

Final Review

Biology 12

1. What is a function of ribosomes?

- A. to carry lipids to the cell membrane
- B. to break down macromolecules taken into the cell
- C. to produce proteins for use within the cell membrane
- D. to produce nucleic acids at the endoplasmic reticulum

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Ribosomes

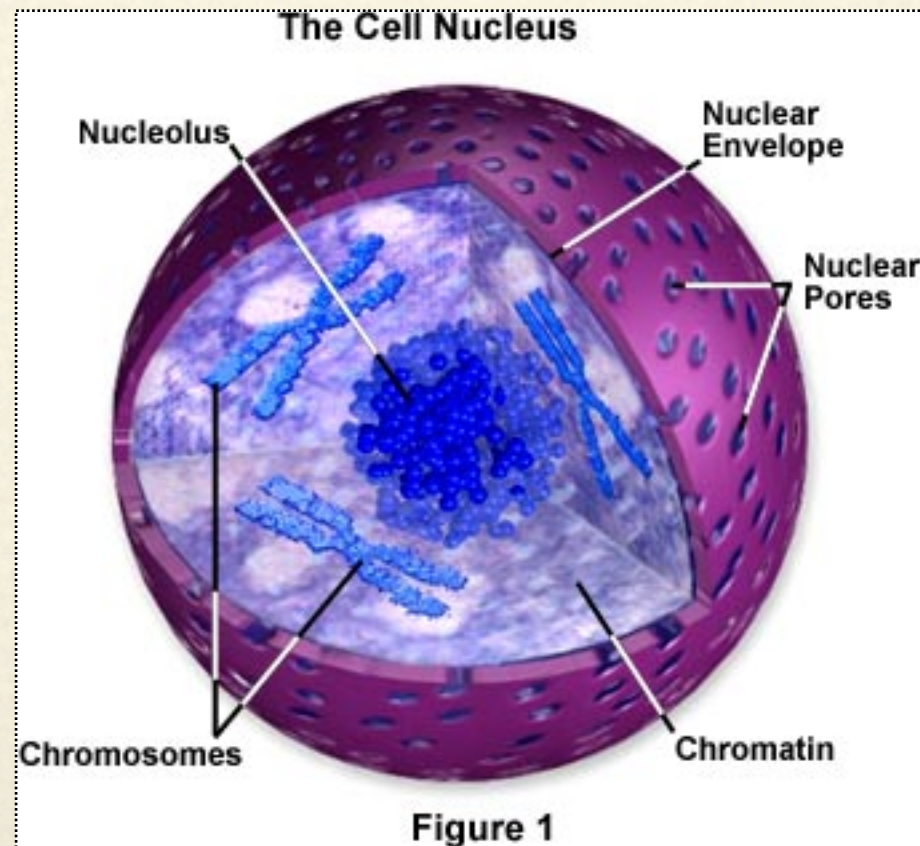
Function

- ❖ Used in the part of protein synthesis called translation
- ❖ Proteins produced by ribosomes on rough ER are transferred to the golgi and packaged into **vesicles** which transport them throughout the cell or to the cell membrane where they are exported to the outside of the cell
- ❖ Groups of ribosomes are called **polyribosomes**
- ❖ Polyribosomes produce multiple copies of the same protein

The Nucleus

Structure

- ❖ The nucleus is surrounded by the **nuclear envelope**, which consists of **nuclear membranes**.
- ❖ The membranes of the nuclear envelope have **pores** which allow particles to move through them.

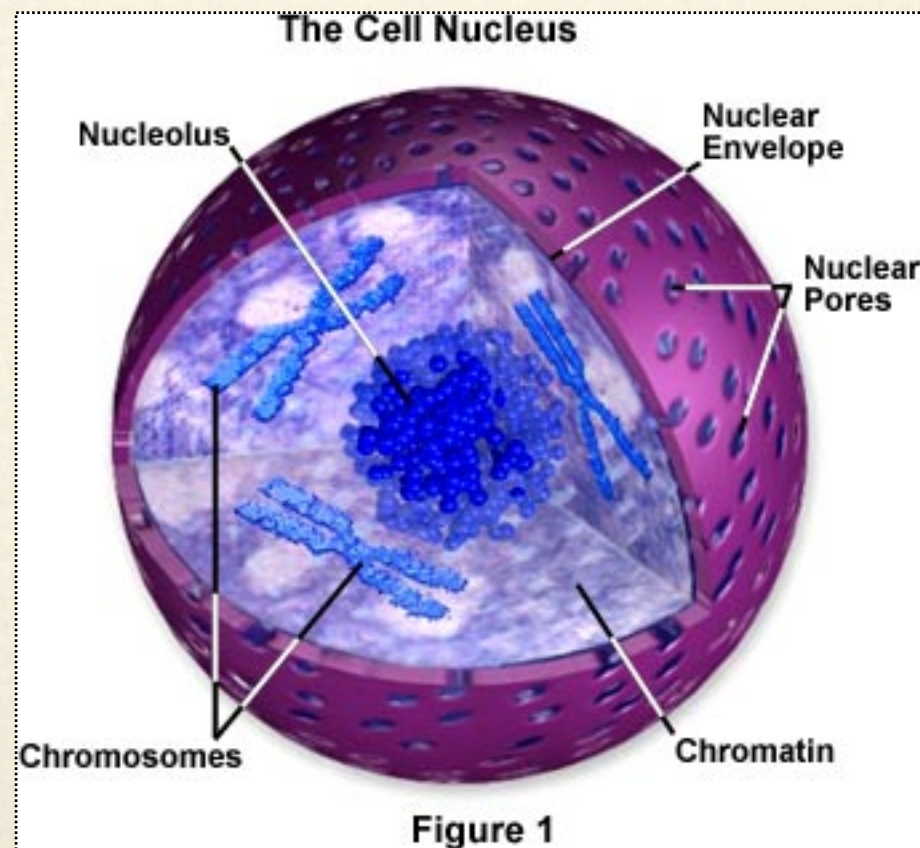


Look at all
that red!

The Nucleus

Structure

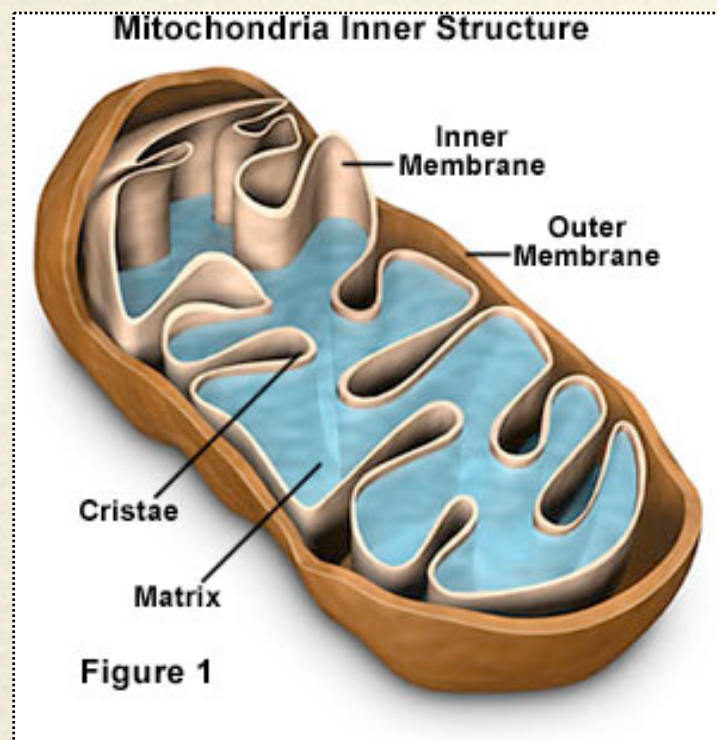
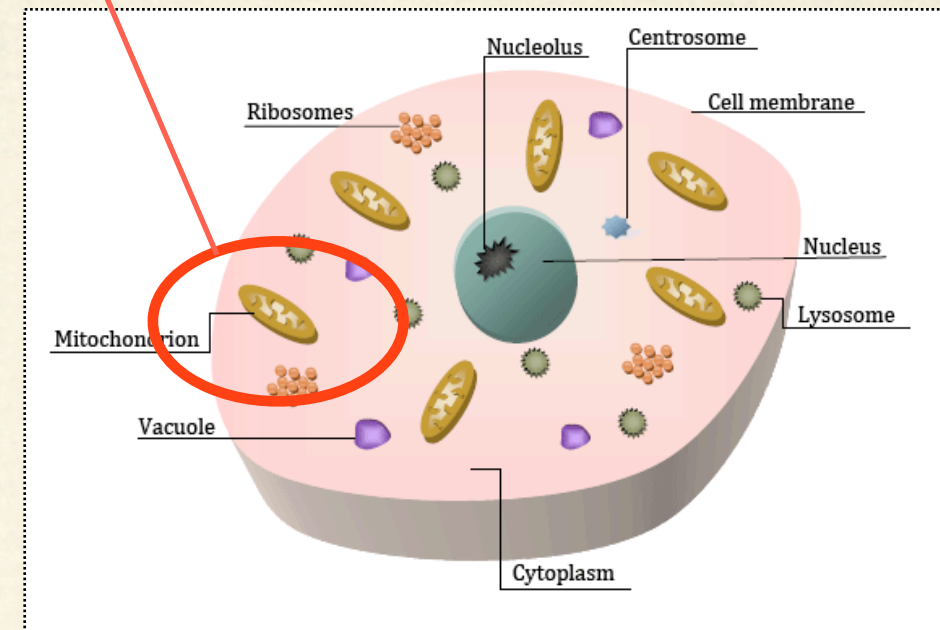
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Mitochondria

Structure

- ❖ Bean shaped organelles surrounded by an inner and outer membrane



- ❖ The inner fluid is called the **matrix**
- ❖ The inner membrane is highly folded to produce projections called **cristae**

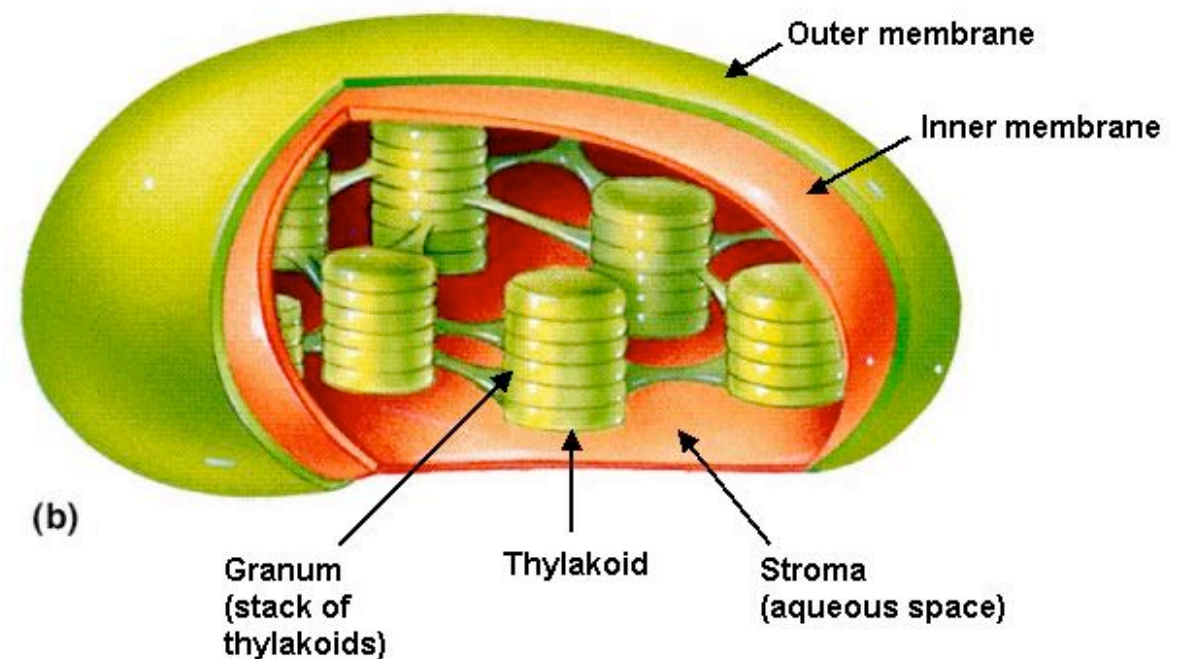
Chloroplasts

Structure

- ❖ Chloroplasts are organelles found in plant cells
- ❖ They have an inner and an outer membrane
- ❖ Between the membranes is the **intermembrane space**
- ❖ The fluid filled space within the inner membrane is called the **stroma**

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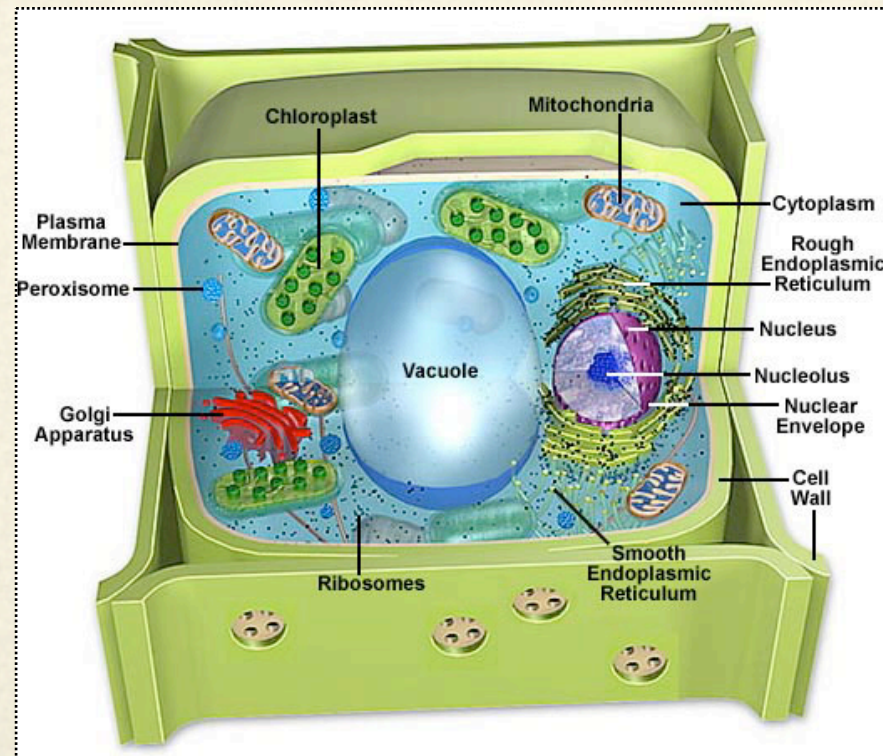
Three-dimensional Model of Chloroplast Membranes



Vacuoles and Vesicles

Structure

- ❖ Vacuoles and vesicles are both membrane bound sac-like structures that are used for storage
- ❖ Vesicles are smaller than vacuoles





Lysosomes

Structure

- ❖ Lysosomes are membrane bound vesicles produced by the golgi apparatus
- ❖ They contain **hydrolytic digestive enzymes**

