

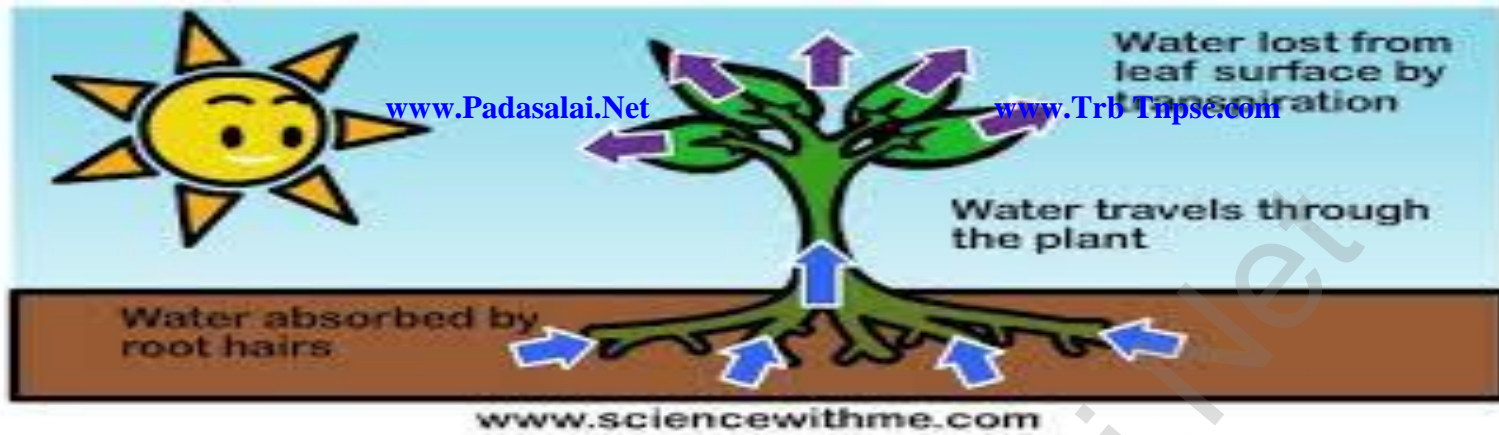
Unit 14

Transportation & circulation

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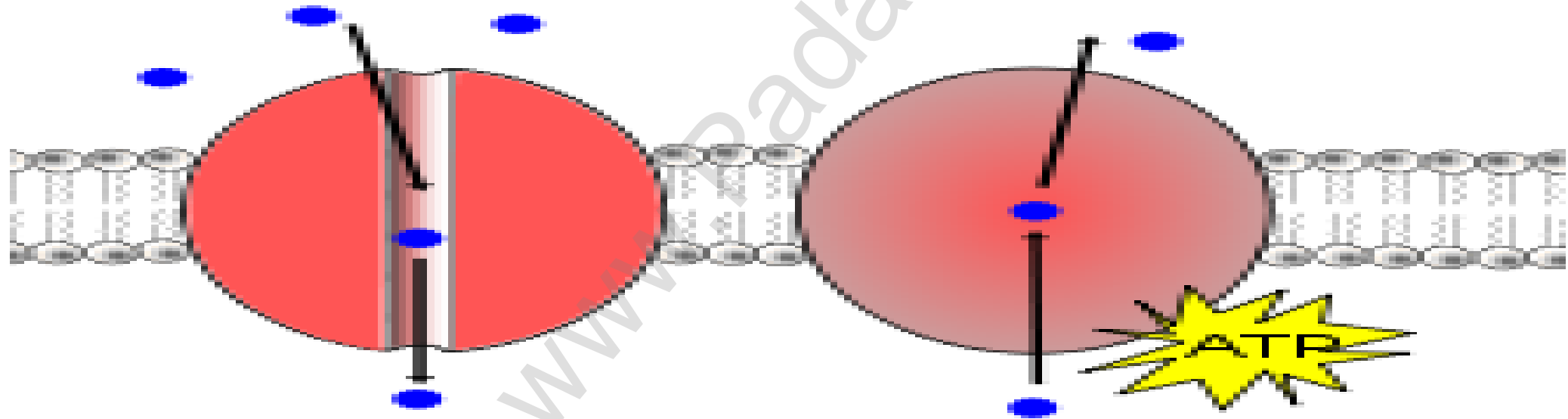
"Plants have two different types of 'transport' tissue. Xylem transports water and solutes from the roots to the leaves, phloem transports food from the leaves to the rest of the plant. Transpiration is the process by which water evaporates from the leaves, which results in more water being drawn up from the roots."

