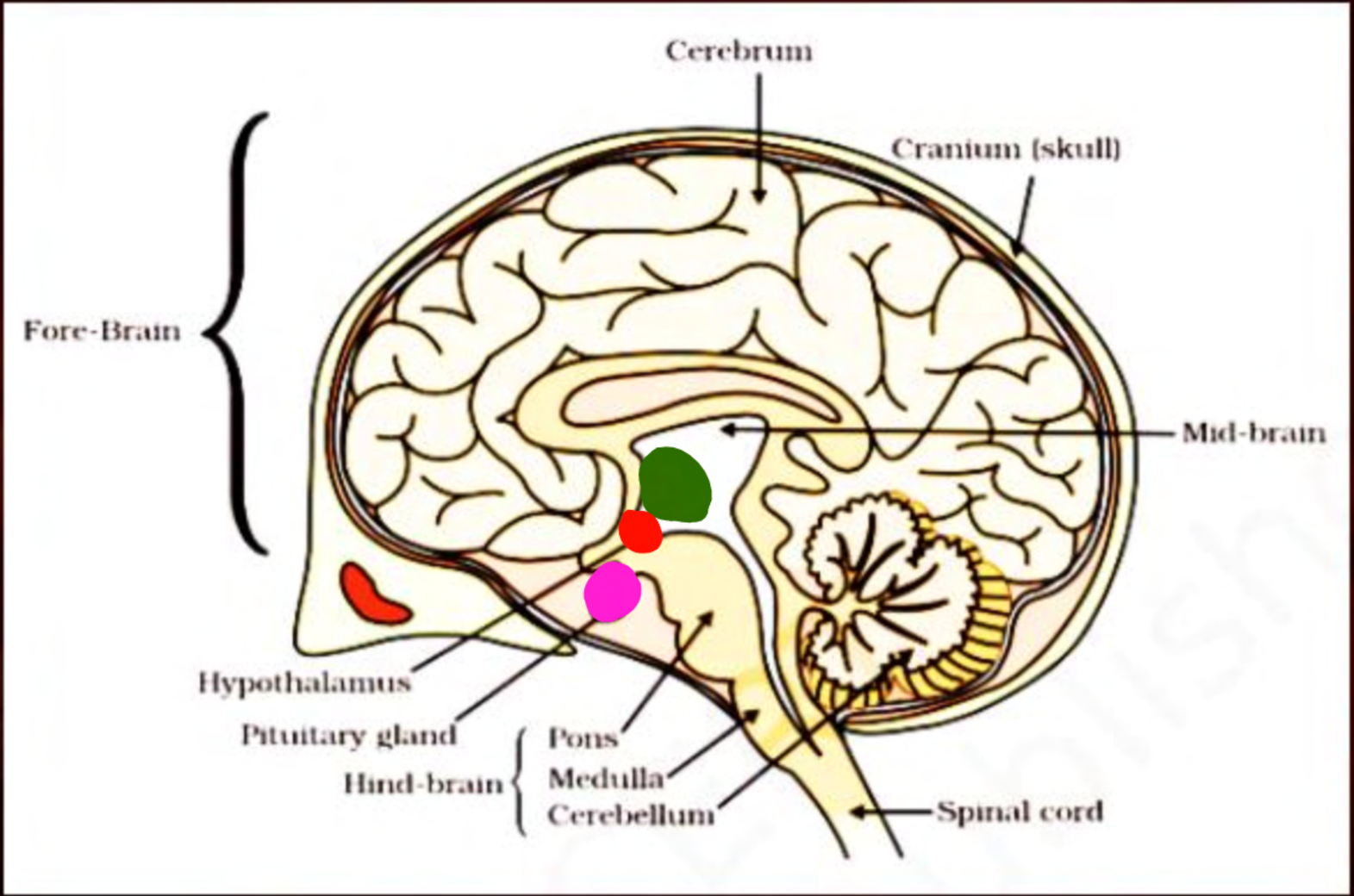
A. Both A and R are true, and R (6 is the correct explanation of A.

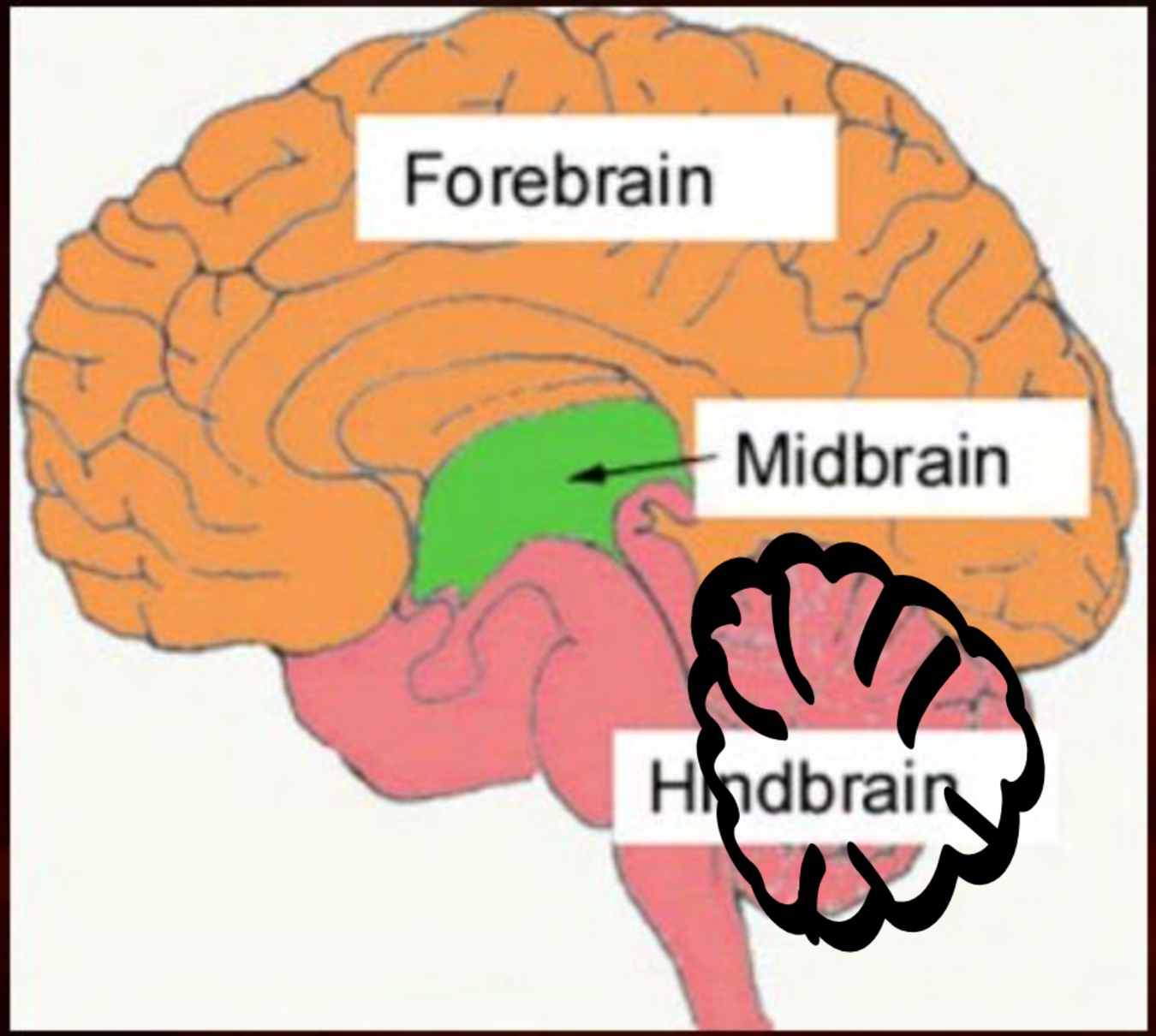
B. Both A and R are true, but R is not the correct explanation of A.