Function

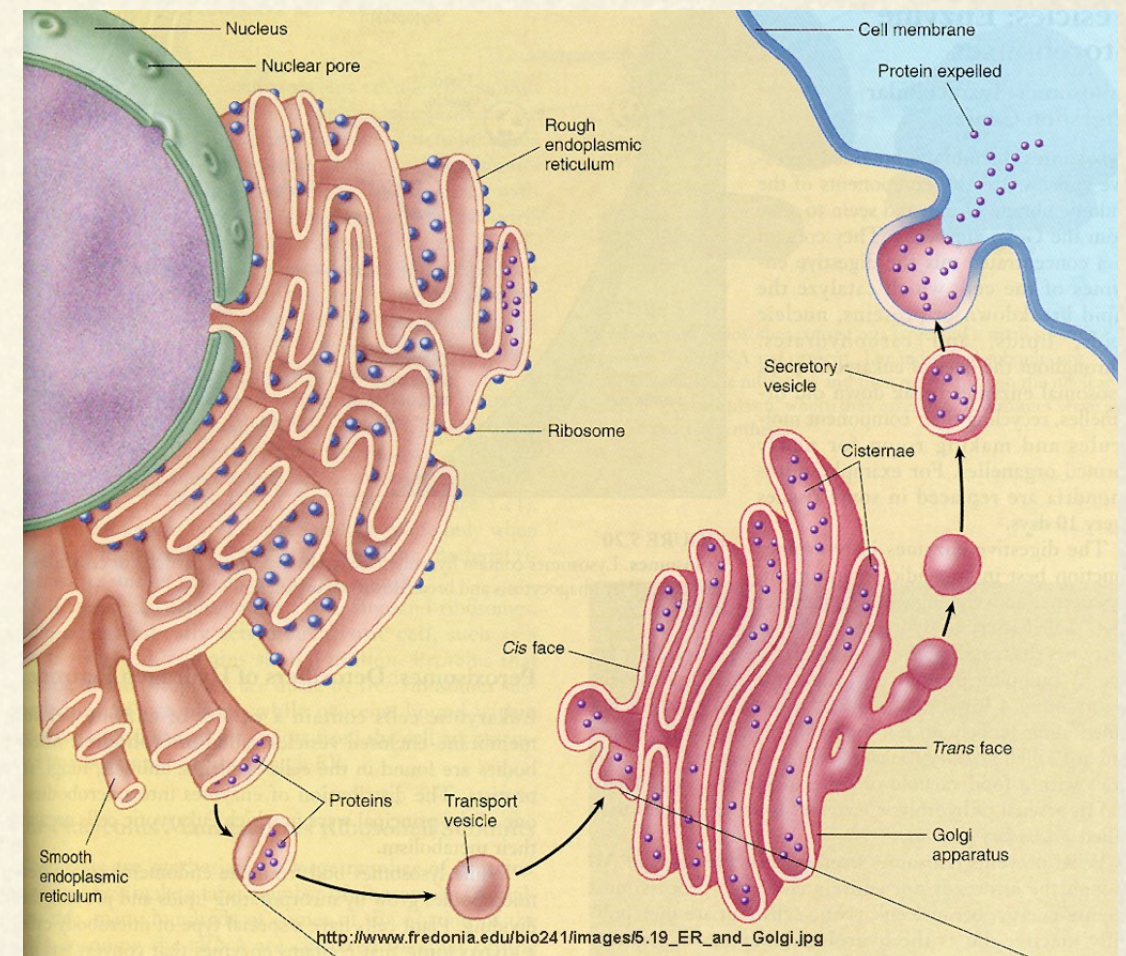
When vesicles bring macromolecules or pathogens into a cell, a lysosome will fuse with the vesicle and digest its contents

Lysosomes can also digest the cell's own contents, this is called **autodigestion** and is needed for normal cell rejuvenation

Endoplasmic Reticulum (ER)

Structure

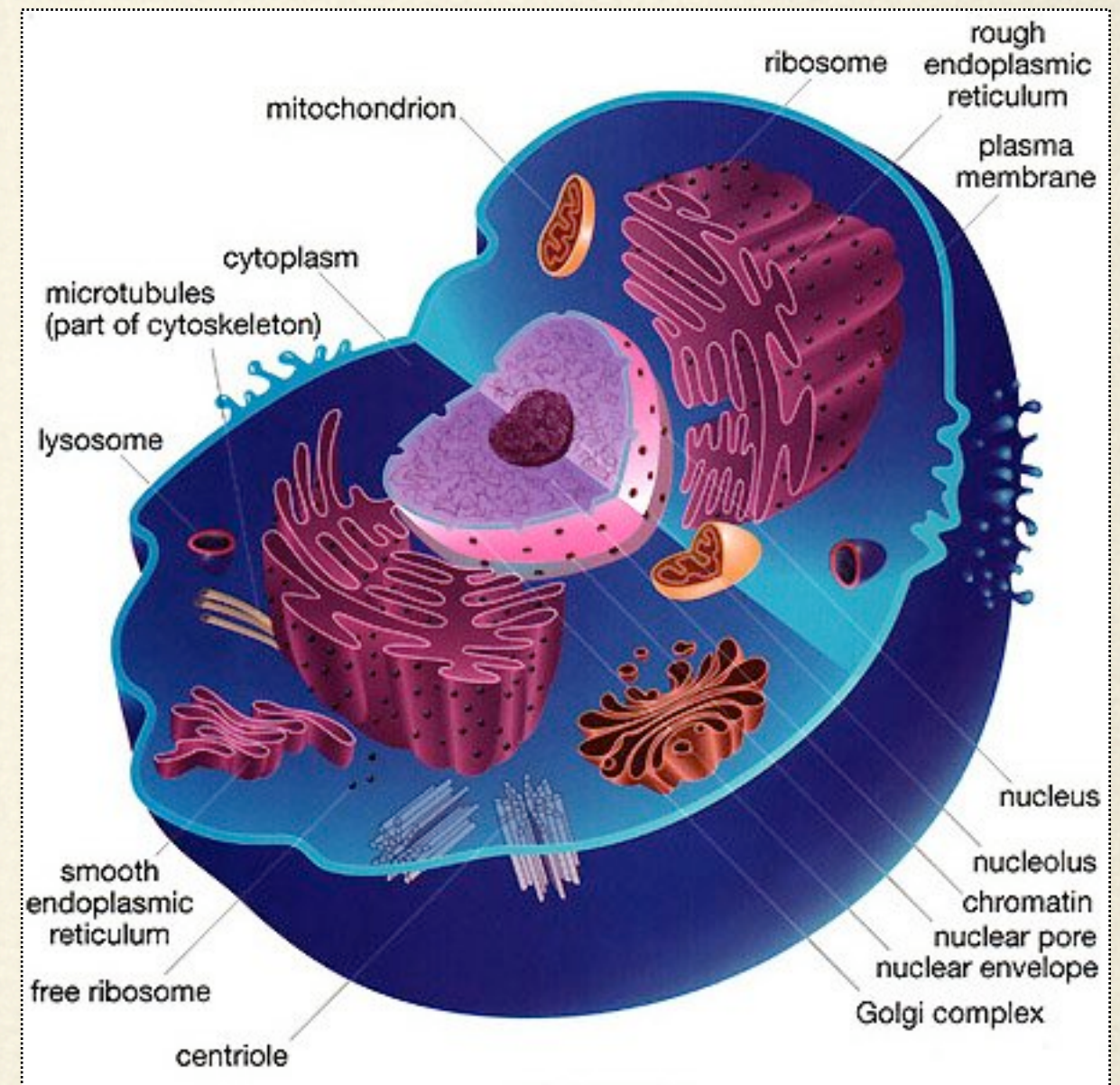
- ❖ The ER is a system of membranous channels and **sacculles** (flattened vesicles)
- ❖ It extends from the outer membrane of the nuclear membrane into the cytoplasm
- ❖ **Rough ER**-has ribosomes on its surface
- ❖ **Smooth ER**-does not have ribosomes the smooth and the



Golgi Apparatus

Structure

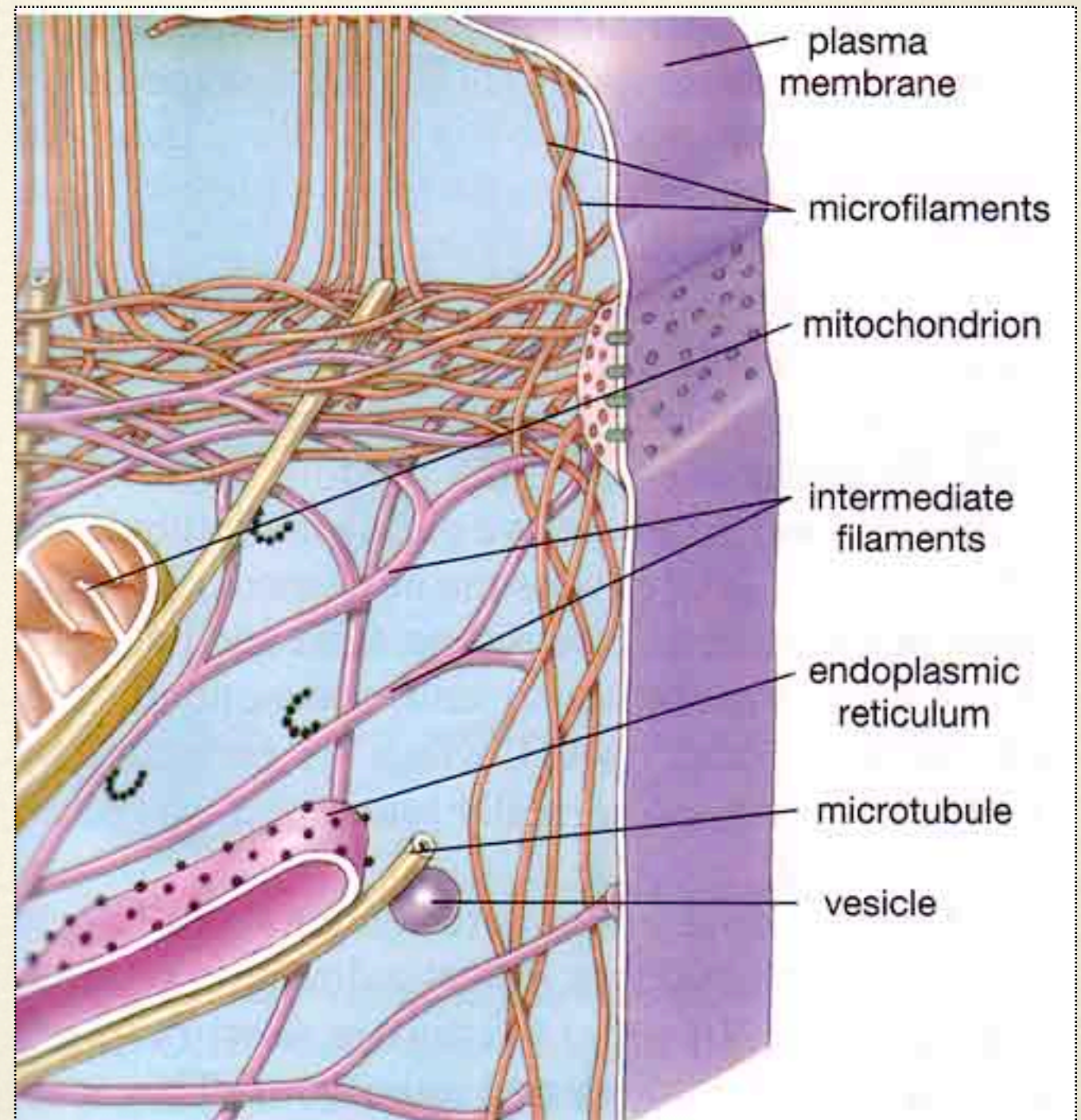
- ❖ The golgi apparatus consists of 3-20 stacked saccules
- ❖ In animals, the inner surface of the stack faces the ER while the outer face faces the cell membrane
- ❖ There are often vesicles around the edges of the golgi



Cytoskeleton

Structure

- ❖ The cytoskeleton consists of a network of interconnected filamentous proteins which include **actin filaments (microfilaments)**, **microtubules**, and **intermediate filaments**
- ❖ The cytoskeleton is suspended in the cytoplasm and gives it a gel like consistency



2. The components of hemoglobin are produced at the

A. nucleus.

B. nucleolus.

C. ribosomes.

D. Golgi bodies.

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B. glucose

C. adenine

D. glycogen

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- B. a pleated sheet.
- C. joined polypeptides.
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- A. storing genetic information
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- C. sending chemical messages
- D. transporting glucose into a cell

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- B. The adenine bonds with thymine.
- C. The strands are held together by ionic bonds.
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11. If a DNA molecule contains 8% adenine and 42% guanine, it also contains

- A. 8% uracil and 42% cytosine.
- B. 42% uracil and 8% cytosine.
- C. 8% thymine and 42% cytosine.
- D. 42% thymine and 8% cytosine.

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11. At which of the following does transcription occur?


- A. the vacuoles
- B. the ribosomes
- C. the Golgi bodies
- D. the chromosomes

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15. The sequence of bases in one strand of a DNA molecule is CCGTAC. Which of the following represents the sequence of bases that attach to this strand during replication?

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- B. GGCUTG
- C. CCGTAC
- D. GGCAUG

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12. Transcription and translation both result in molecules which

- A. contain deoxyribose.
- B. contain nitrogen atoms.
- C. have a tertiary structure.
- D. are produced in the cytoplasm.

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- A. the same as that of the solution.
- B. higher than that of the solution.
- C. lower than that of the solution.

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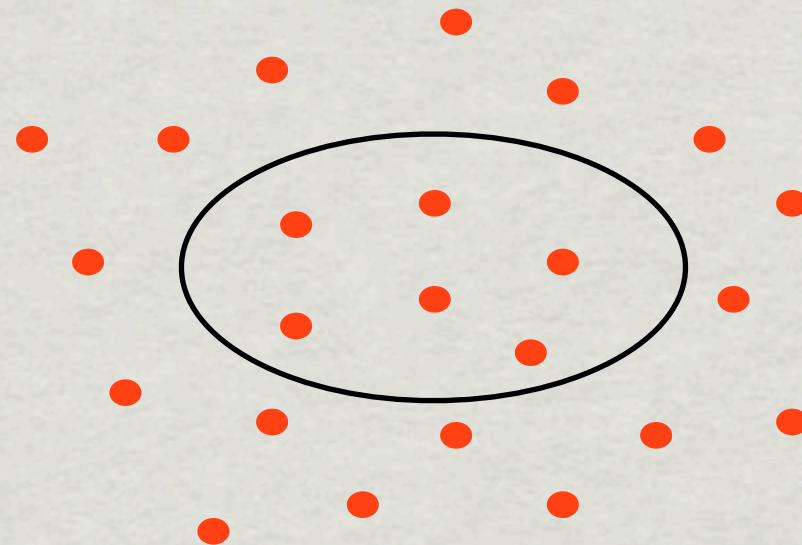
Selective Permeability

- The **plasma membrane** is described as **selectively** (or **differentially**) **permeable** since it controls the passage of particles in and out of the cell
- Particles can move across the membrane in a number of ways depending on:
 - The **size** of the particle
 - The **concentration gradient** of the particle
 - Whether or not the particle is **lipid soluble** (ie: can it pass through the non-polar tails of the bilayer)
 - Note: Note- polar molecules and ions are lipid **insoluble** and therefore cannot easily pass through the non polar

ISOTONIC SOLUTIONS

ISO MEANS THE **SAME** AS, AND **TONICITY** REFERS TO THE STRENGTH OF A SOLUTIONS
THUS, THE **SOLUTE** CONCENTRATIONS OF TWO ISOTONIC SOLUTIONS ARE **EQUAL**
THE SOLVENT CONCENTRATIONS ARE EQUAL AS WELL