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PASSIVE TRANSPORT <small>www.Padasalai.Net</small>	ACTIVE TRANSPORT <small>www.TrbTnpsc.com</small>
high \rightarrow low	Low \rightarrow high
With the concentration gradient	Against the concentration gradient
No energy required	Energy required
Diffusion & osmosis	Active transport



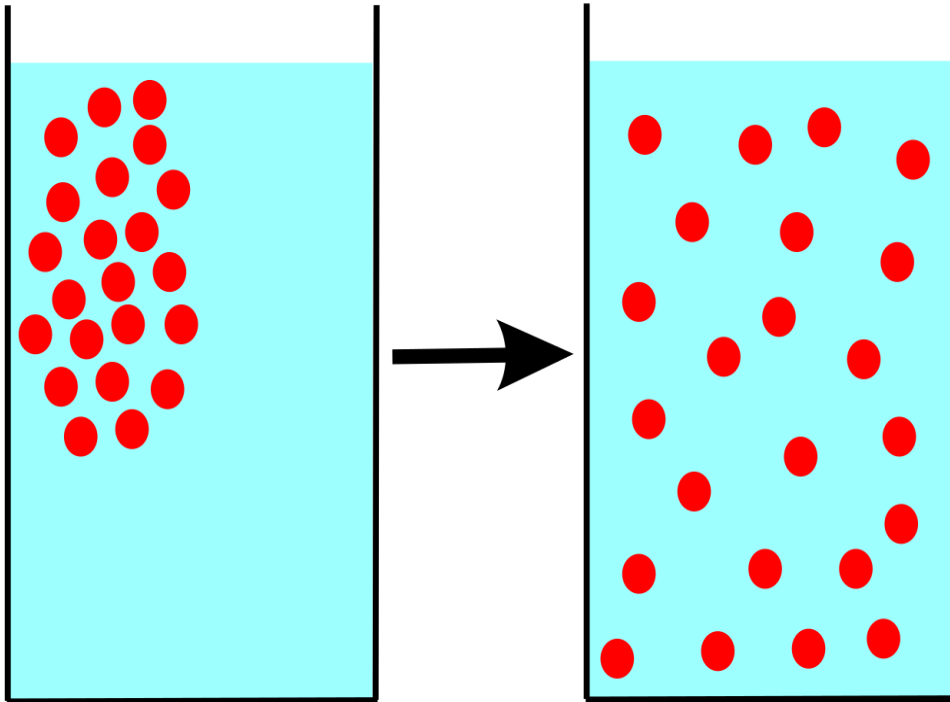
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DIFFUSION

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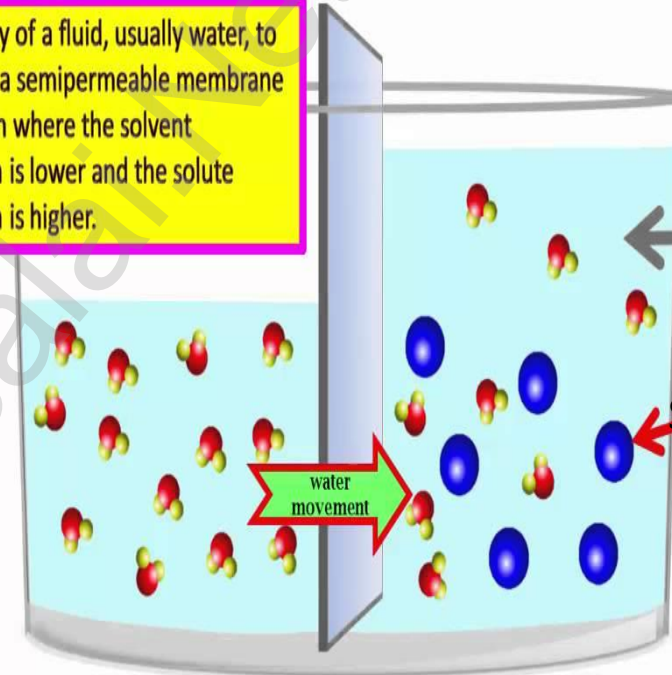


Movements Of Molecules In Liquid And Solids

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Osmosis

- the tendency of a fluid, usually water, to pass through a semipermeable membrane into a solution where the solvent concentration is lower and the solute concentration is higher.