C. A is true, but R is false.

D. A is false, but R is true.

Human Brain


Cerebrum
Cranium (skull)
Fore-Brain
Mid-brain
Hypothalamus
Pituitary gland
Hind-brain
Pons
Medulla
Cerebellum
Spinal cord


Forebrain
Midbrain
Hindbrain

BRAIN

(i) Centre of coordination of all activities
(ii) Involved in thinking
(iii) Divided into three parts-

Voluntary action

(1) FORE BRAIN

Cerebrum :
(i) Main thinking and largest part of the brain.
(ii) It has Seat of mental abilities, controls thinking, memory, reasoning, perception, emotions, and speech.

Thalamus: It relays sensory information to the Cerebrum.
Hypothalamus: It controls sleep, hunger thirst etc. It forms the link between Nervous system & Endocrine system .

(2) MID BRAIN

- Connects Fore brain and Hind brain.
- Concerned with few involuntary actions

(3) HIND BRAIN

Connects the Fore brain & Hind brain
Cerebellum: Controls & coordinates muscular movements, maintaining body balance and posture.

Pons: concerned with regulation of breathing rate, sleep cycle.

Medulla oblongata: Controls involuntary actions like blood pressure. salivation, vomiting, etc.

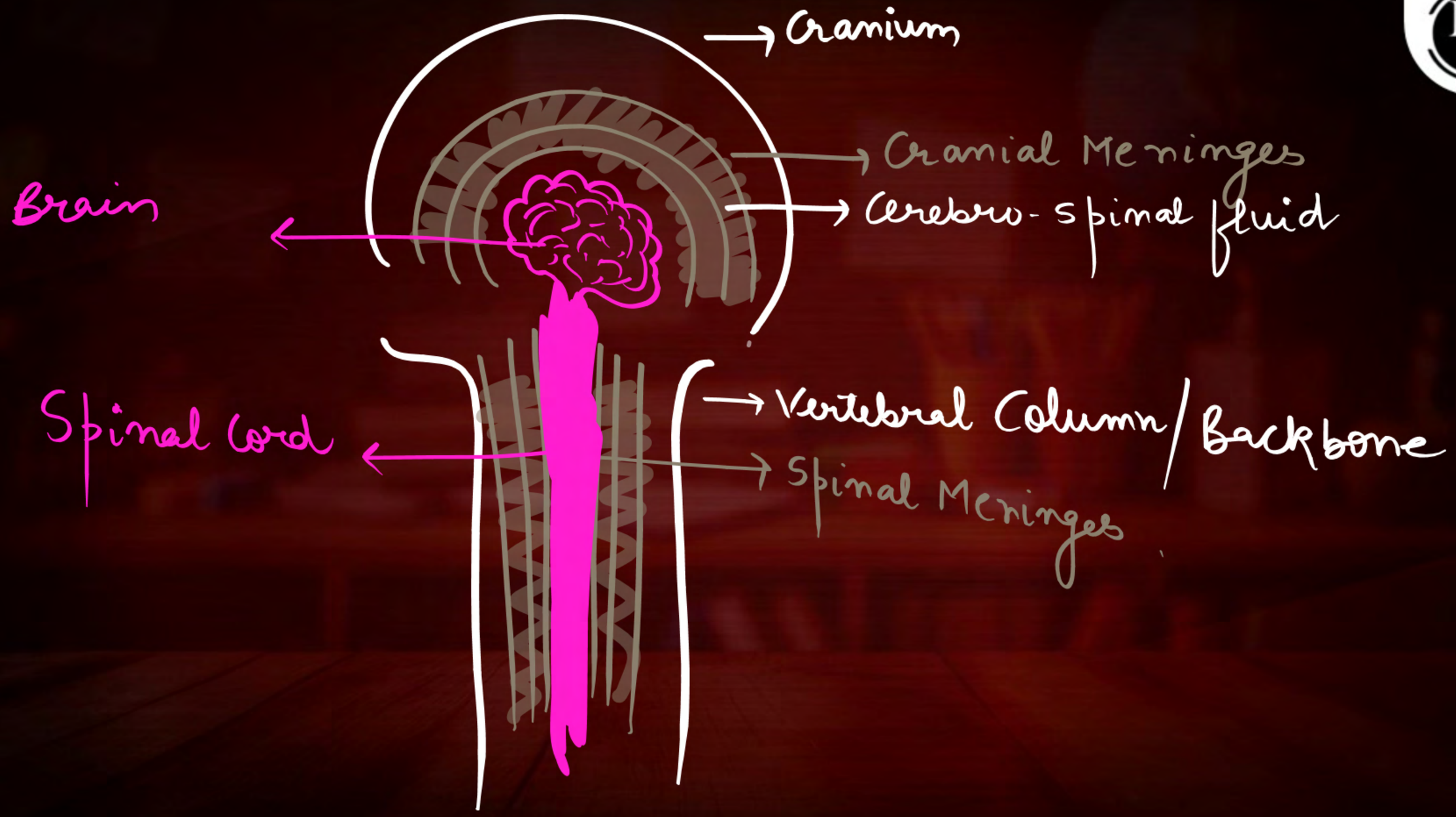
QUESTION

Reflex action

Voluntary action

(a) Sheila saw a snake and instantly jumped back. She then slowly moved away from the snake. What is the difference between these two actions?

(b) 'Brain and spinal cord are two vital organs of our body.' How is our body designed to protect them? **(An, Un)**