EG- IF A CELL IS PLACED IN AN **ISOTONIC** SOLUTION, THE CONCENTRATION INSIDE AND OUTSIDE OF THE CELL WILL BE EQUAL



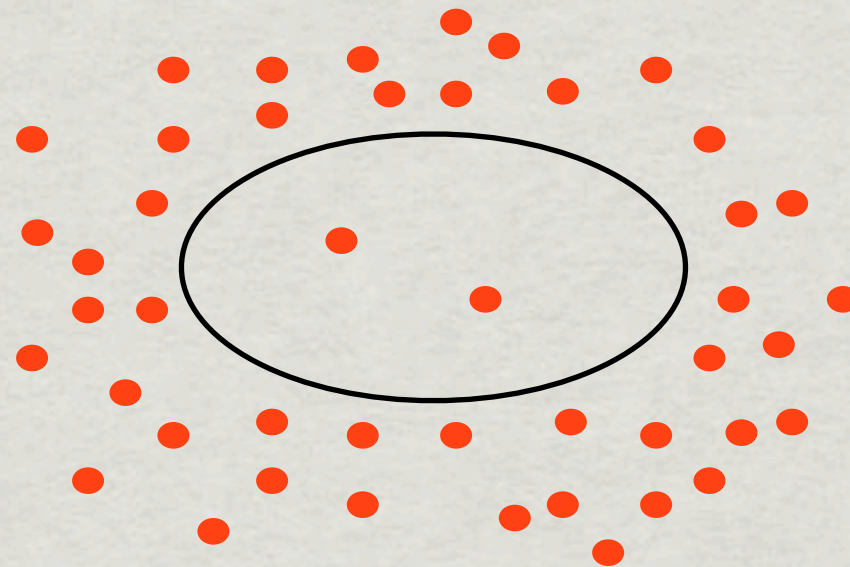
HYPERTONIC SOLUTIONS

HYPER MEANS GREATER THAN

THUS, THE **SOLUTE** CONCENTRATION OF A HYPERTONIC SOLUTION IS **GREATER** THAN THE SOLUTE CONCENTRATION OF THE SOLUTION IT IS BEING COMPARED TO

THE SOLVENT CONCENTRATION OF A HYPERTONIC SOLUTION IS LESS THAN THE SOLVENT CONCENTRATION OF THE SOLUTION IT IS BEING COMPARED TO

EG- IF A CELL IS PLACED IN A **HYPERTONIC** SOLUTION, THE CONCENTRATION OF THE SOLUTE WILL BE **GREATER** IN THE SOLUTION OUTSIDE OF THE CELL AND THE CONCENTRATION OF WATER WILL BE GREATER INSIDE THE CELL



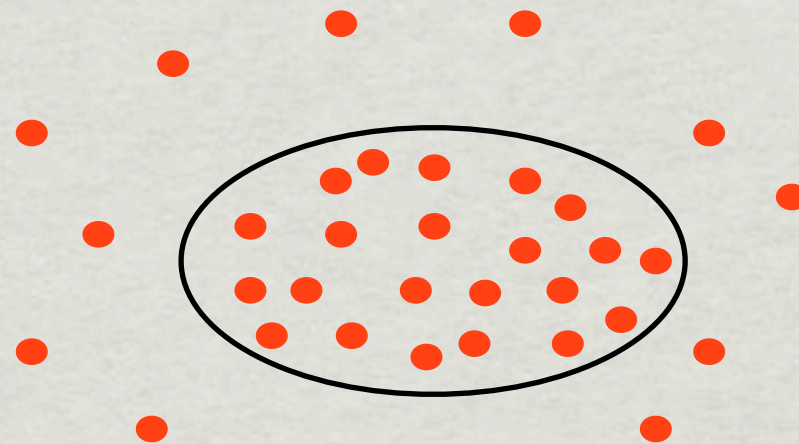
HYPOTONIC SOLUTIONS

HYPO MEANS **LESS THAN**

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THE SOLVENT CONCENTRATION OF A HYPOTONIC SOLUTION IS GREATER THAN THE SOLVENT CONCENTRATION OF THE OTHER SOLUTION

EG- IF A CELL IS PLACED IN A HYPOTONIC SOLUTION, THE SOLUTE CONCENTRATION WILL BE LESS OUTSIDE OF THE CELL AND THE WATER CONCENTRATION WILL BE GREATER OUTSIDE OF THE CELL



16. Oxygen moves through a cell membrane by

A. osmosis.

B. diffusion.

C. active transport.

D. facilitated transport.

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Passive Transport: Diffusion

Diffusion is the movement of particles from an area of **HIGH** concentration to an area of **LOW** concentration (**DOWN** the concentration gradient)

This is a **PASSIVE** process and does NOT require energy

Particles diffusing across the plasma membrane move between the phospholipids or through protein channels

Movement of particles
→





Sounds like a lot of vocab. I'm gonna need more flashcards

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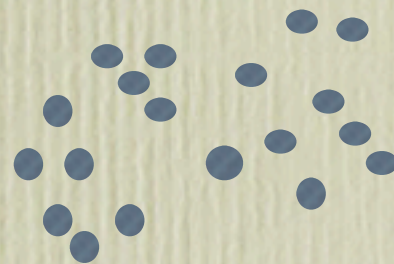
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→



Osmosis

Osmosis is the movement of **water** across a membrane

During osmosis, water moves from an area of **high water concentration**, to an area of **low water concentration**

Osmosis is a passive mechanism since it does not require the energy stored in ATP
During Osmosis, water moves between loosely packed phospholipids or through protein channels

Note- Even though water is a **polar** molecule, it is able to move through the **non polar tails** of the phospholipids because they are loosely packed



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Note- Even though water is a **polar** molecule, it is able to move through the **non polar tails** of the phospholipids because they are loosely packed

Facilitated Diffusion

Facilitated diffusion is the movement of particles from an area of **high** concentration to an area of **low** concentration

Involves the use of a **carrier protein**

The carrier proteins are specific to different types of molecules

The carrier protein binds to the molecule and changes shape to release it on the other side of the membrane

It is a passive mechanism, as it does NOT require energy

Active Transport

Active transport is the movement of particles from an area of **LOW** concentration to an area of **HIGH** concentration (**AGAINST** the concentration gradient)

Active transport requires a **carrier protein**, these are often referred to as “**pumps**” because they pump molecules against the gradient in the same way that a water pump pumps water against gravity

Active transport is an active mechanism as it requires energy from ATP

23. Which of the following is a monomer of the mosaic component of the cell membrane?

- A. glycerol
- B. nucleotide
- C. amino acid
- D. phospholipid

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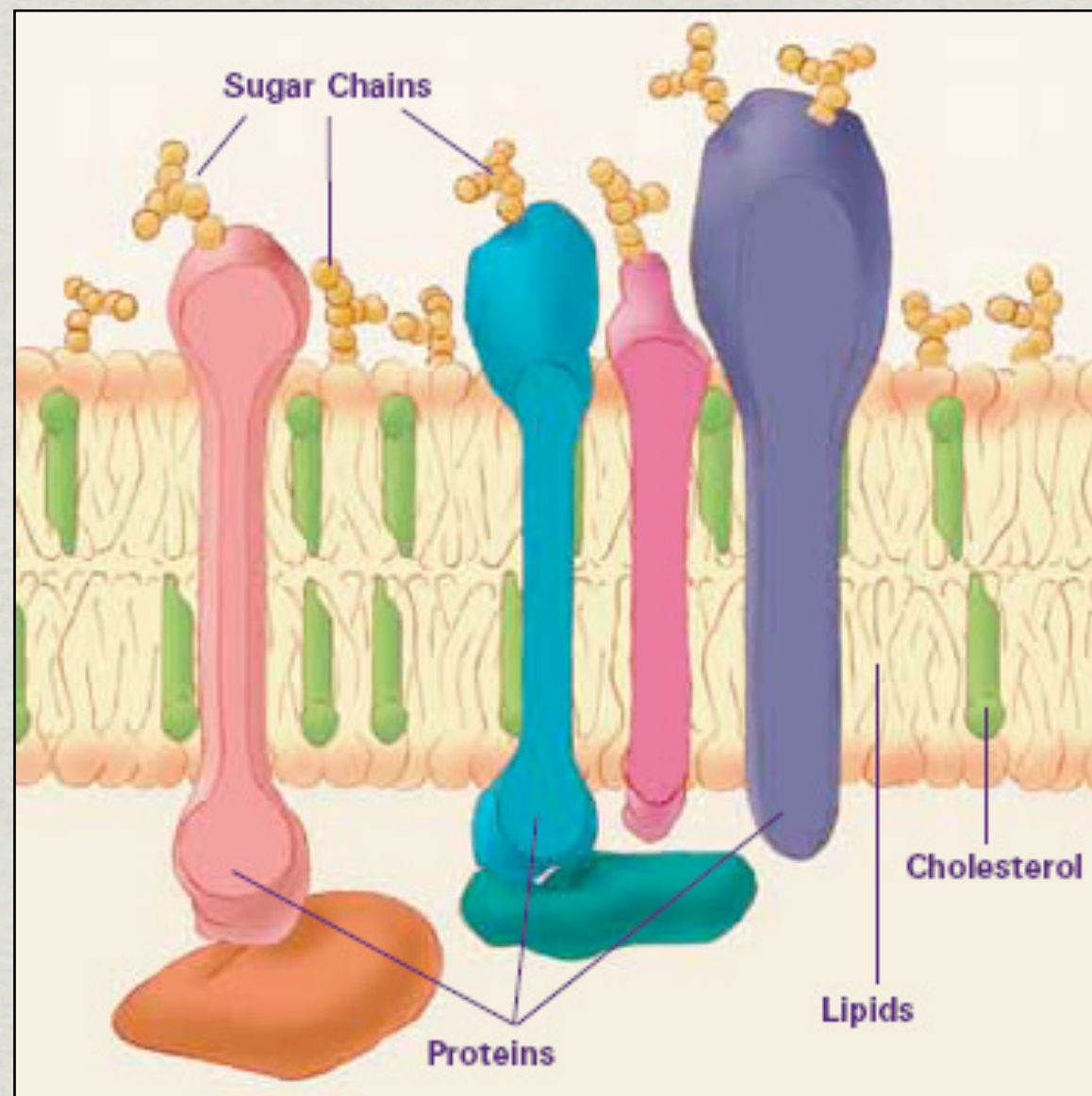
C. amino acid

D. phospholipid

Structure

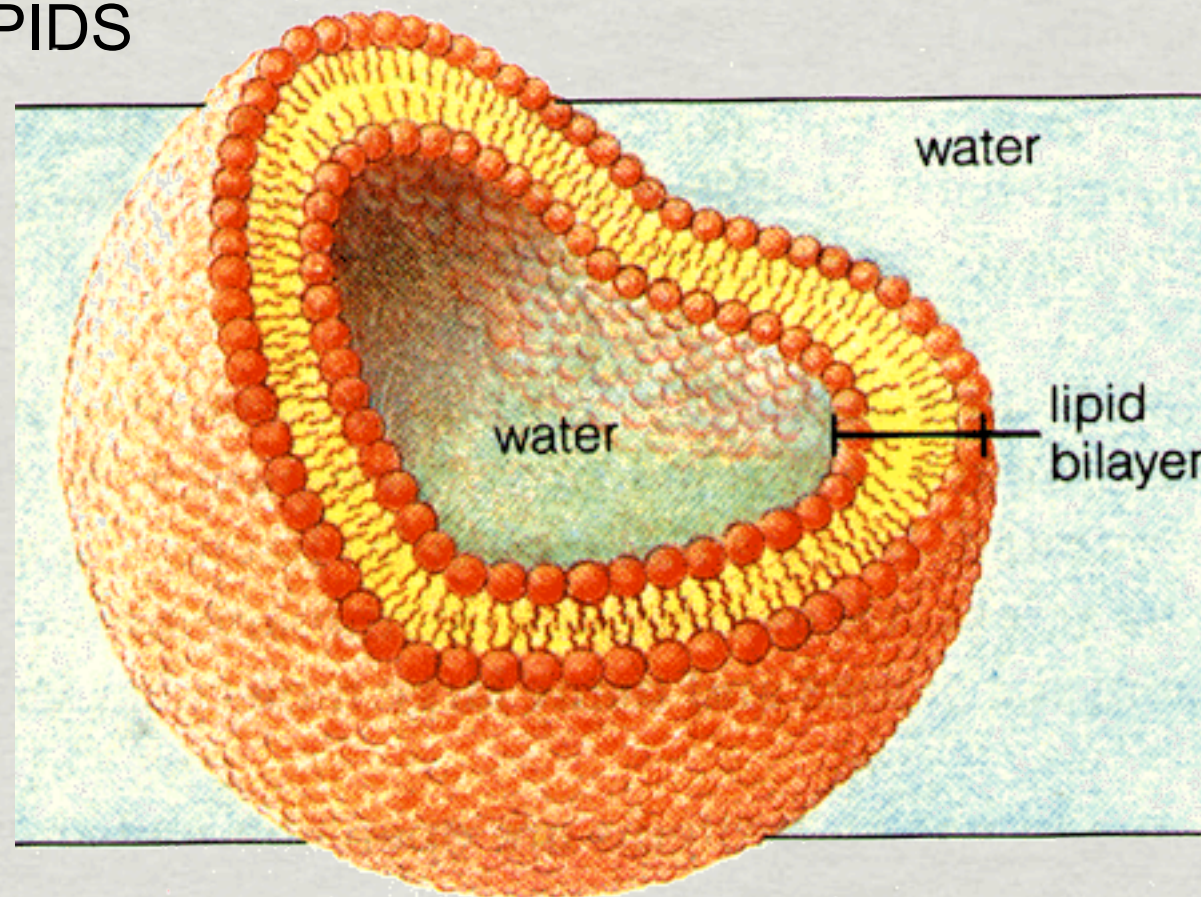
THE MEMBRANE CONSISTS OF THE FOLLOWING
TYPES OF MOLECULES:

1. PHOSPHOLIPIDS
2. PROTEINS
3. CHOLESTEROL
4. GLYCOPROTEINS & GLYCOLIPIDS



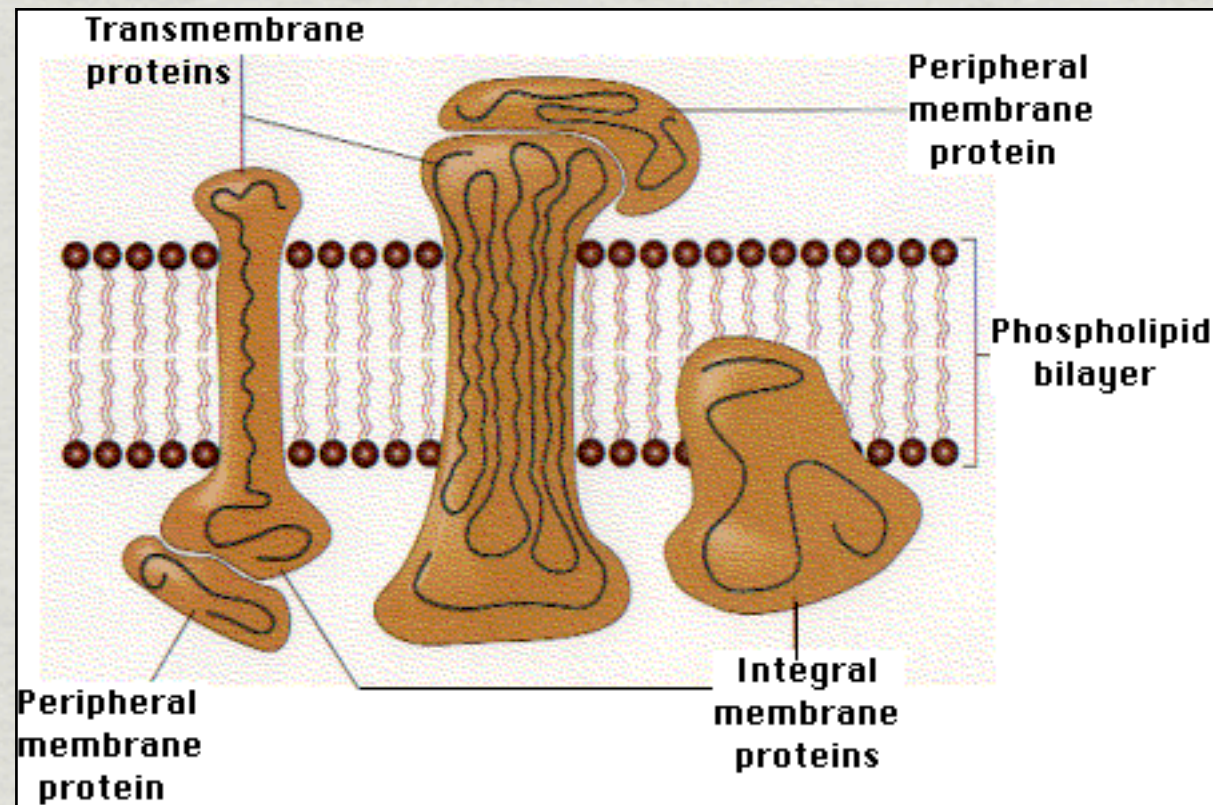
1. Phospholipids

- THE HEAD GROUPS OF EACH LAYER FACE THE OUTSIDE AND THE INSIDE OF THE CELL SINCE THEY ARE ATTRACTED TO WATER
- THE TAILS FORM THE INSIDE OF THE BILAYER SINCE THEY ARE AFRAID OF WATER
- THE BILAYER HAS A **FLUID** CONSISTENCY DUE TO THE BEHAVIOR OF THE PHOSPHOLIPIDS