Water is the solvent

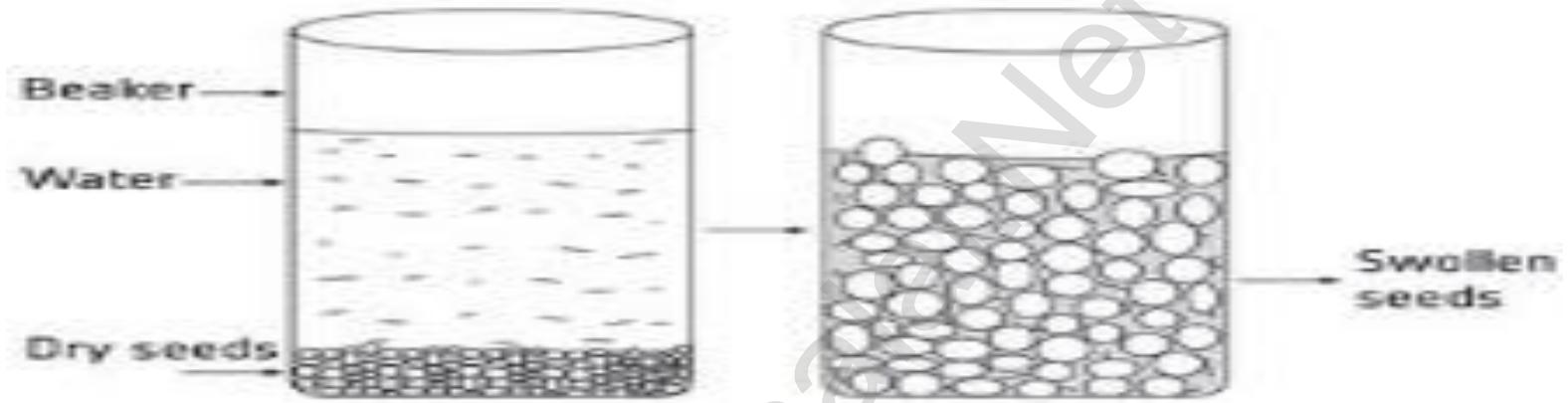
Sugar is the solute

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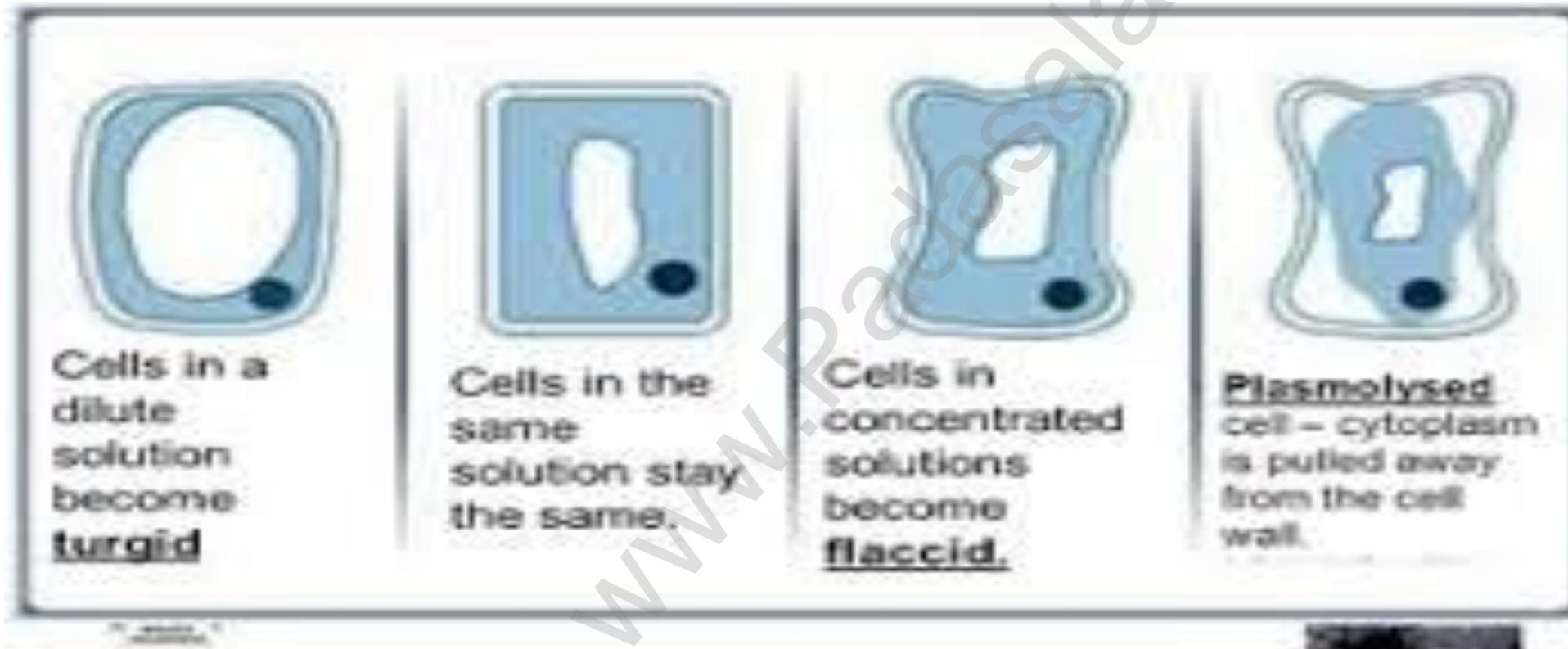
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PLASMOLYSIS