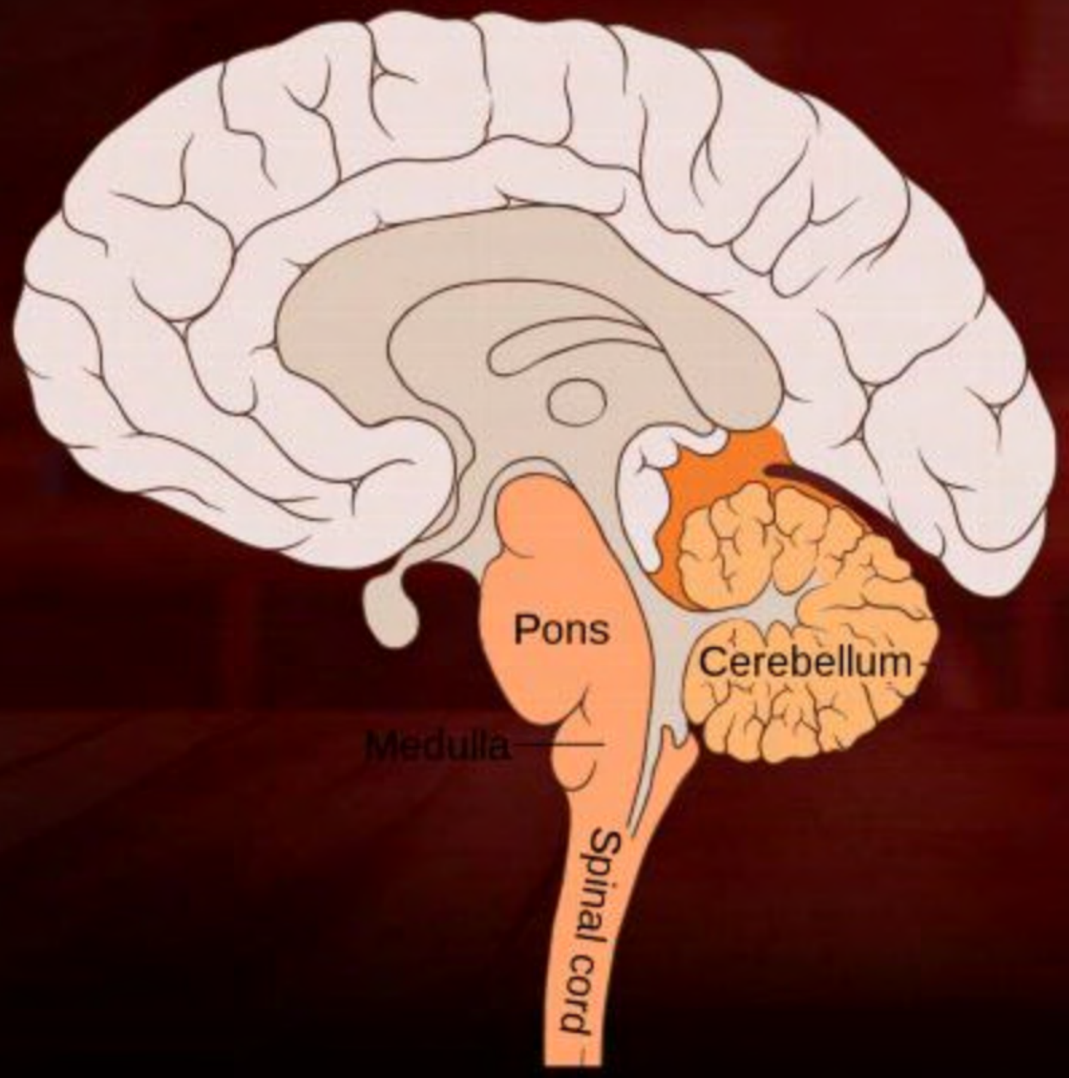

Cranium
Cranial Meninges
Cerebro-spinal fluid
Brain
Vertebral Column/Backbone
Spinal Cord
Spinal Meninges

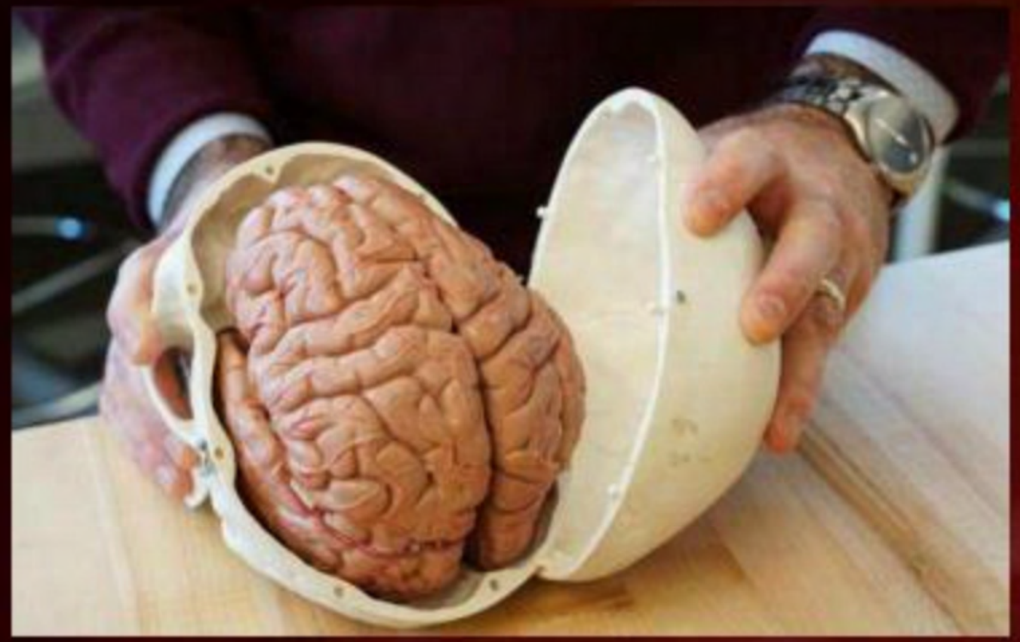
ANSWER

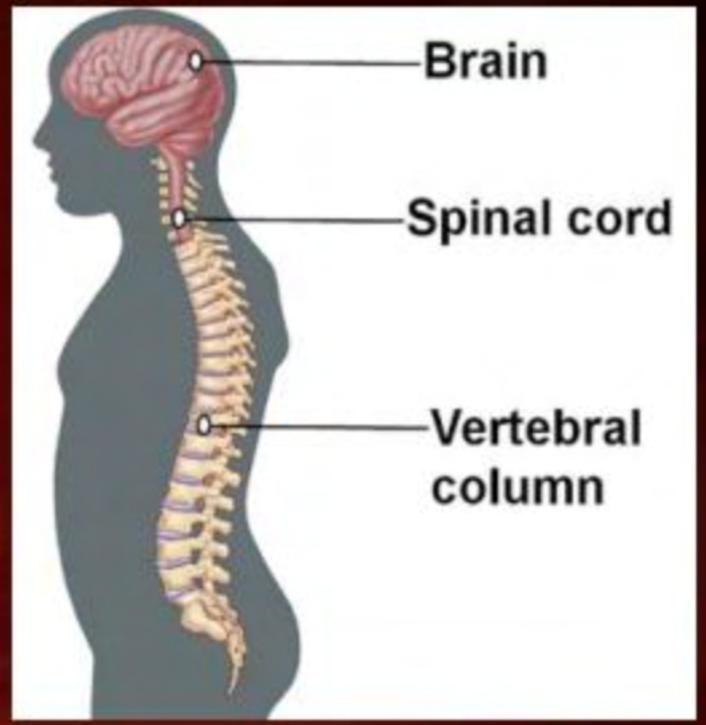
(a) Sheila's instant jump back is a reflex action, a quick, automatic response to a stimulus that does not involve conscious thought, primarily for protection and is mediated by the spinal cord. Whereas, slowly moving away involves voluntary action, which is a conscious, deliberate movement where she decides to avoid the snake, showing control and coordination of muscles after processing the situation.

(b) The brain is enclosed within a protective bony enclosure called the skull or cranium and is surrounded by a fluid- filled sac that shields it from shocks. The spinal cord is safeguarded by the vertebral column.

How are these Tissue Protected ?






Brain
Spinal cord
Vertebral column

Endocrine System : Animal Hormones

→ Endocrine gland → Hormone.