2. Proteins

- THE MANY PROTEINS EMBEDDED IN THE MEMBRANE FORM A **MOSAIC** PATTERN
- DEPENDING ON THEIR POSITION IN THE MEMBRANE, PROTEINS MAY BE **INTEGRAL OR PERIPHERAL**

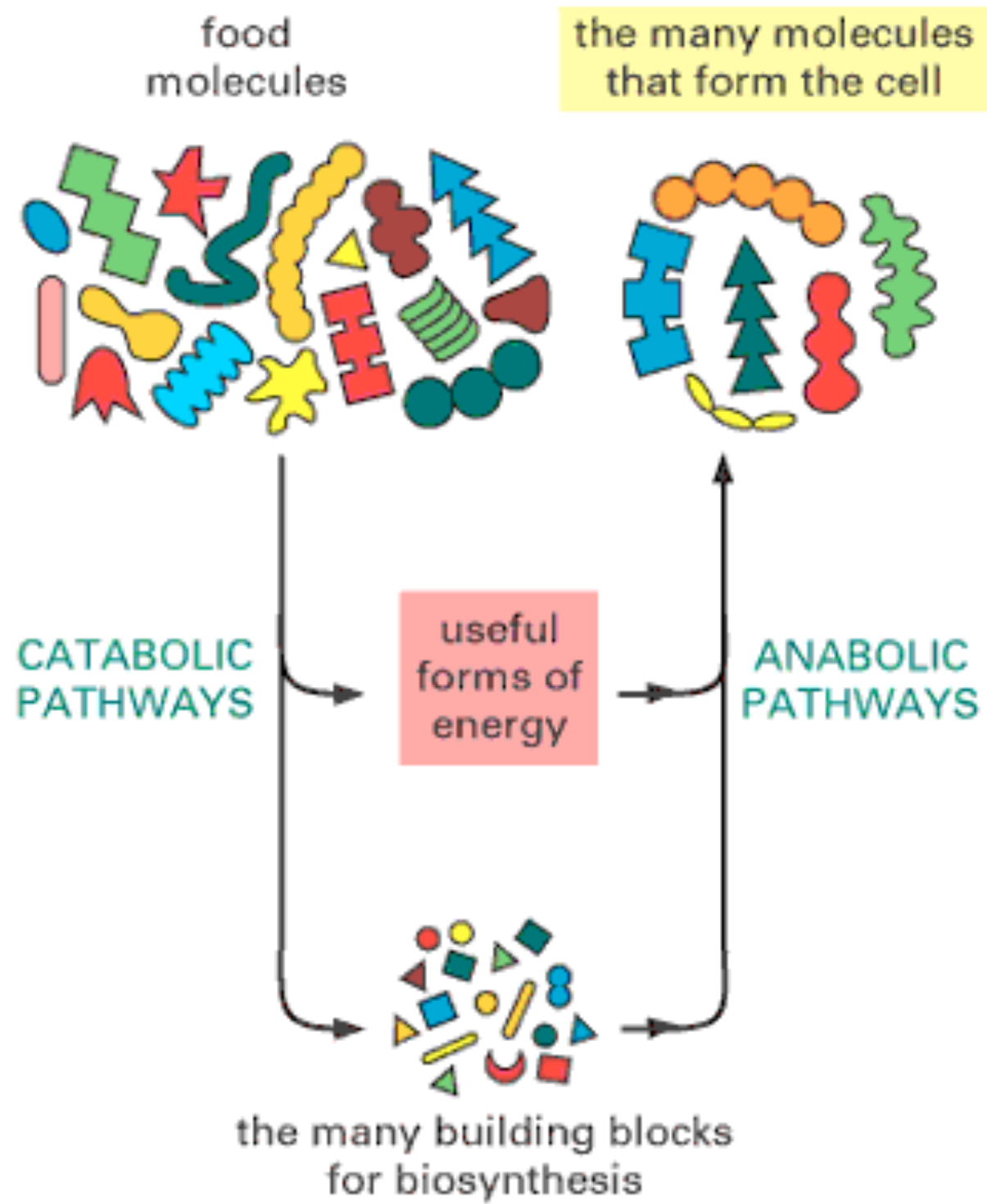


29. Which of the following describes the function of an enzyme?

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- B. It increases the available substrate.
- C. It increases the activation energy of a reaction.
- D. It contributes atoms to facilitate a chemical reaction.

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18. Which of the following describes a coenzyme?

- A. a protein molecule that speeds up a reaction
- B. a metal ion that binds to the enzyme changing its shape
- C. a substance that aids an organic catalyst by donating atoms
- D. a substrate that joins with an enzyme to form an enzyme-substrate complex

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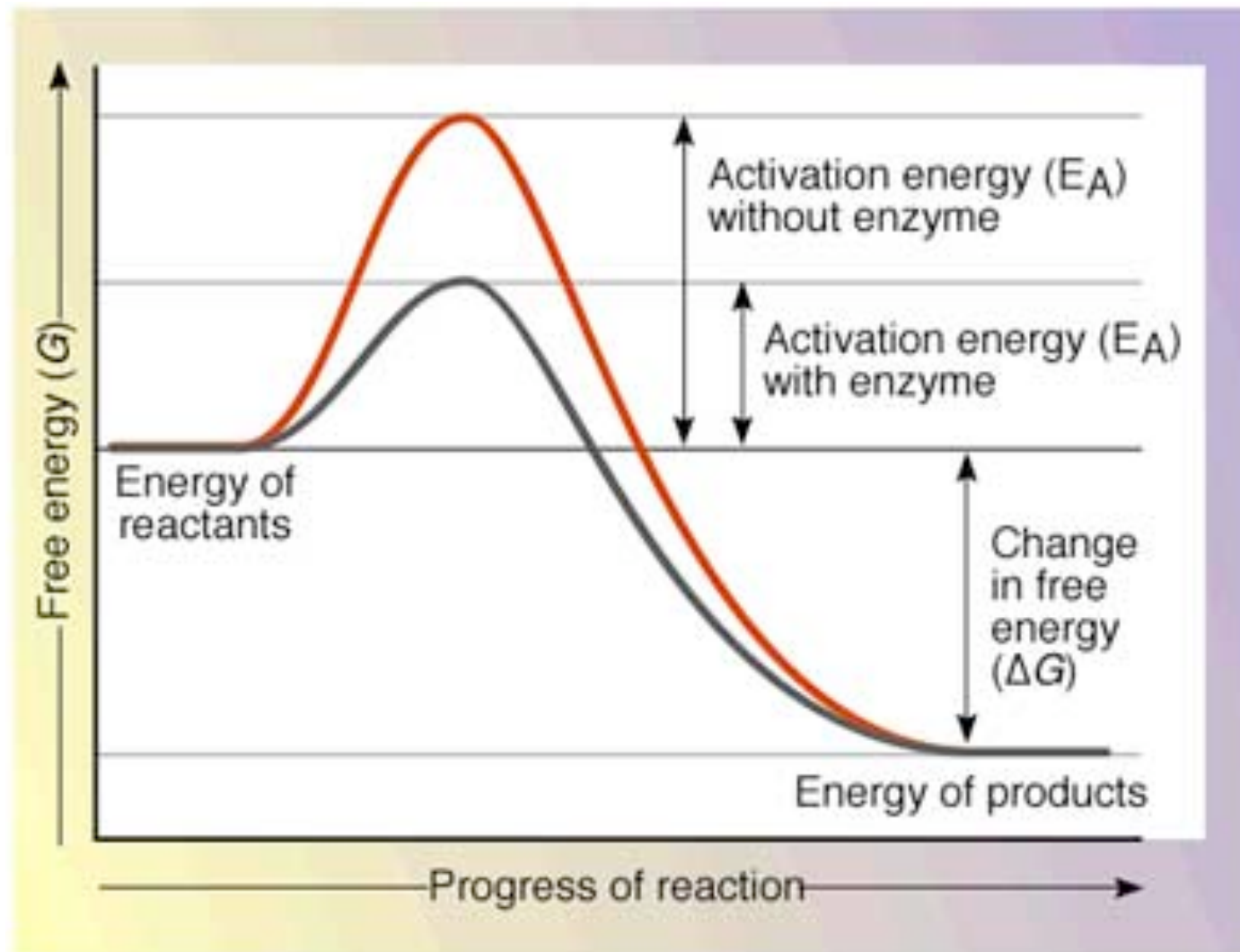
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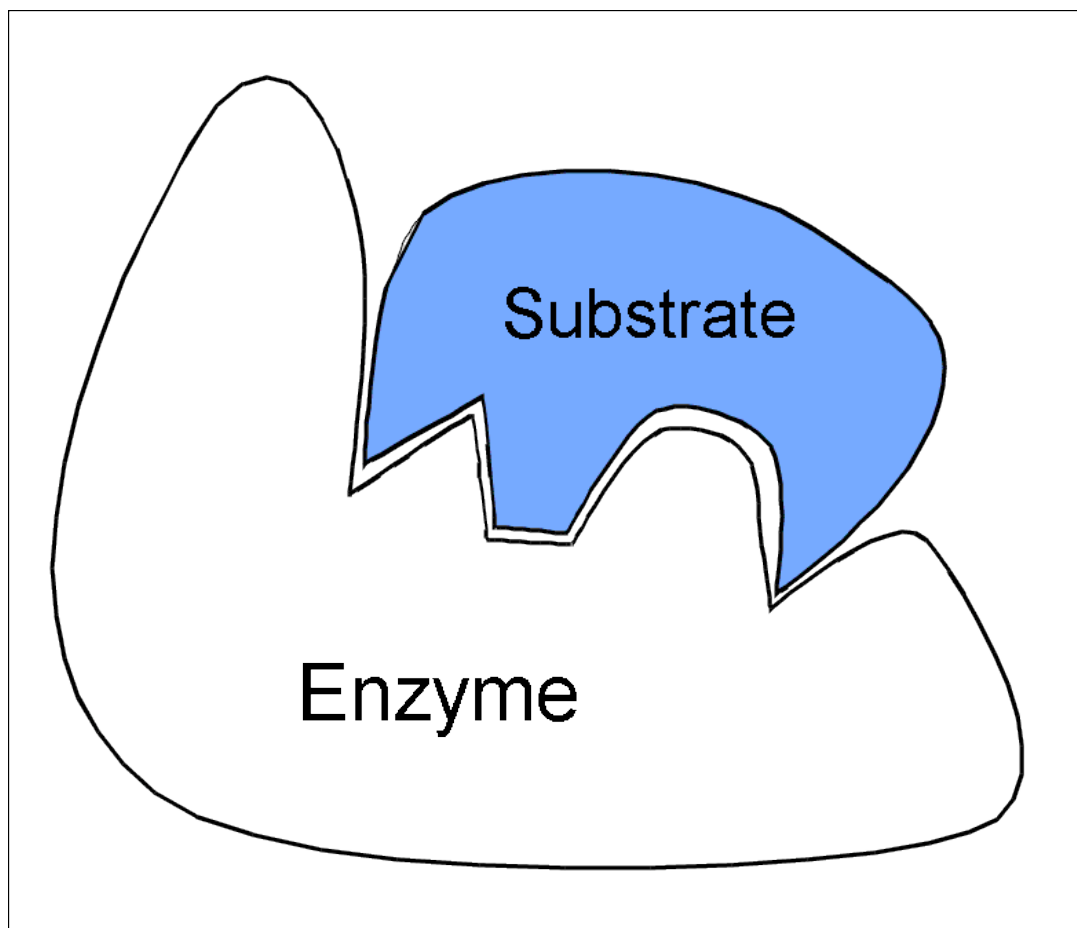
C. a substance that aids an organic catalyst by donating atoms

D. a substrate that joins with an enzyme to form an enzyme-substrate complex

- **Enzymes** are catalysts that are made of **protein** and that increase the rate of **metabolic reactions** in organisms by decreasing the activation energy required to start the reaction
- Each type of enzyme has a specific **structure** which allows it to catalyse a **specific** reaction



Notice how the activation energy is LOWER when an enzyme is involved!



Cofactor

- Co-factors are **non protein** helpers which assist the enzyme in catalyzing the reaction
- They may assist in the reaction by accepting or contributing atoms
- Some cofactors are **inorganic ions** such as **copper ions**, **zinc ions** and **iron ions**

Coenzyme

- Some cofactors are **organic** and are called **coenzymes**
- **Vitamins** such as **niacin** and **B₁₂** are often components of coenzymes

21. What may have caused the changes in the enzyme?

A. adding lead ions

B. reducing the activation energy

C. increasing the substrate concentration

D. heating the enzyme-catalyzed reaction to 37°C

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A. the liver

B. the kidney

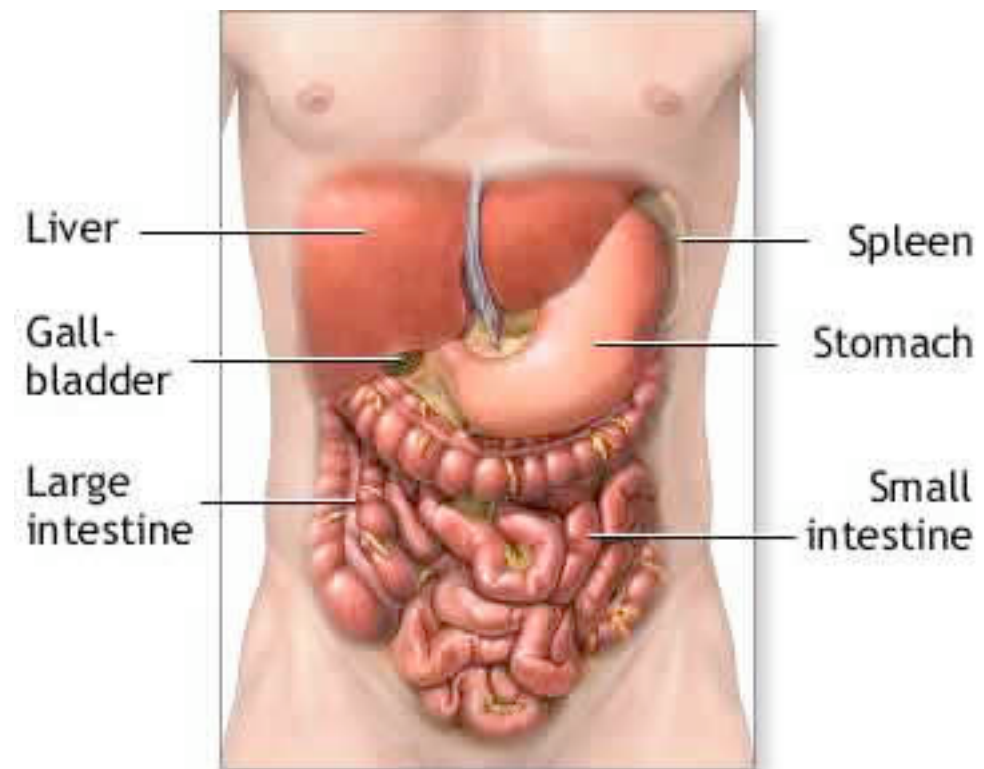
C. the stomach

D. the small intestine

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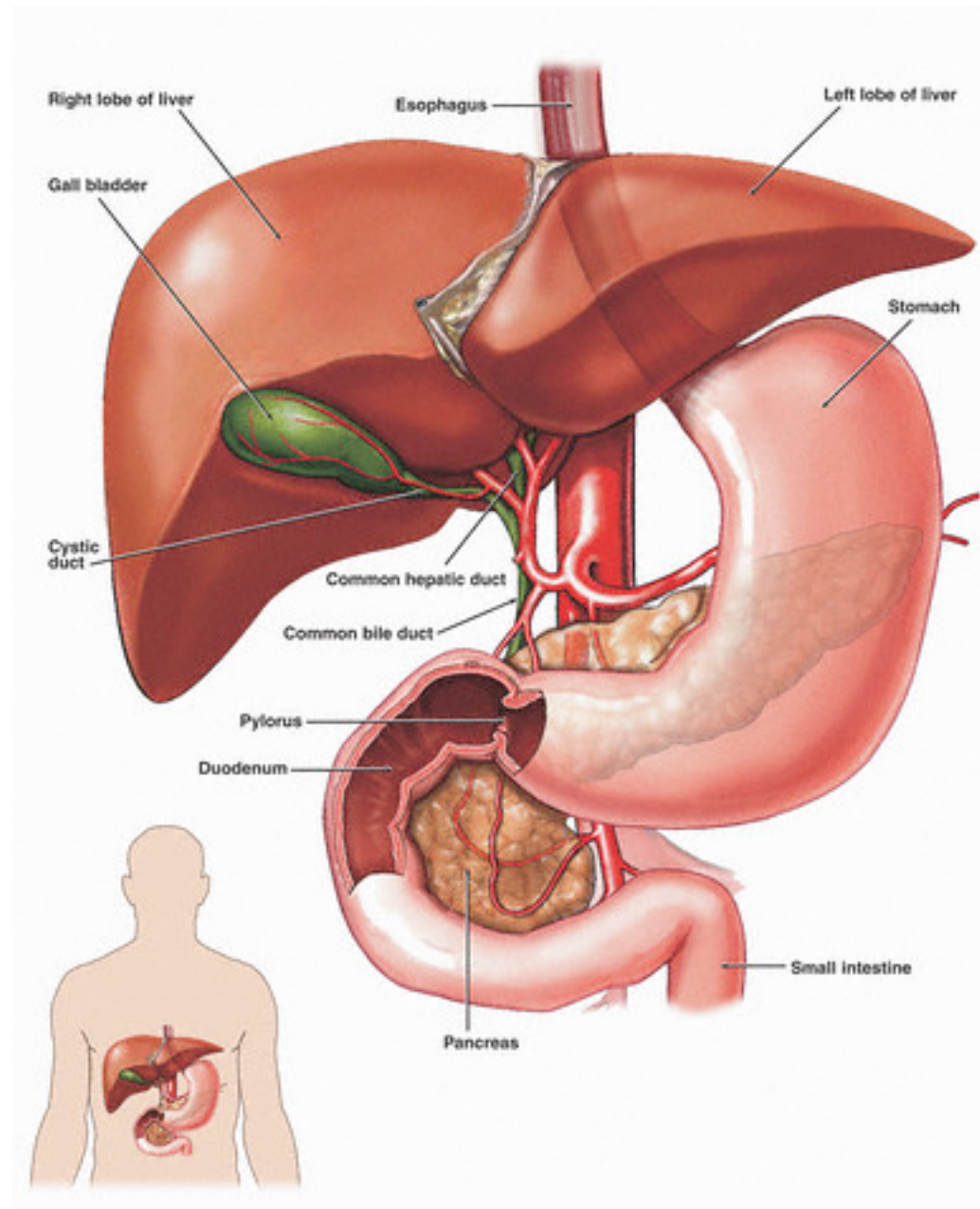
The LIVER



adam.com

Functions

- Blood from the intestines passes through the liver where harmful substances are removed and the liver works to keep the contents of the blood constant
- Detoxifies blood by metabolizing and removing harmful substances
- Stores iron Fe^{2+} and the fat soluble vitamins ADE and K
- Produces plasma proteins (ie albumin and fibrinogen) from amino acids

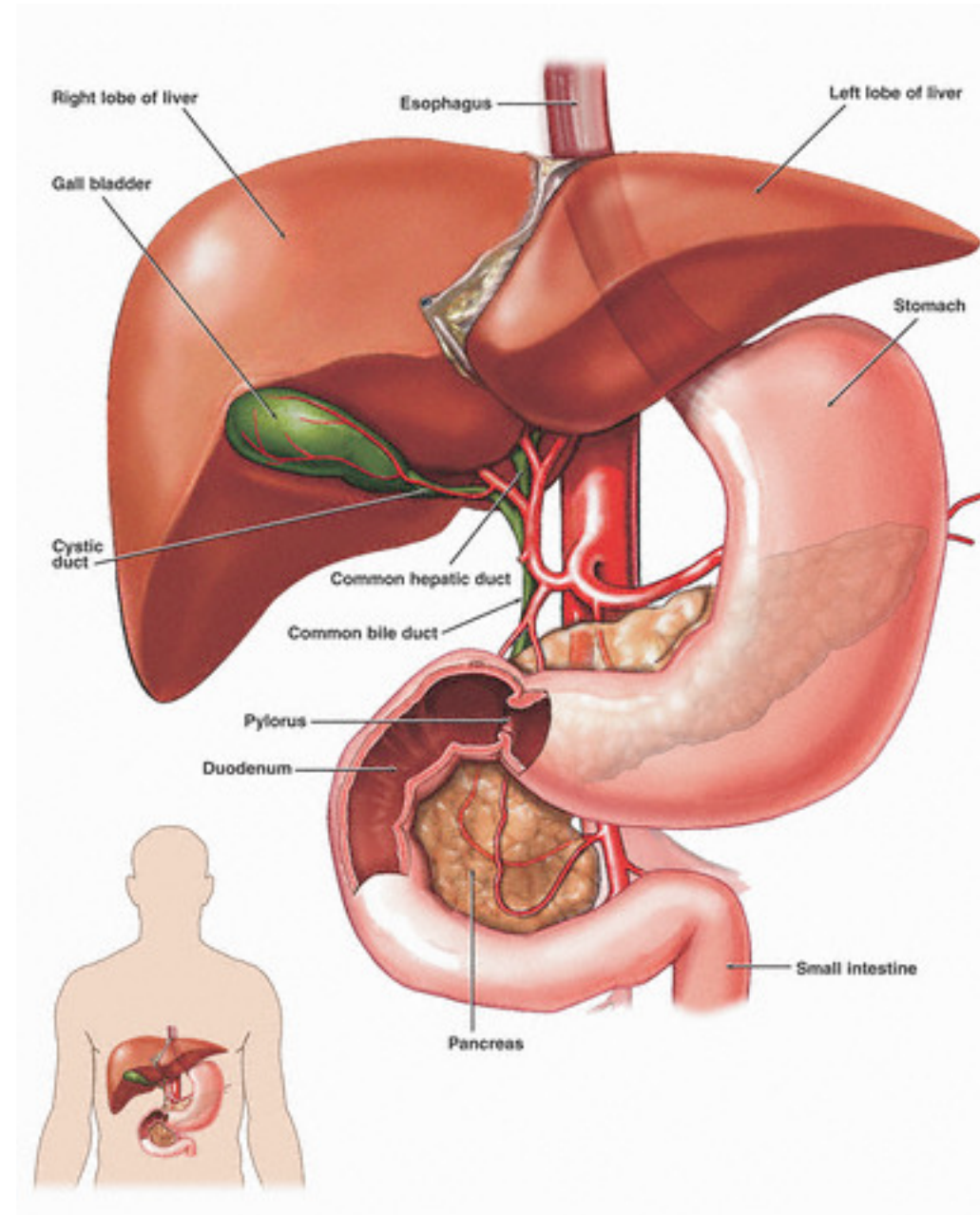


More Functions...

- Stores glucose as glycogen after eating and breaks down glycogen to glucose to maintain glucose levels between meals
- Produces urea (nitrogen containing waste product) from the breakdown of amino acids
 - if glycogen is depleted, the liver will convert glycerol and amino acids to glucose,
 - requires deamination of amino acids
 - Urea is formed through a metabolic pathway that combines ammonia with carbon dioxide
 - Urea is excreted by the kidneys
- Removes bilirubin (a breakdown product of hemoglobin) from the blood and excretes it in BILE
 - Breakdown of hemoglobin (the red pigment in RBC's) produces bilirubin
 - Bilirubin gives bile a yellowish green color
 - Bile is stored in the gall bladder
 - Bile also contains bile salts which emulsify fat in the small intestine
 - Emulsification of fats creates small droplets with increased surface area for enzyme action
- Produces lipids from fatty acids and helps regulate blood cholesterol

Structure

- Largest organ inside the body
- All blood from the stomach and the small intestine passes thru the liver
- Lies under the diaphragm in the upper right section of the abdominal cavity
- Two lobes



31. In which structure does peristalsis **not** occur?

A. the liver

B. the stomach

C. the esophagus

D. the duodenum

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A. bile

B. trypsin

C. pepsinogen

D. bicarbonate ions

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Summary

Component	Source	Function
Mucous	Goblet Cells	Protection of stomach wall from acid. Lubrication of stomach contents
HCl	Parietal Cells	Breaks down CT of meat. Protects stomach from bacteria. Activates pepsinogen.
Pepsinogen	Chief Cells	Inactive form of pepsin (enzyme)

Enzyme	Source	Digestion
Pepsin	Chief Cells	Begins the digestion of almost all types of proteins

25. After eating a meal, which of the following would be found in the small intestine?

- A. carbohydrates, bile, water and protein
- B. water, maltase, glycerol and nucleotides
- C. pepsin, bicarbonate ions, maltose and mucus
- D. water, hydrochloric acid, fatty acids and peptides

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Pancreatic Enzymes

Enzyme	Digestive Action
Amylase	Converts starch and glycogen into disaccharides
Lipase	Converts fats into fatty acids and glycerol
Peptidases Trypsin, Chymotrypsin, Carboxypeptidase.	Converts proteins or partially digested proteins into amino acids
Nucleases	Converts nucleic acids into nucleotides

*pancreatic juice also contains sodium bicarbonate which neutralizes chime from the stomach

36. An increase in the concentration of glucose in the blood results in increased secretion of a hormone from the

A. liver.

B. stomach.

C. pancreas.

D. duodenum.

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Pancreatic Hormones

Hormone	Action
Insulin	Promotes the movement of glucose through the cell membranes. Stimulates the liver to convert glucose to glycogen. Causes blood glucose to DECREASE.
Glucagon	Stimulates liver to convert glycogen to glucose. Cause blood sugar to increase.

27. What process moves chyme through the digestive system?

A. osmosis

B. peristalsis

C. phagocytosis

D. active transport

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42. Which of the following is required to initiate blood clotting?

A. platelets

B. antibodies

C. red blood cells

D. white blood cells

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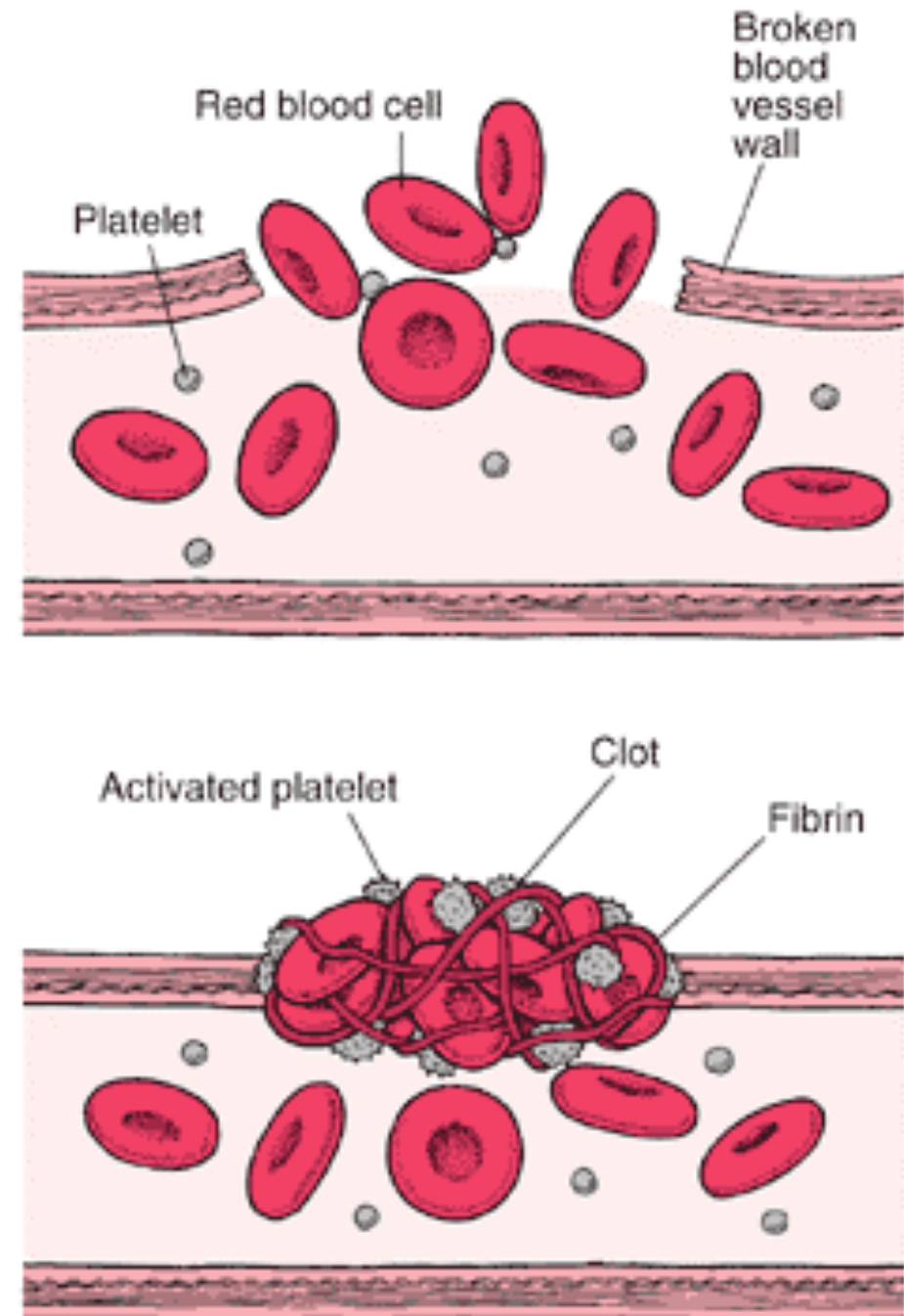
B. antibodies

C. red blood cells

D. white blood cells

Blood Clotting

- Blood clotting seals punctures in blood vessels and thus prevents blood loss
- The process of blood clotting involves platelets, cells of the damaged tissue, plasma proteins such as **prothrombin** and **fibrinogen** and **Ca ions**
- The basic steps in clotting are as follows:
 - **Platelets** clump at the site of the leak and partially seal it
 - **Platelets** and the **cells of the damaged tissue** release **prothrombin activator**
 - With the assistance of **Ca ions**, prothrombin activator converts the plasma protein **prothrombin** into **thrombin**
 - **Thrombin** acts as an enzyme and cleaves the protein **fibrinogen** to **fibrin**
 - **Fibrin fibres** wrap around the platelet plug and trap blood cells at the injury site to form the blood clot