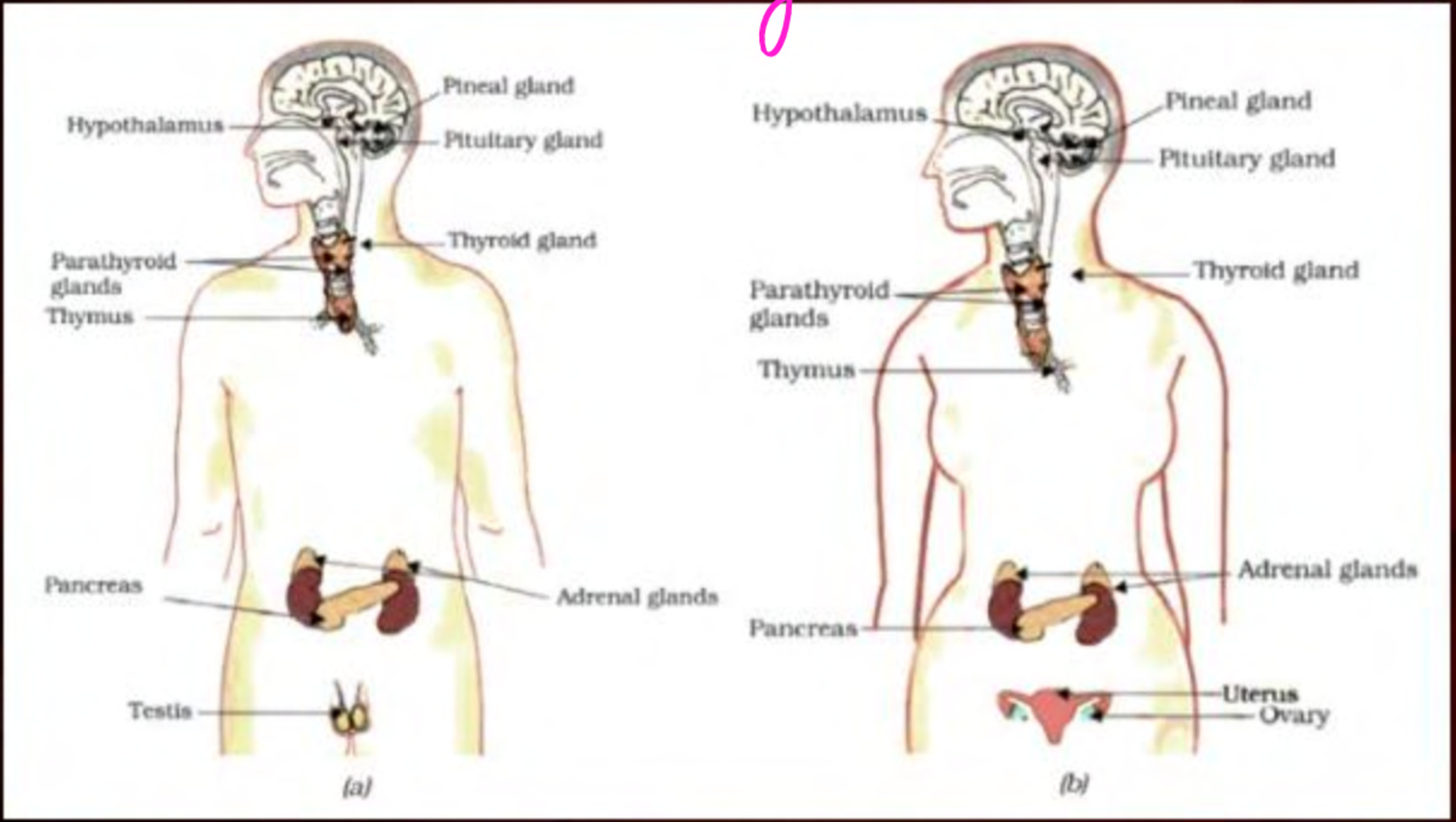


Fig. : Endocrine Glands in human beings (a) male, (b) female

Gland	Hormone	Function
Hypothalamus	Releasing hormones	Stimulates pituitary gland to release hormones
Pituitary gland	Growth hormone	Body growth, development of bones & muscles (if excess-Gigantism) (if less- Dwarfism)
Thyroid gland → Iodine	Thyroxine	Regulates carbohydrate, protein \ fat metabolism (if less iodine intake - Goitre)
Pancreas	Insulin → / Glucagon →	Control blood sugar levels (if less - diabetes is caused)
		Insulin → decreases blood sugar; Glucagon → Increases blood sugar; ↑ deficiency of Insulin
Adrenal gland	Adrenaline	Prepare body to cope with emergency situations.
Testes in males	Testosterone	Development of secondary male characters the deep voice, beard, and sex organs
Ovaries in females	Oestrogen and progesterone	Development of secondary female characters like mammary glands, menstrual cycle and sex organs. Maintenance of pregnancy

QUESTION

Why is the use of iodised salt advisable? Name the disease caused due to deficiency of iodine in our diet and state its one symptom. **(Re) (CBSE 2019, 2018)**

ANSWER

- Iodised salt is recommended due to the role of iodine in production of thyroxin hormone by thyroid gland .
- **Disease Caused by Iodine Deficiency:** Goitre:
- Abnormal growth of thyroid gland due to very high or little production of thyroid hormone.
- **Symptom:** Swollen neck due to the enlargement of the thyroid gland.

QUESTION

Which of the following part of human brain will help us to maintain posture while cycling ?

A. Cerebrum

B. Cerebellum

C. Medulla oblongata

D. Pons

QUESTION

Which of the following does not involve thinking ?

A. Peristaltic movement

B. Pumping of blood from heart

C. Withdrawing hand after touching hot surface

D. All of these

QUESTION

Which part of human brain control salivation ?

Involuntary action

A. Medulla

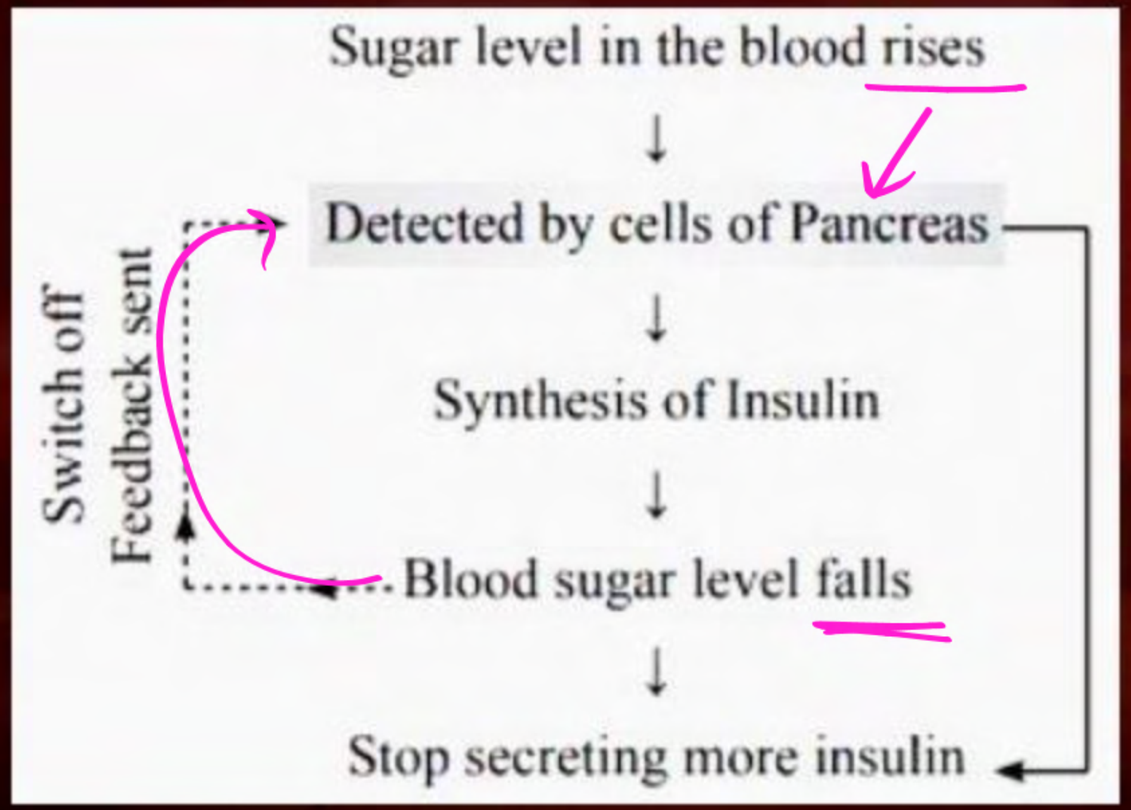
B. Cerebrum

C. Pons

D. Cerebellum

QUESTION

Explain with the help of an example, the feedback mechanism for the regulation of hormonal secretion in the human body. **(Re) (CBSE, 2020)**



ANSWER

The feedback mechanism of hormones is the mechanism through which the balance of hormone in the blood/body is maintained.

There can be two types of feedback:

Positive feedback: Stimulates the secretion or production of the hormone.