33. Which of the following is a function of a vein?

- A. to carry oxygenated blood away from the lungs
- B. to carry oxygenated blood from the heart to the stomach
- C. to carry deoxygenated blood away from the right atrium
- D. to carry deoxygenated blood from the iliac artery to the leg

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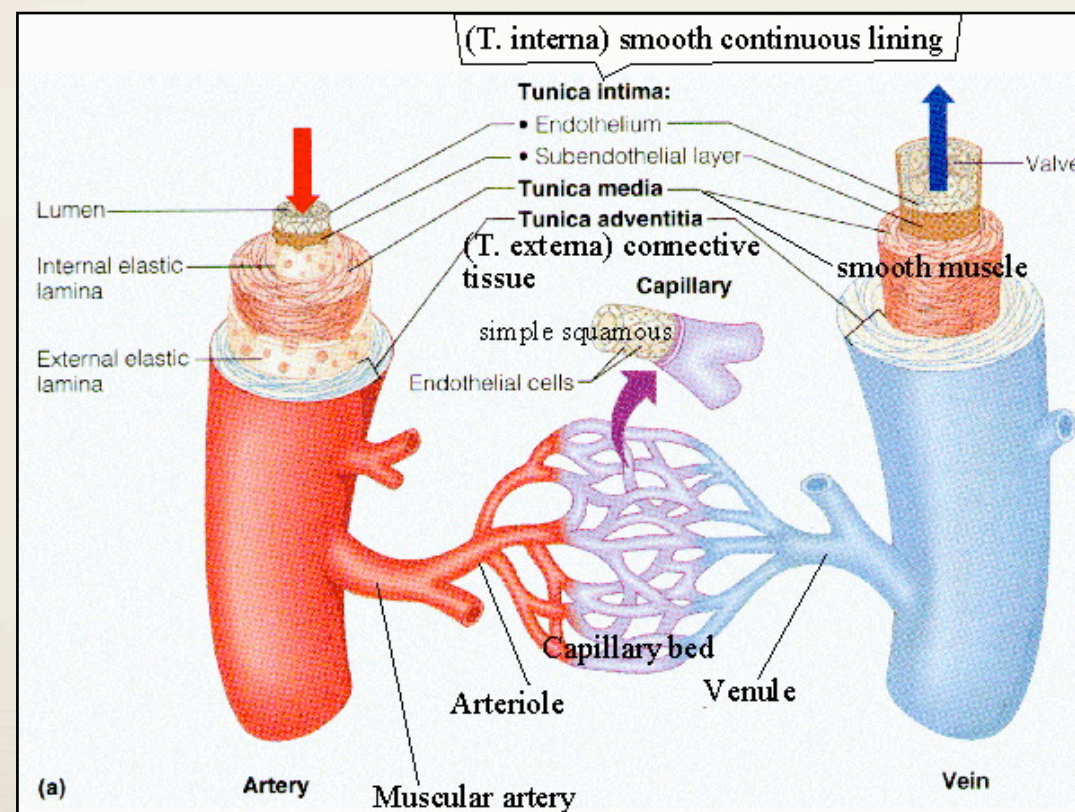
Arteries

Function

- The function of the arteries is to **carry blood away from the heart**

Structure

- The walls of the arteries are very **thick** and highly **muscular** which allows them to **contract** in response to changes in blood pressure and blood flow
- Artery walls consist of three layers:
 - An outer layer of **connective** tissues
 - A middle layer of **smooth muscle** and some **elastic** tissue
 - An inner layer of **squamous epithelium** and **elastic** fibres



Veins

Function

- Veins carry blood low in oxygen to the heart
- Major veins serve as blood **reservoirs** which, if blood pressure is too **low**, can constrict forcing more blood through the circulatory system thus maintaining blood pressure

Structure

- Although the walls of the veins consist of the same layers, the middle layer of smooth muscle and elastic fibres is much **thinner** in veins than in arteries since the blood pressure is much lower
- Veins also have **one way valves** which allow blood to flow only towards the heart when open and prevent the backflow of blood when closed
- Although the walls of the venules consist of the same layers, there is **less** smooth muscle and connective tissue
- **Valves** are found in vessels carry in blood **against** the flow of gravity

46. In fetal circulation, which of the following vessels carries blood with the highest concentration of oxyhemoglobin?

- A. the aorta
- B. the umbilical vein
- C. the umbilical artery
- D. the anterior vena cava

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38. What blood vessel carries blood from the fetus to the placenta?

- A. arterial duct
- B. umbilical vein
- C. umbilical artery
- D. posterior vena cava

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A. arterial duct

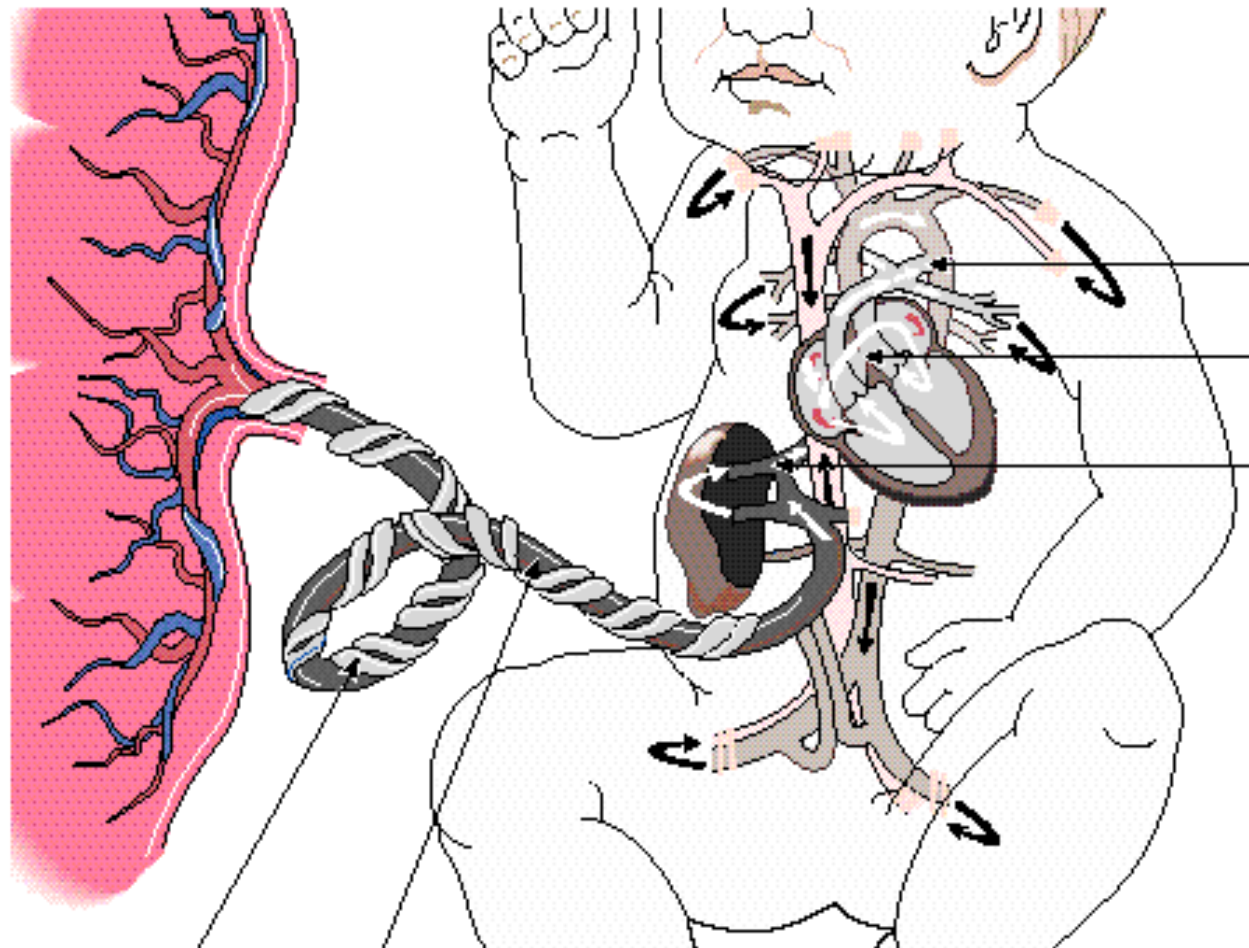
B. umbilical vein

C. umbilical artery

D. posterior vena cava

Fetal Circulation

- Since the fetal lungs **do not** function to exchange gases, and oxygenated blood is obtained from the mother, there are some significant differences in the circulatory system of adults and the fetus
- **The umbilical arteries and veins**
 - These vessels carry wastes and oxygen to and from the placenta
 - The arteries carry wastes and CO₂ to the placenta the veins carry oxygen from the placenta



36. What blood vessels carry blood to and from the intestines?

- A. the iliac artery and the iliac vein
- B. the carotid artery and the jugular vein
- C. the hepatic portal vein and the hepatic vein
- D. the mesenteric artery and the hepatic portal vein

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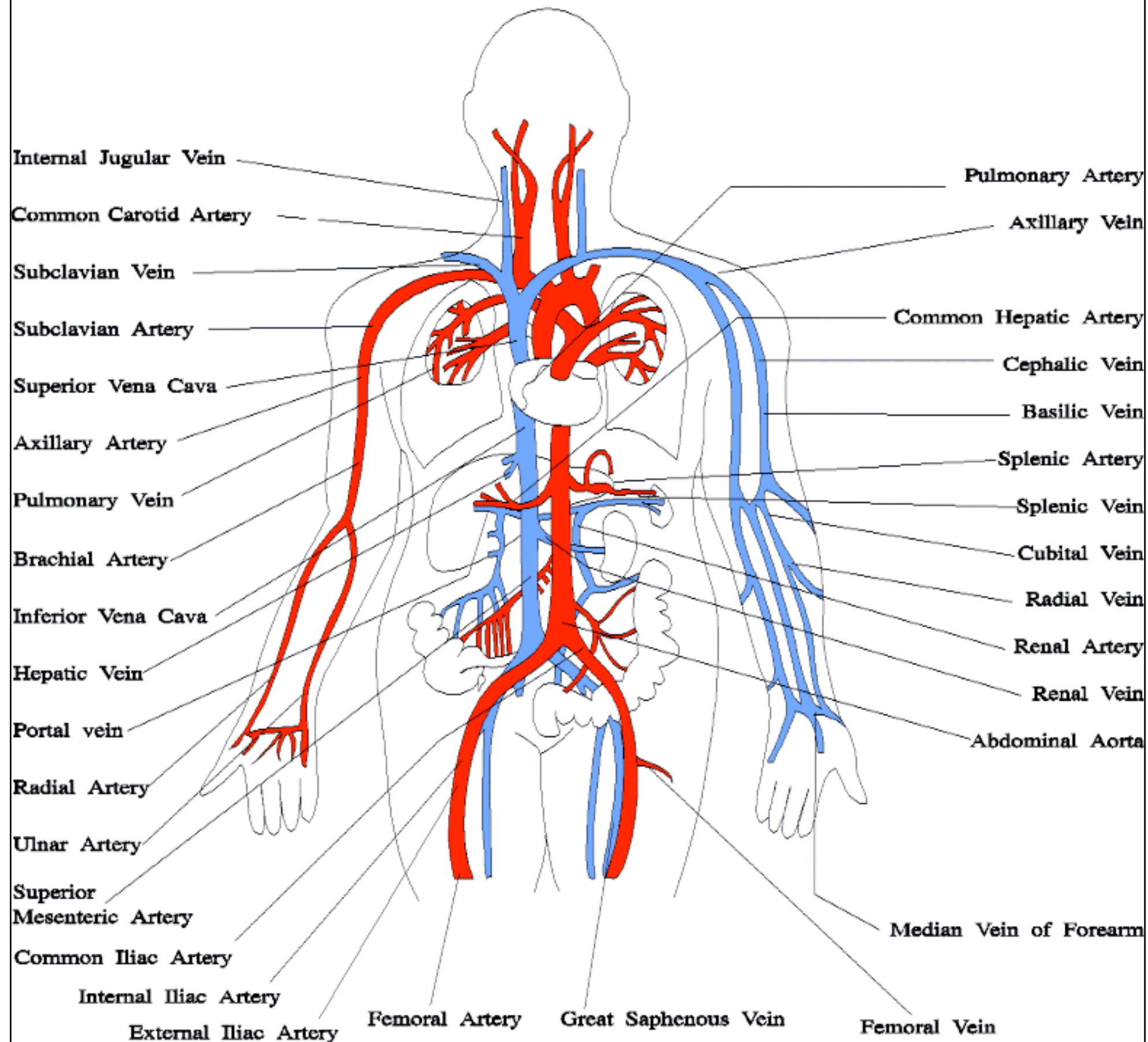
B. the carotid artery and the jugular vein

C. the hepatic portal vein and the hepatic vein

☒ D. the mesenteric artery and the hepatic portal vein

Blood Circulation

Principal Veins and Arteries



48. During inhalation, air moves from the bronchioles into the

A. larynx.

B. alveoli.

C. trachea.

D. bronchi.

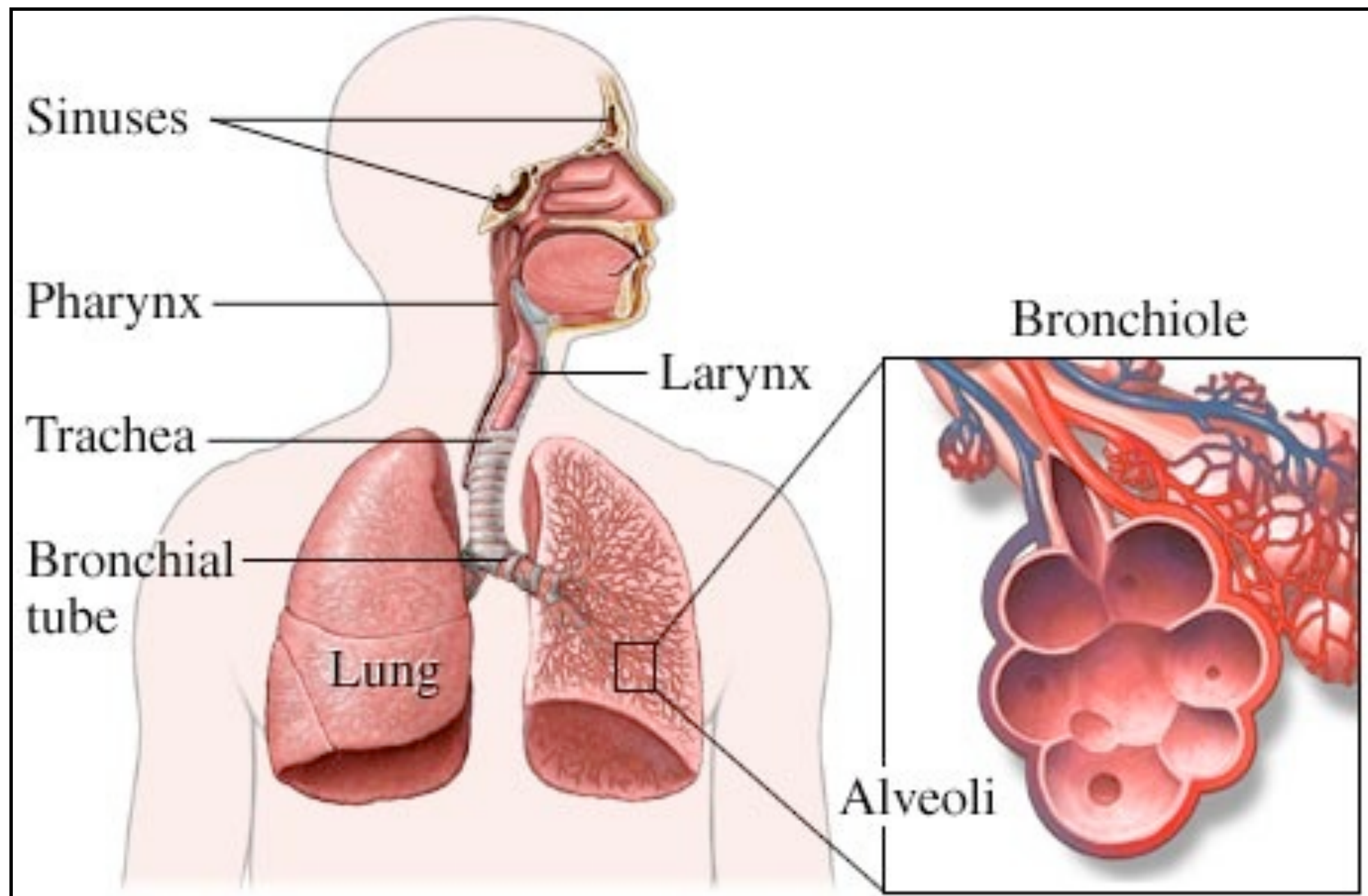
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42. Between which of the following does external respiration occur?