Negative feedback: Inhibits the secretion of the hormone.

Example: Blood glucose regulation

Positive Feedback: Consumption of carbohydrates leads to an increase in blood glucose levels. Which triggers the pancreas to release insulin.

Cellular uptake of glucose: Insulin signals boy cells to uptake glucose from the blood, reducing blood glucose levels.

Negative Feedback: As blood glucose levels drop, negative feedback mechanisms inhibit further insulin secretion, preventing hypoglycemia and maintaining blood glucose homeostasis.

QUESTION

Which gland is not present in pair ?

A. Testis

B. Ovaries

C. Thyroid gland

D. Salivary gland

QUESTION

A patient is being given an injection of insulin. Which of the organ is likely to be affected ?

(A) Ovaries

(B) Thyroid gland

(C) Hypothalamus

(D) Pancreas

QUESTION

#H.W

Dwarfism results due to

↳ dwarf

(A) Excess secretion of thyroxin

(B) Less secretion of growth hormone

(C) Less secretion of adrenaline

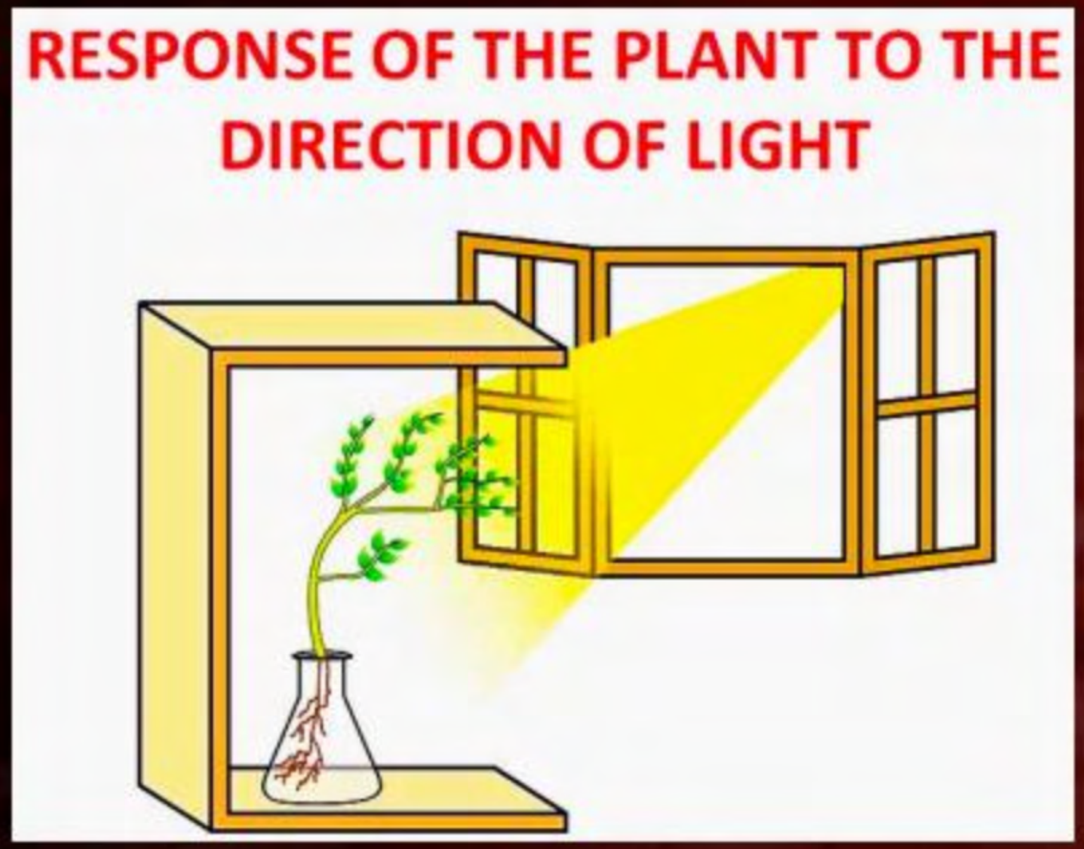
(D) Excess secretion of growth hormone

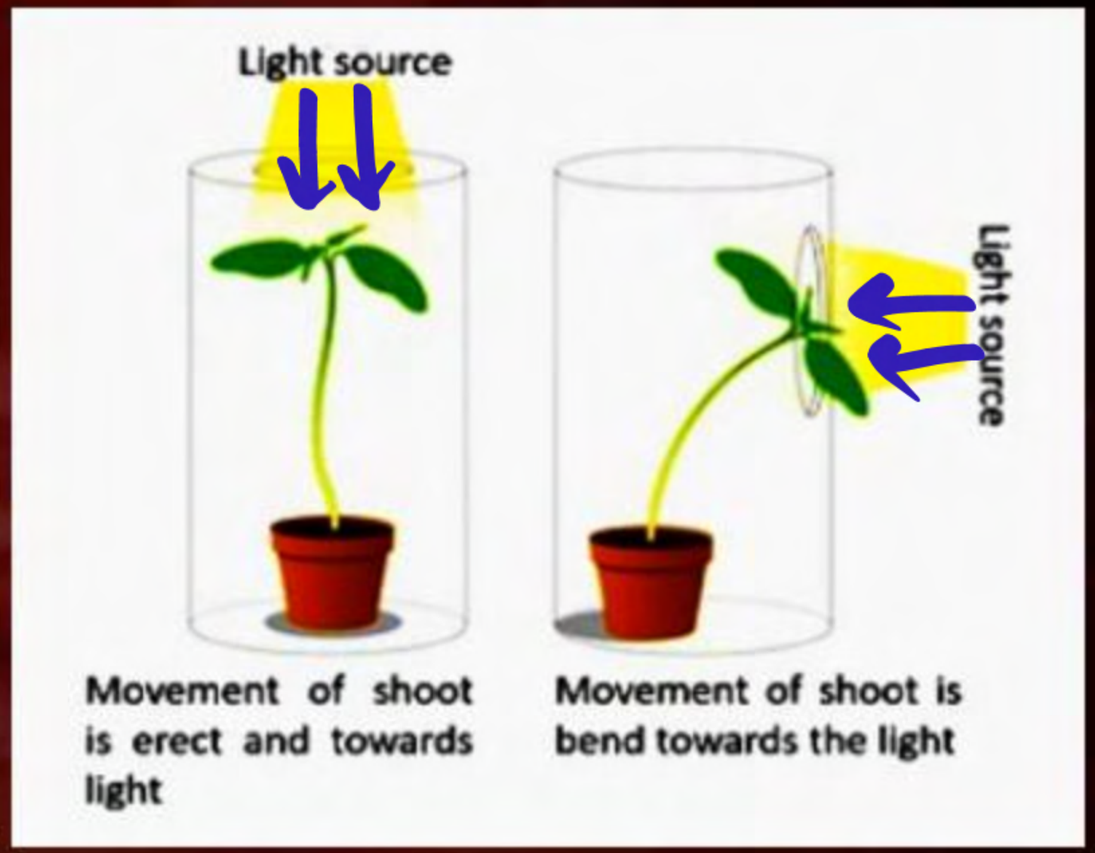
Coordination in Plants

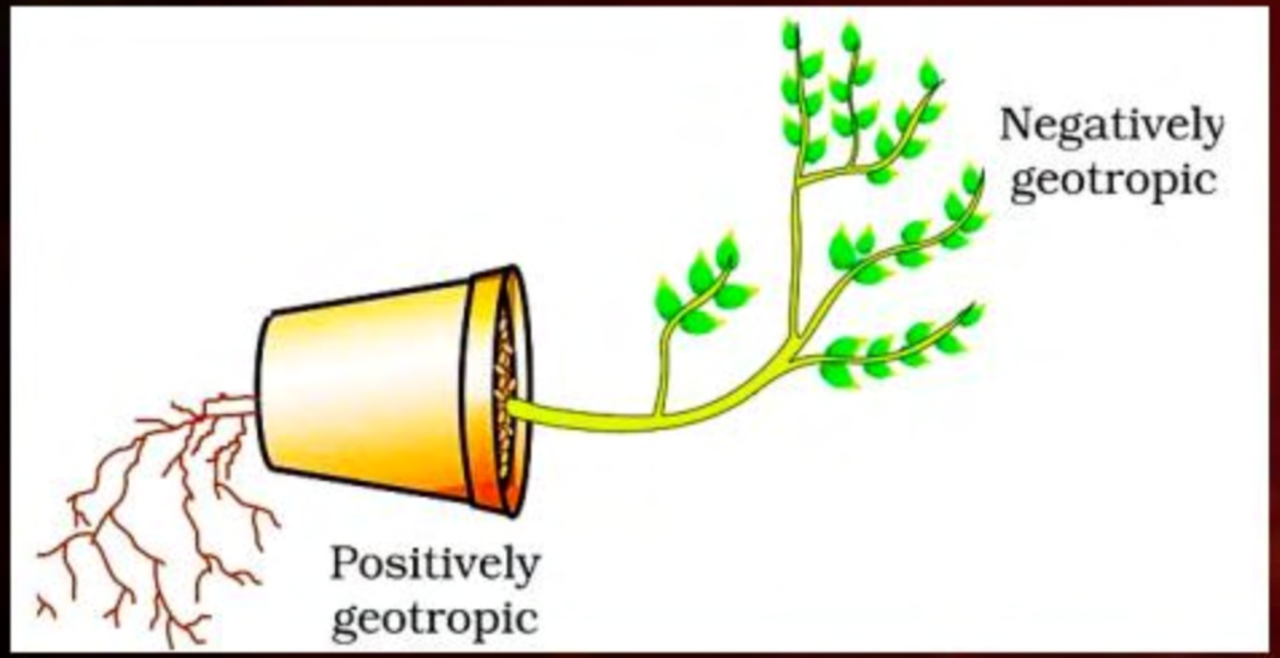
Sense → Response

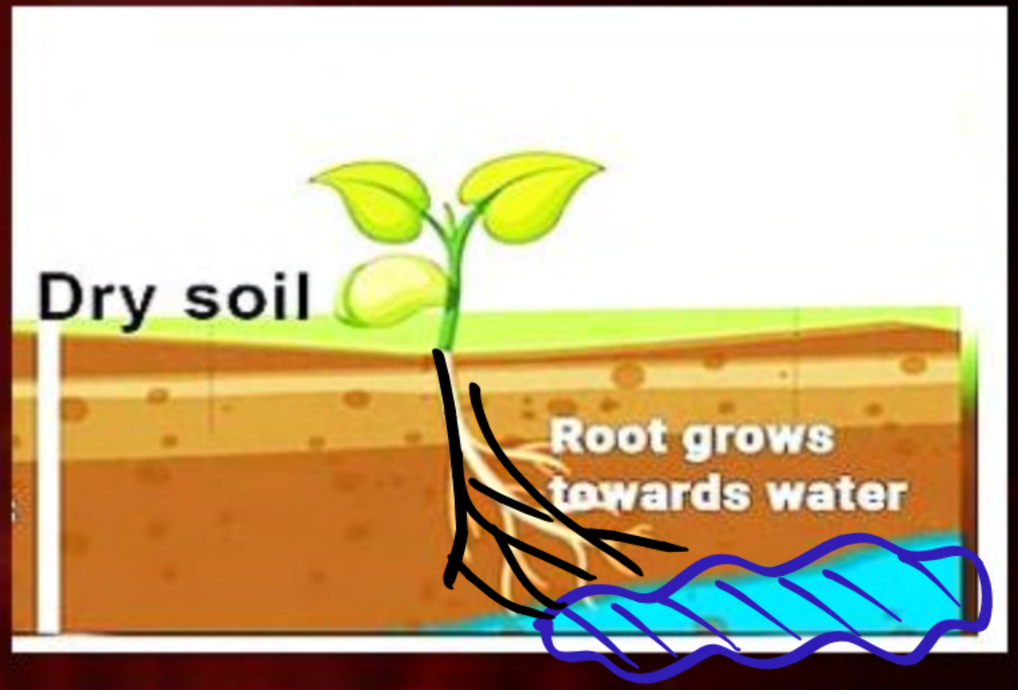
All leaves fold up even though it is touched only at the tip. How is this possible?

Stimulus → Response.









Positive Hydrotropism

Coordination in Plants

Nastic Movements

Tropic Movements

Response in Plants

- Closing of Leaves of Touch-me –Not Plant → Not related to growth
- Root and shoot growing downward and upward respectively → Related to growth

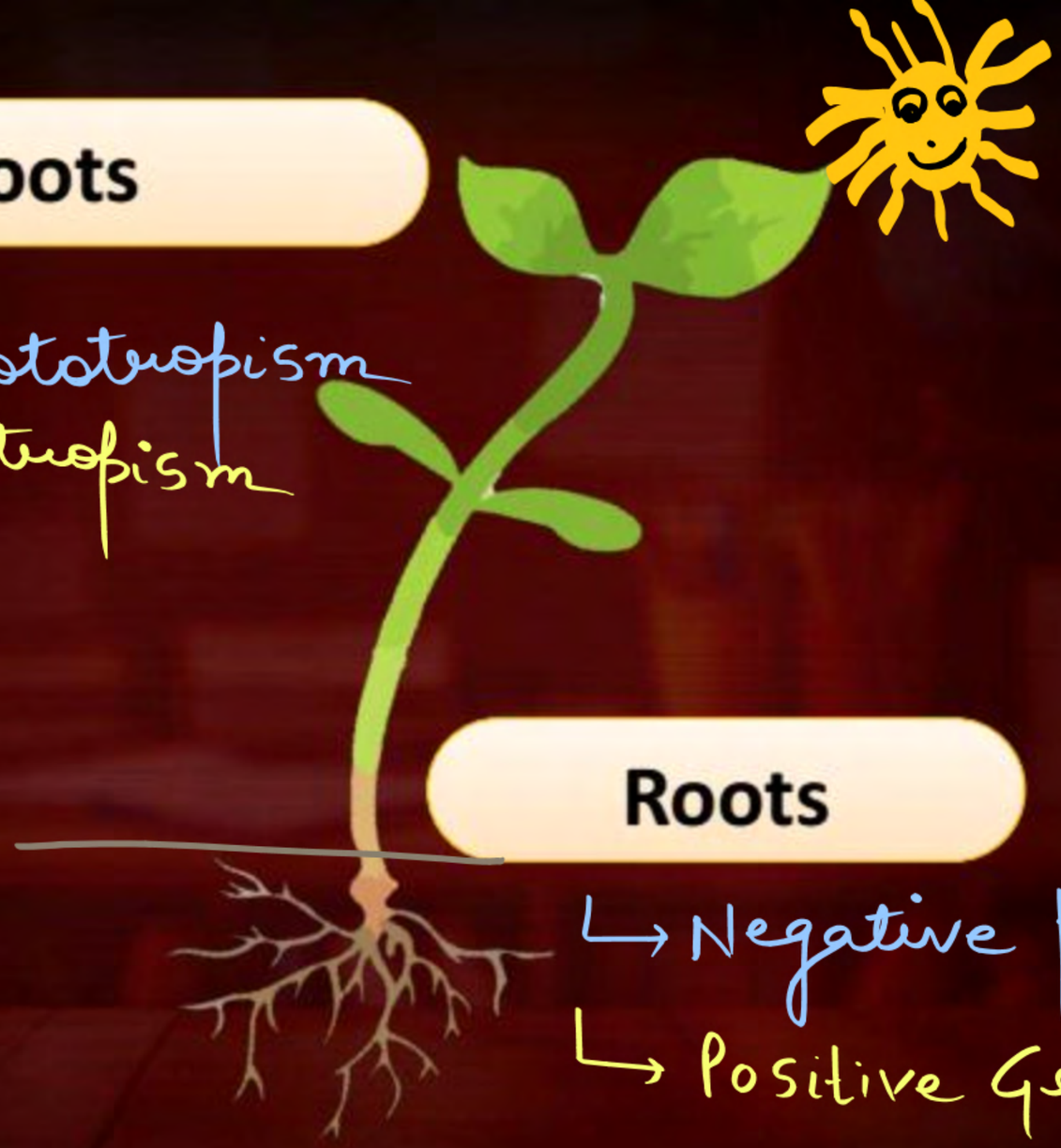
Coordination in Plants

Tropic movements	Nastic movements
• Growth dependent movements	• Growth independent movements
• Directional movements with respect to stimulus	• Non directional movements
• More or less permanent and irreversible	• Temporary and reversible
• Found in all plants	• Found only in a few specialized plants
• Slow action	• Immediate action

Shoots

↳ Positive Phototropism

↳ Negative geotropism



Roots

↳ Negative phototropism

↳ Positive Geotropism

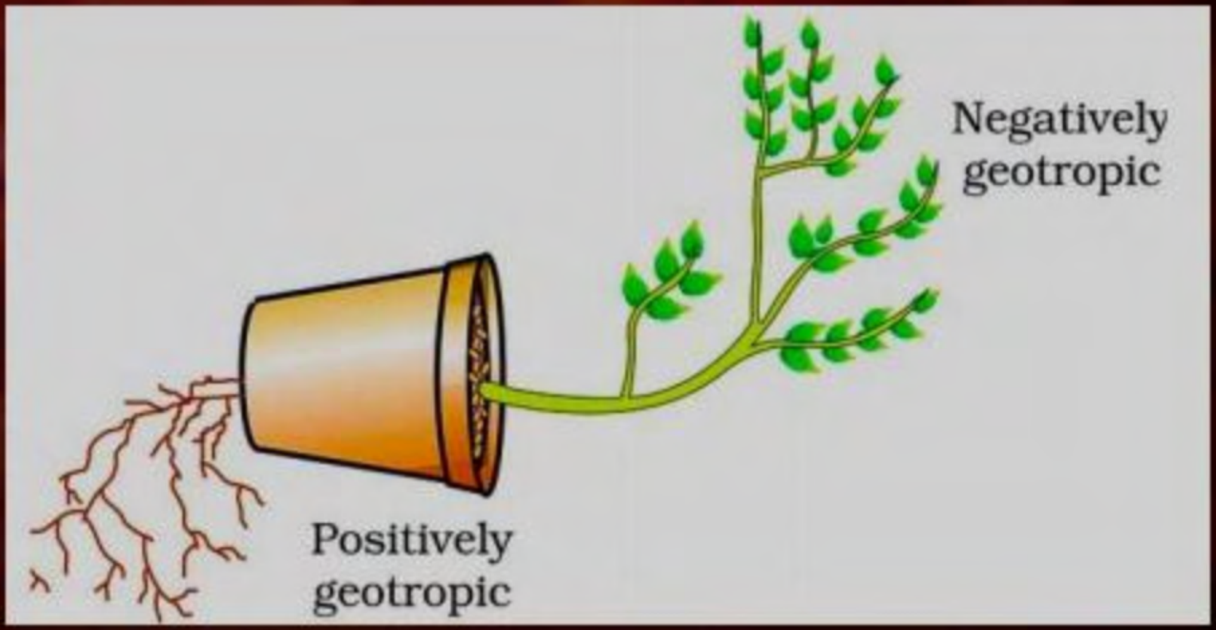
Heleiotropism

Sunflower

QUESTION

Define geotropism. Draw a labelled diagram of a plant showing geotropic movements of its parts.

- Geotropism is the growth of plant parts towards or away from gravity.
- Stem is negatively geotropic, it grows away from gravity whereas roots are positively geotropic. It grows towards gravity. **(Cr) (CBSE, 2020)** (PYQ)



QUESTION

Tip of Shoot

Where are auxins synthesized in a plant? Which organ of the plant shows:

(Re) (CBSE, 2023)

(PYQ)

(i) Positive phototropism

(ii) Negative geotropism

(iii) Positive hydrotropism

ANSWER

Auxins are synthesized at the tip of the plant shoot.

	Phenomenon	Part of the Plant
(i)	Positive phototropism	Stem
(ii)	Negative geotropism	Stem
(iii)	Positive hydrotropism	Root

Tropic Movements / Tropism

• Phototropism	• Growth of plant part towards or away from Light
• Geotropism / Gravitotropism	• Growth of plant part towards or away from Gravity
• Hydrotropism	• Growth of plant part towards or away from water
• Chemotropism	• Growth of plant part towards or away from chemicals
• Thigmotropism	• Growth of plant part towards or away from touch

QUESTION

(T)

Select from the following the correct statement about tropic movement in plants:

(Re) (CBSE, 2023)

(PYQ)

A. It is due to stimulus of touch and temperature only

B. It does not depend upon the direction of stimulus received.

C. It is observed only in roots and not in stems.

D. It is a growth related movement.

QUESTION

Closing of leaves of a sensitive plant is an example of

A. Hydrotropism

B. Phototropism

C. Nastic movement

D. Chemotropism

QUESTION

Direction: The following questions consist of two statements Assertion (A) and Reason (R). **Assertion (A):** Phototropism is the plant movement towards light.
Reason (R): Root shows positive phototropism.
Answer these questions by selecting the appropriate option given below: **(Re)**

A. Both A and R are true, and R (6 is the correct explanation of A.

B. Both A and R are true, but R is not the correct explanation of A.

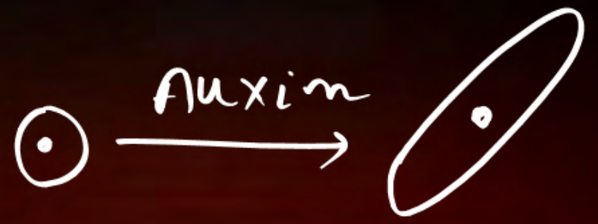
C. A is true, but R is false.

D. A is false, but R is true.

Plant Hormones

- Plant Hormones (Plant Growth Regulators)
  - Plant Growth promoters
    - Auxins
    - Gibberellins
    - Cytokinin's
  - Plant Growth Inhibitors
    - Abscisic Acid [ABA]
    - Ethylene

Plant Hormones



Plant Hormone	Function
• Auxin	• Promotes cell elongation in shoots • Controls phototropism / gravitotropism • Stimulates fruit development
• Gibberellins (GA)	• Stimulates stem elongation • Helps in seed germination, • Fruit and flower development
• Cytokinin	• Promote cell division • Delays ageing of leaves flower
• Abscisic Acid [ABA] ↳ Stress hormone	• Causes stomata to close • Maintains dormancy in seeds [Growth Stop] • Wilting of leaves
• Ethylene gaseous hormone	• Stimulates ripening in fruits • Promotes fruit and leaf drop

QUESTION

In plants the role of cytokinin is: (Re) (CBSE, 2023)

PYQ

A. Promote cell division.

B. Wilting of leaves.

C. Promote the opening of stomatal pore.

D. Help in the growth of stem.

QUESTION

The main function of abscisic acid in plants is to (Re) (NCERT Exemplar)

A. Increase the length of cells.

B. Promote cell division.

C. Inhibit growth.

D. Promote growth of stem.

QUESTION

Auxin

Which of the following plant hormone is involved in phototropism and fruit ripening respectively?