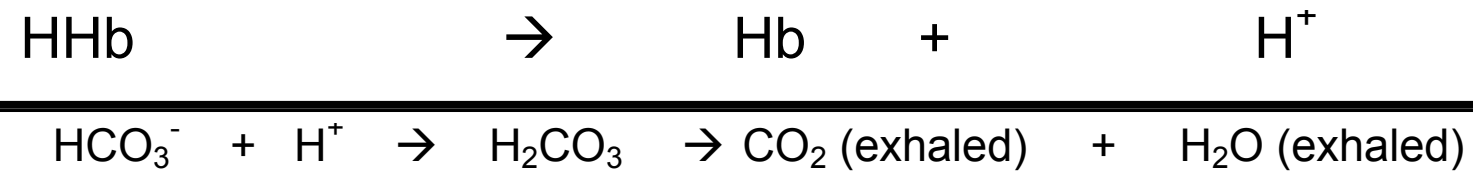
- A. the alveoli and the lung capillaries
- B. the tissue fluid and the tissue cells
- C. the mitochondria and the cytoplasm
- D. the tissue capillaries and the tissue fluid

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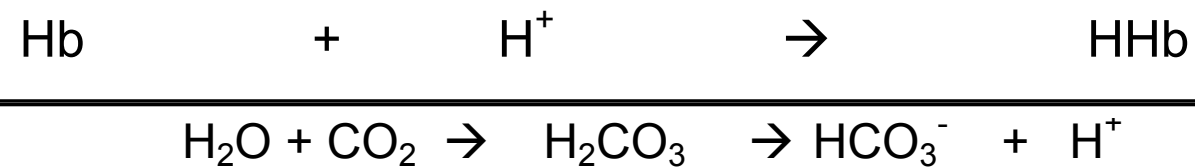
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SEE THE SIMILARITIES?

External Respiration

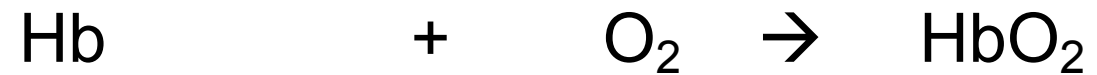


Internal Respiration



SEE THE SIMILARITIES?

External Respiration



Internal Respiration



External Respiration



Internal Respiration



52. What part of a neuron carries impulses toward the cell body?

- A. an axon
- B. a dendrite
- C. the synaptic cleft
- D. the myelin sheath

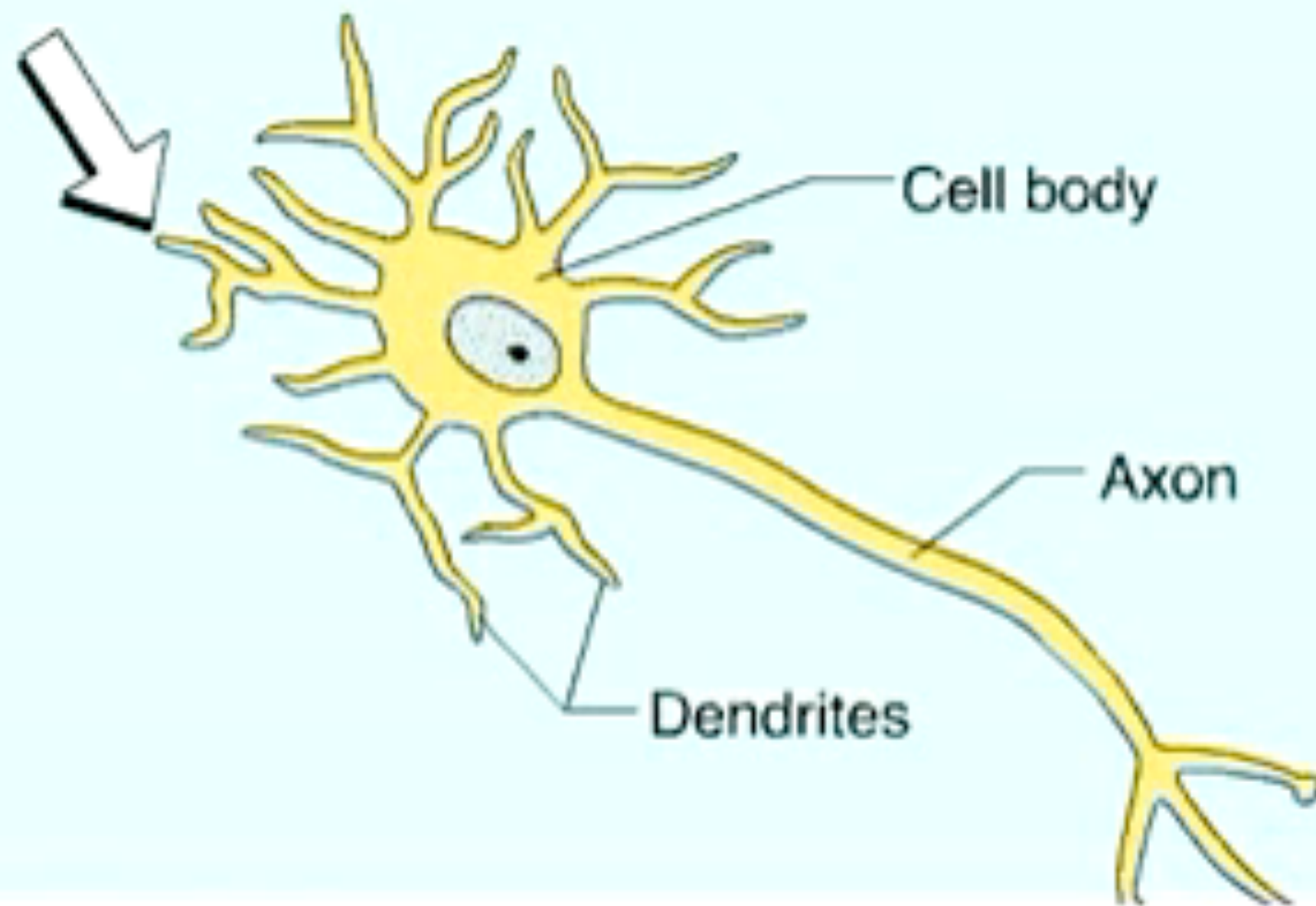
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53. What structure carries impulses towards the central nervous system?

- A. the effector
- B. the interneuron
- C. the motor neuron
- D. the sensory neuron

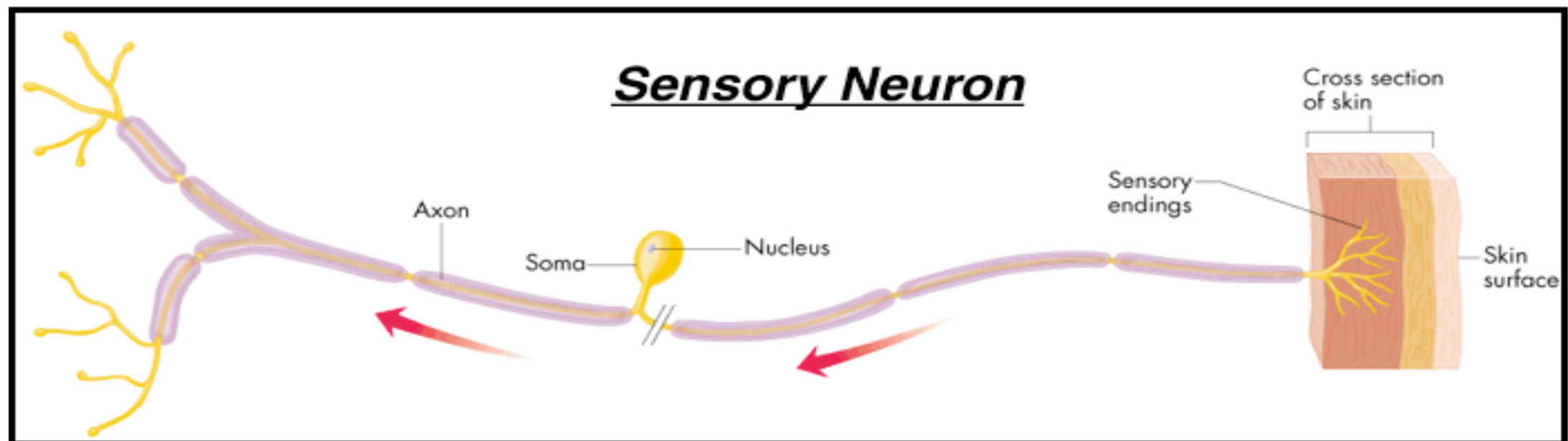
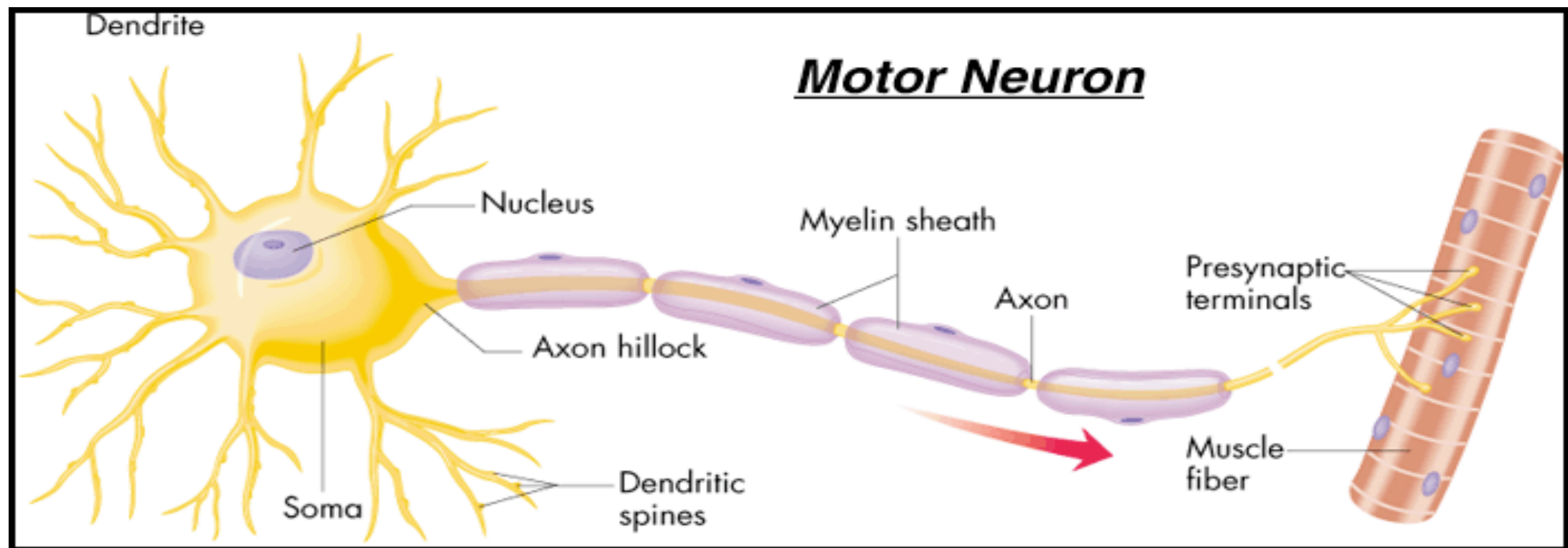
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53. What structure stores neurotransmitters?

- A. a receptor site
- B. the synaptic cleft
- C. a synaptic vesicle
- D. the postsynaptic membrane

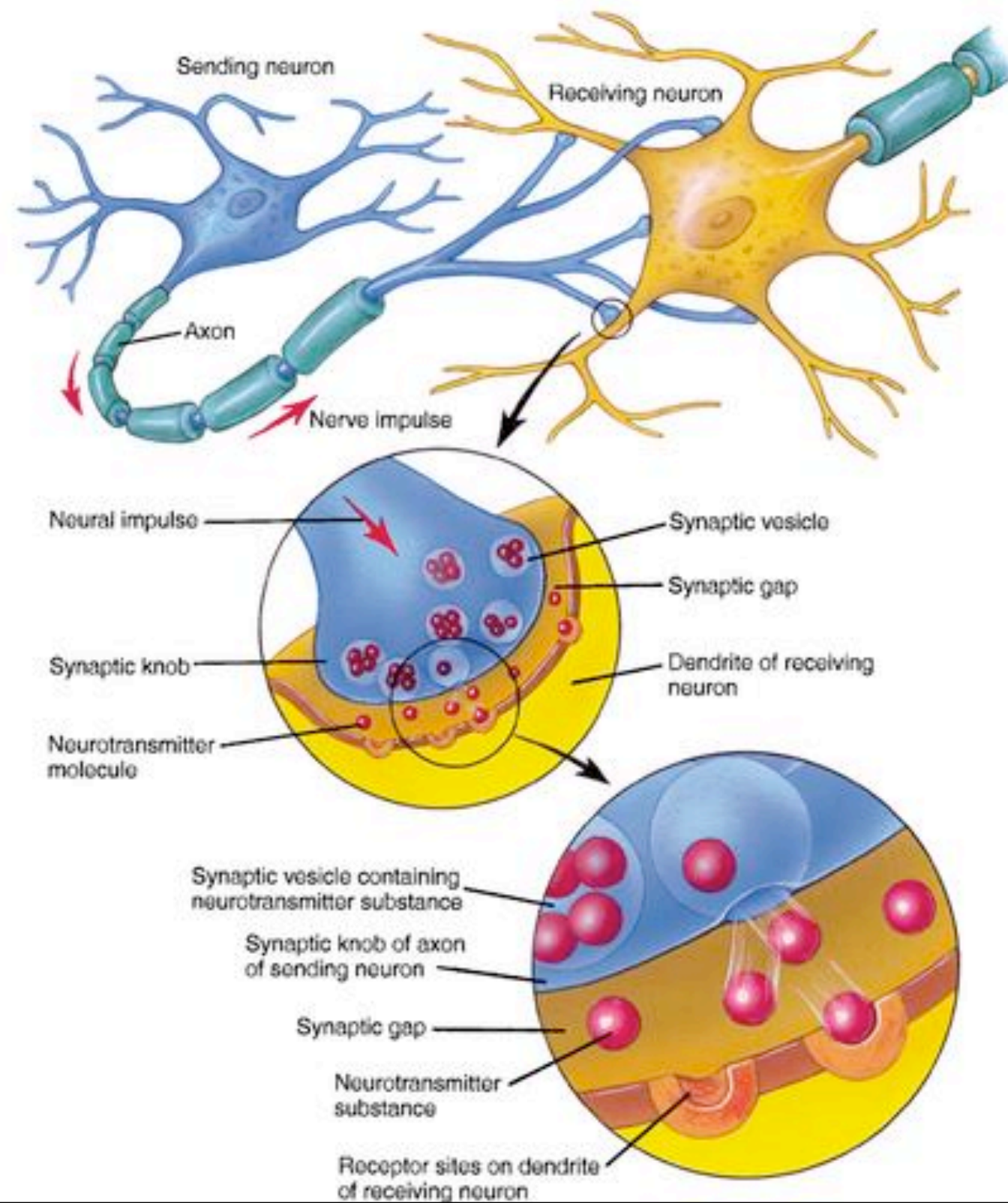
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56. Stimulation of which of the following causes the pupils to dilate?

- A. the central nervous system
- B. the somatic nervous system
- C. the sympathetic nervous system
- D. the parasympathetic nervous system

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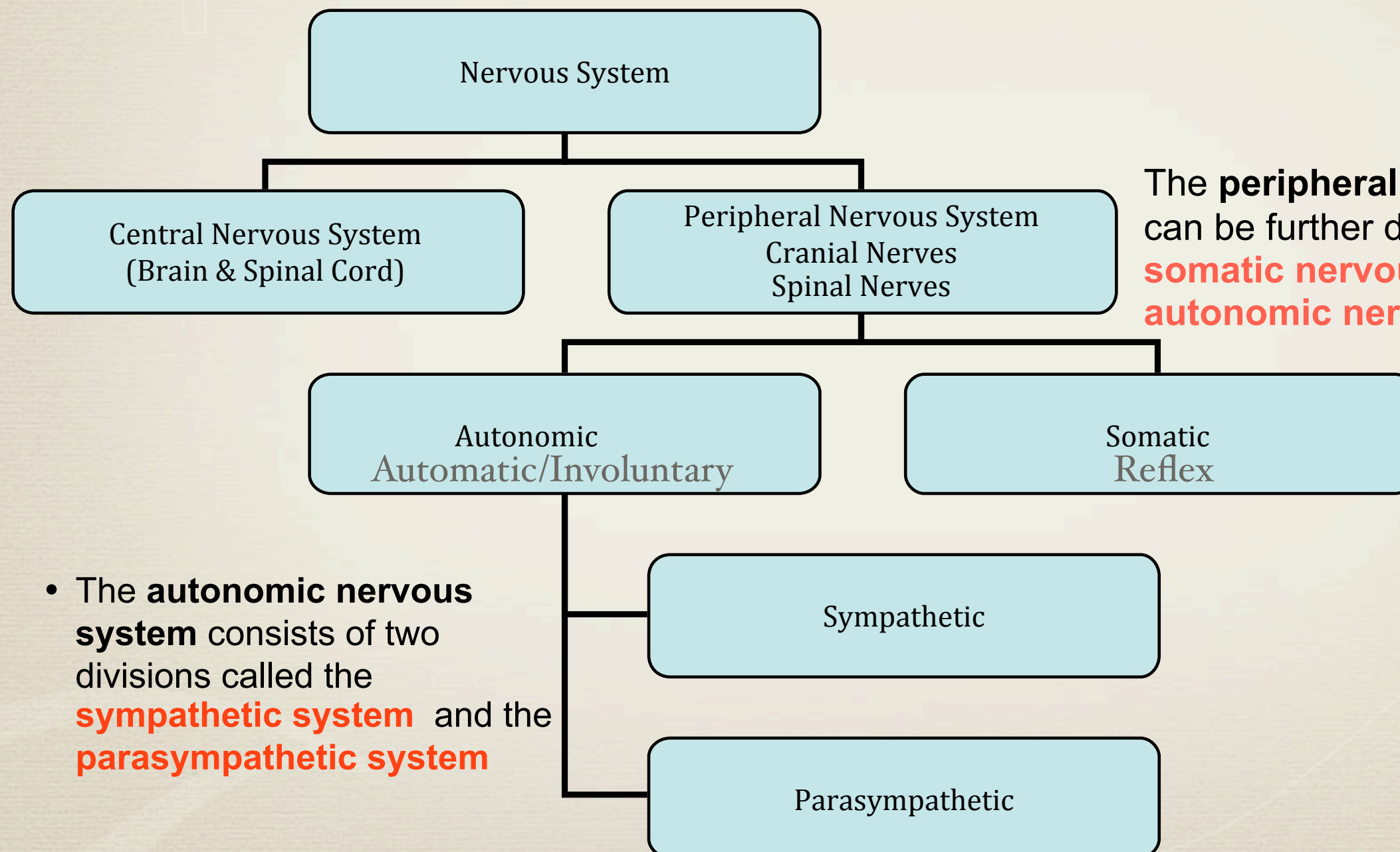
B. the somatic nervous system

C. the sympathetic nervous system

D. the parasympathetic nervous system

Divisions of the Nervous System

- The two major divisions of the nervous system are the **central nervous system** and the **peripheral nervous system**

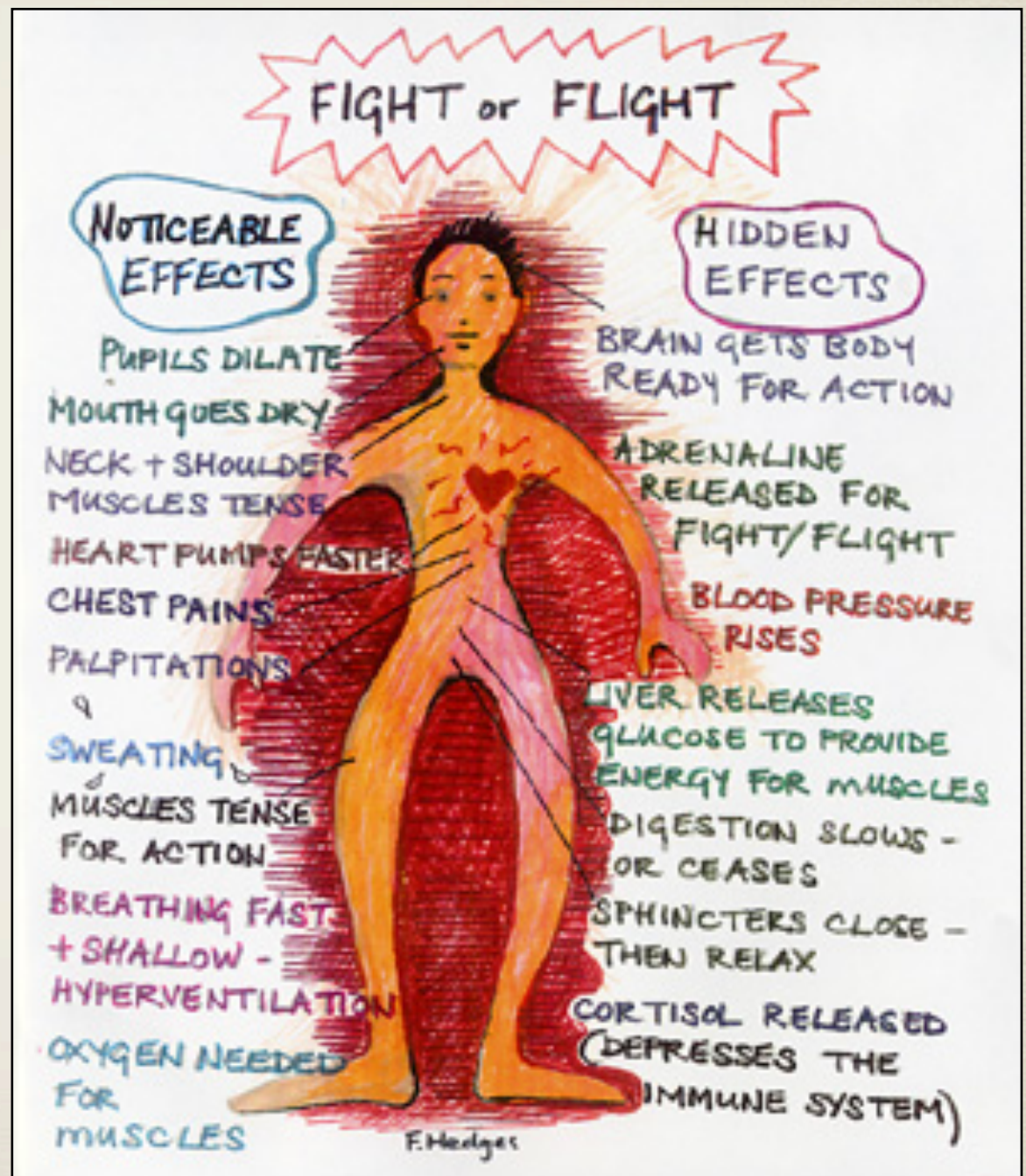


The **peripheral nervous system** can be further divided into the **somatic nervous system** and the **autonomic nervous system**

- The **autonomic nervous system** consists of two divisions called the **sympathetic system** and the **parasympathetic system**

Sympathetic Nervous System

- The Sympathetic division of the peripheral nervous system is used to respond to **emergency situations**
- It is also known as the **flight or fight** response
- Like all autonomic pathways, it consists of two neurons and a ganglion
- The **preganglionic neuron** is **short** while the **postganglionic neuron** is **long**
- The **neurotransmitter** used in the sympathetic pathway is **nor epinephrine**
- The sympathetic nervous system prepares the body for emergencies by:
 - Increasing heart rate
 - Increasing breathing rate
 - Dialation of the bronchi
 - Dilation of the pupils
 - Decreasing rate of digestion



55. Which of the following results if the synaptic ending is treated with a substance that prevents the absorption of calcium ions?

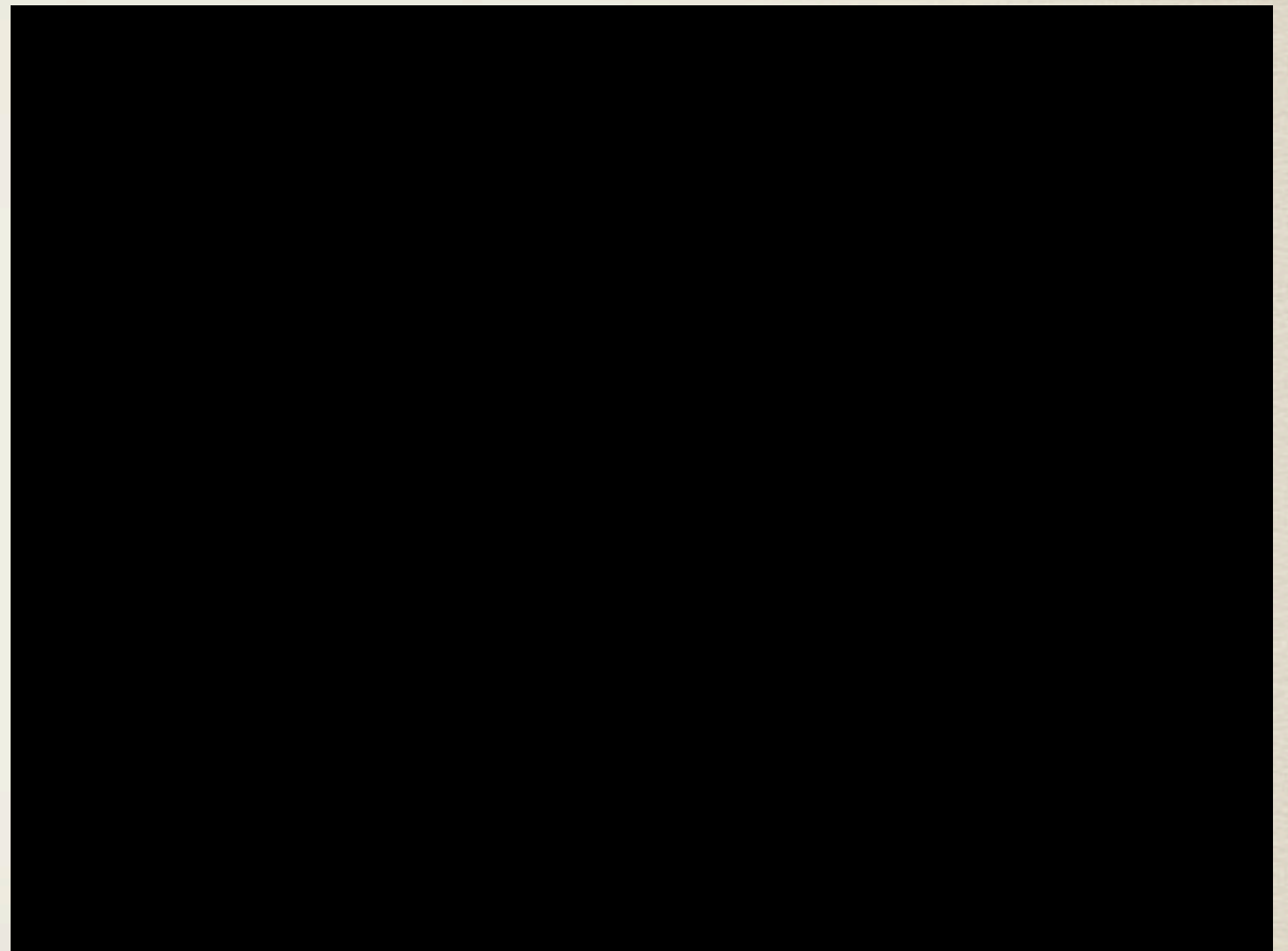
- A. The neurotransmitter is denatured.
- B. The postsynaptic membrane remains polarized.
- C. The synaptic vesicles release neurotransmitters.
- D. Contractile proteins pull synaptic vesicles to the membrane.

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Transmission Across the Synapse

- When an action potential arrives at the axon bulb of the presynaptic neuron it causes the membrane to become very **permeable** to **Ca²⁺ ions**
- The **Ca²⁺ ions** diffuse from the synaptic cleft **into** the axon bulb
- The increase in positive charge stimulates the **vesicles** to fuse with the cell membrane of the axon bulb
- The vesicles **release** their **neurotransmitter molecules** into the synaptic cleft
- The **neurotransmitter molecules** diffuse across the synaptic cleft and bind to **receptor proteins** on the postsynaptic membrane



59. Fluid in the proximal convoluted tubule flows directly into the

- A. glomerulus.
- B. loop of Henle.
- C. efferent arteriole.
- D. distal convoluted tubule.

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- A. increased blood volume and increased urine production
- B. increased blood volume and decreased urine production
- C. decreased blood volume and increased urine production
- D. decreased blood volume and decreased urine production

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B. interstitial cells.

C. seminal vesicles.

D. seminiferous tubules.

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- A. to fertilize the ovum
- B. to nourish sperm cells
- C. to increase the pH of the vagina
- D. to cause contraction of the uterus

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66. What effect does the hormone that causes development of the corpus luteum in females have in males?

- A. ejaculation
- B. sperm production
- C. testosterone production
- D. release of luteinizing hormone (LH)

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- B. secretion of estrogen by the follicle
- C. secretion of progesterone by the corpus luteum
- D. production of human chorionic gonadotropin (HCG)

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56. What structure can carry both urine or semen?

- A. the ureter
- B. the urethra
- C. the vas deferens
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- A. the head
- B. the flagellum
- C. the acrosome
- D. the mid-piece

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64. Which of the following describes the path of sperm during ejaculation?

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- B. seminiferous tubule ureter urethra
- C. seminiferous tubule urethra vas deferens
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- B. to produce testosterone
- C. to produce seminal fluid
- D. to provide a site for sperm maturation

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- B. the adrenal cortex
- C. the hypothalamus
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B. uterus

C. thalamus

D. anterior pituitary

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