Ethylene.

(A) Ethylene, gibberellin

(B) Auxin, gibberellin

(C) Auxin, ethylene

(D) Cytokinin, ABA

QUESTION

B.Q

A big tree falls in a forest, but its roots are still in contact with the soil. The branches of this fallen tree grow straight up (vertically). This happens in response to: **(Un)**

(A) Water

(B) Minerals

(C) Gravity

(D) Light

QUESTION

Why is chemical communication better than electrical impulses as a means of communication between cells in a multicellular organism? **(Un) (CBSE, 2020)**

ANSWER

Chemical communication is a better means of communication than electrical impulses because:

1. **It is mediated through hormones:** Hormones can diffuse to different regions of the body, thereby allowing cells to communicate even without interacting with each other and can be maintained at a steady rate and easily regulated.

2. It doesn't require specialized tissue like nervous tissue used in electrical impulses.

3. **Provide widespread communication:** Unlike electrical impulses, which are region-specific and limited to specific areas connected by nerves, chemical communication occurs throughout the body.

QUESTION

Why are farmers often advised to apply gibberellin to their sugarcane crops?

Stem elongation

ANSWER

Gibberellin promotes stem elongation. By applying it to the crop, farmers can achieve longer sugarcane stems, directly leading to an increase in crop production by several tonnes per acre.

QUESTION

(a) Plants do not have any nervous system but yet, if we touch a sensitive plant, some observable changes take place in its leaves.
Explain how could this plant respond to the external stimuli and how it is communicated. → Electrical-Chemical Signal pathway

(b) Name the hormone that needs to be administered to
(i) increase the height of a dwarf plant. → GA
(ii) cause rapid cell division in fruits and seeds. → Cytokinin **(Ap) (CBSE, 2019)**

ANSWER

(a) When we touch the compound leaf of the sensitive plant, (Mimosa pudica) it collapses and its leaflets fold together.

This response occurs due to:

The change in amount of water in the cell at the region of contact.

The external stimulus of touch is communicated by the changes in concentration of ions.

(b) (i) Gibberellin

(ii) Cytokinin

QUESTION

Why is chemical communication better than electrical impulses as a means of communication between cells in a multi-cellular organism? **(Un) (CBSE, 2020)**

ANSWER

Chemical communication is better than electrical impulses as a means of communication between cells in a multicellular organism because:

Not region specific: Chemical signals can reach multiple cells throughout the body, eliminating the need for specialized nervous tissue.

Effects last longer: Hormones work over extended periods, offering continuous coordination over short term electric impulses.

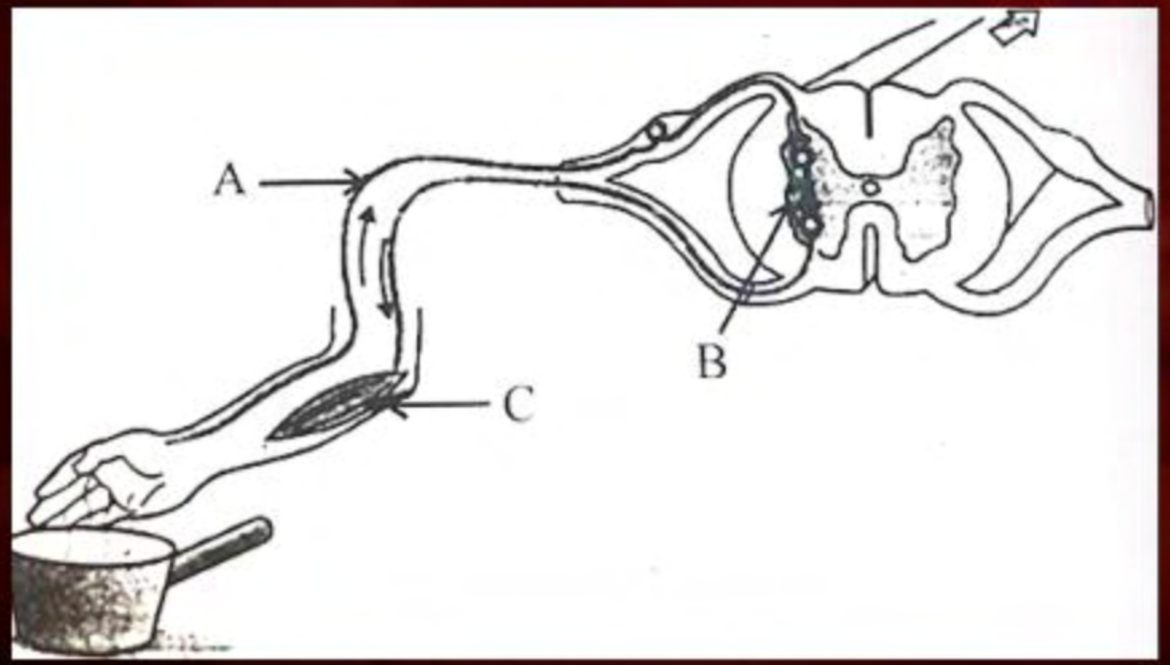
QUESTION

In the given diagram

(i) Name the parts labelled A, B, and C.

(ii) Write the functions of A and C.

(iii) Reflex arcs have evolved in animals? Why?



ANSWER

(i) The parts labelled in the diagram are:

A: Sensory Neuron

B: Relay Neuron

C: Effector/Muscle in Arm

(ii) **Functions:**

A (Sensory Neuron): It detects the initial stimulus and carries the signal to the spinal cord/CNS.

C (Effector/Muscle in Arm): It performs the required action in response to the signal, like moving the hand away from a painful stimulus.

(iii) Reflex arcs have evolved in animals to enable quick and involuntary responses to certain stimuli, ensuring immediate action without the delay of conscious thought, which can be crucial for survival.

QUESTION

Case Based:

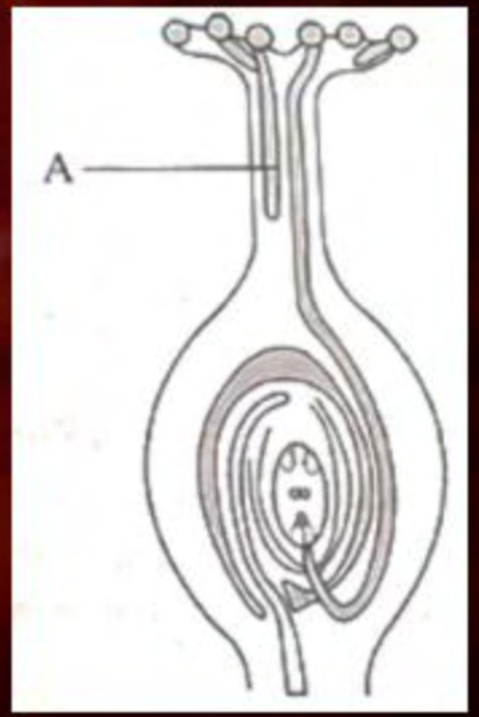
The diagram given below represents a plant movement. Answer the following questions. **(An) (CBSE, 2020)**

(i) Name the tropic movement shown in the diagram.

(ii) Label the part marked 'A'.

(iii) What is part A attracted to?

(iv) Give an example of a plant which shows thigmotropism.



ANSWER

(i) Chemotropism

(ii) A is pollen tube

(iii) A is attracted towards chemical secreted by the embryo sac.

(iv) Pea plant's tendrils show thigmotropism.

Face it ! Fix it ! Make a difference !

THANK
YOU