Effects of Osmosis on Plant Cells

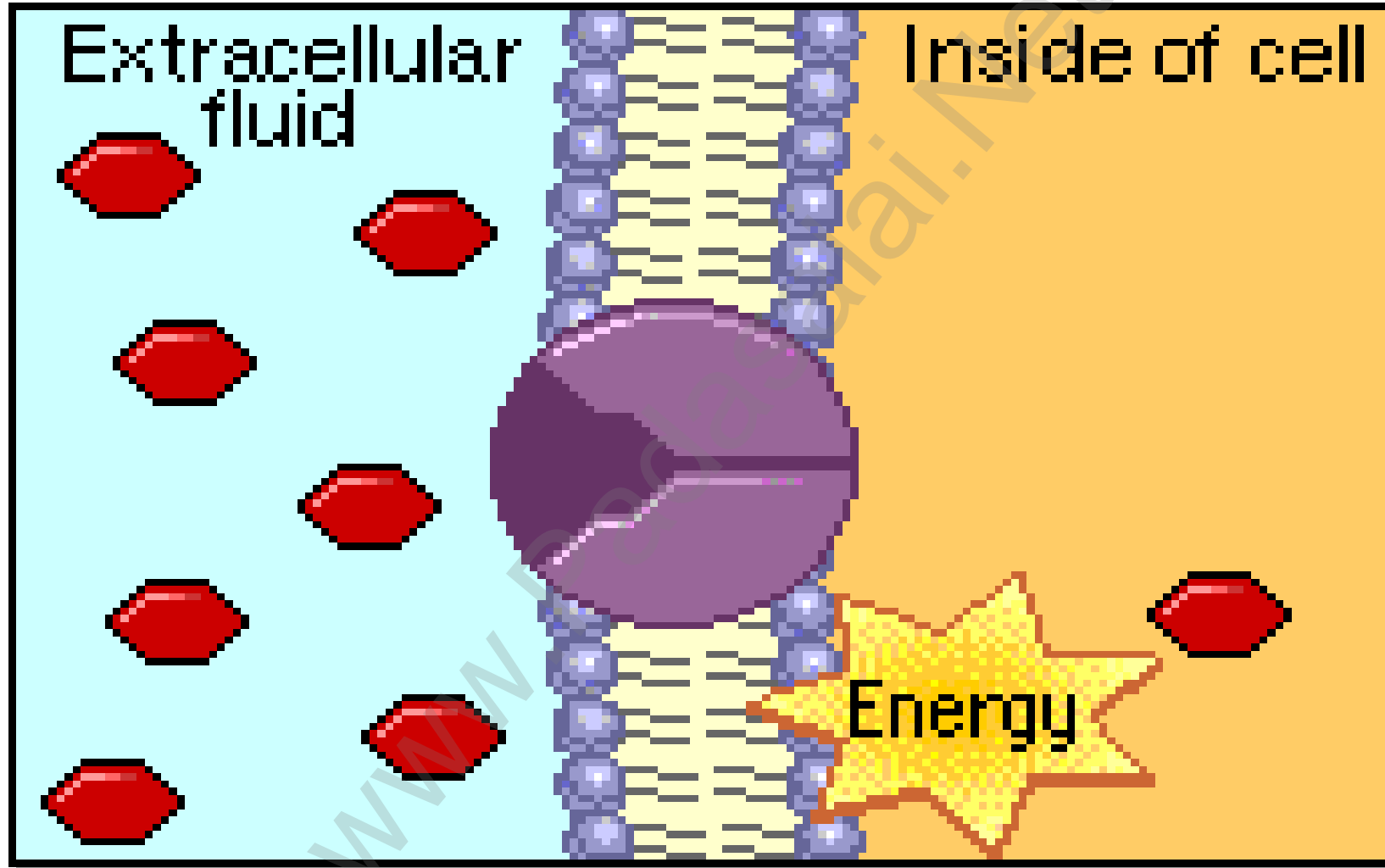


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Active Transport



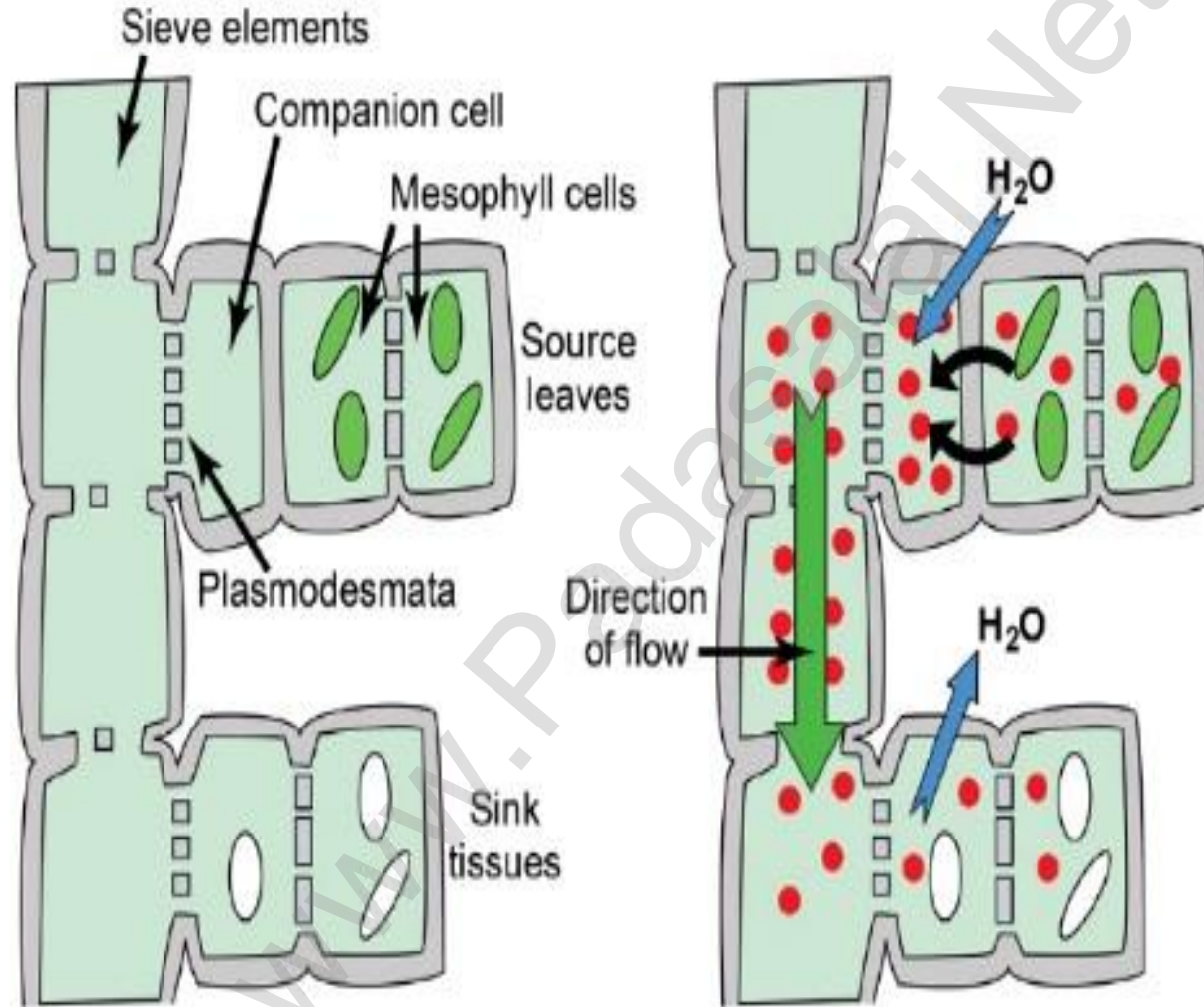
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ENERGY IS A NEEDED AGAINST CONCENTRATION GRADIENT FROM A LOWER CONCENTRATION TO HIGHER CONCENTRATION ACROSS CELL MEMBRANES.

Active transport in root hair

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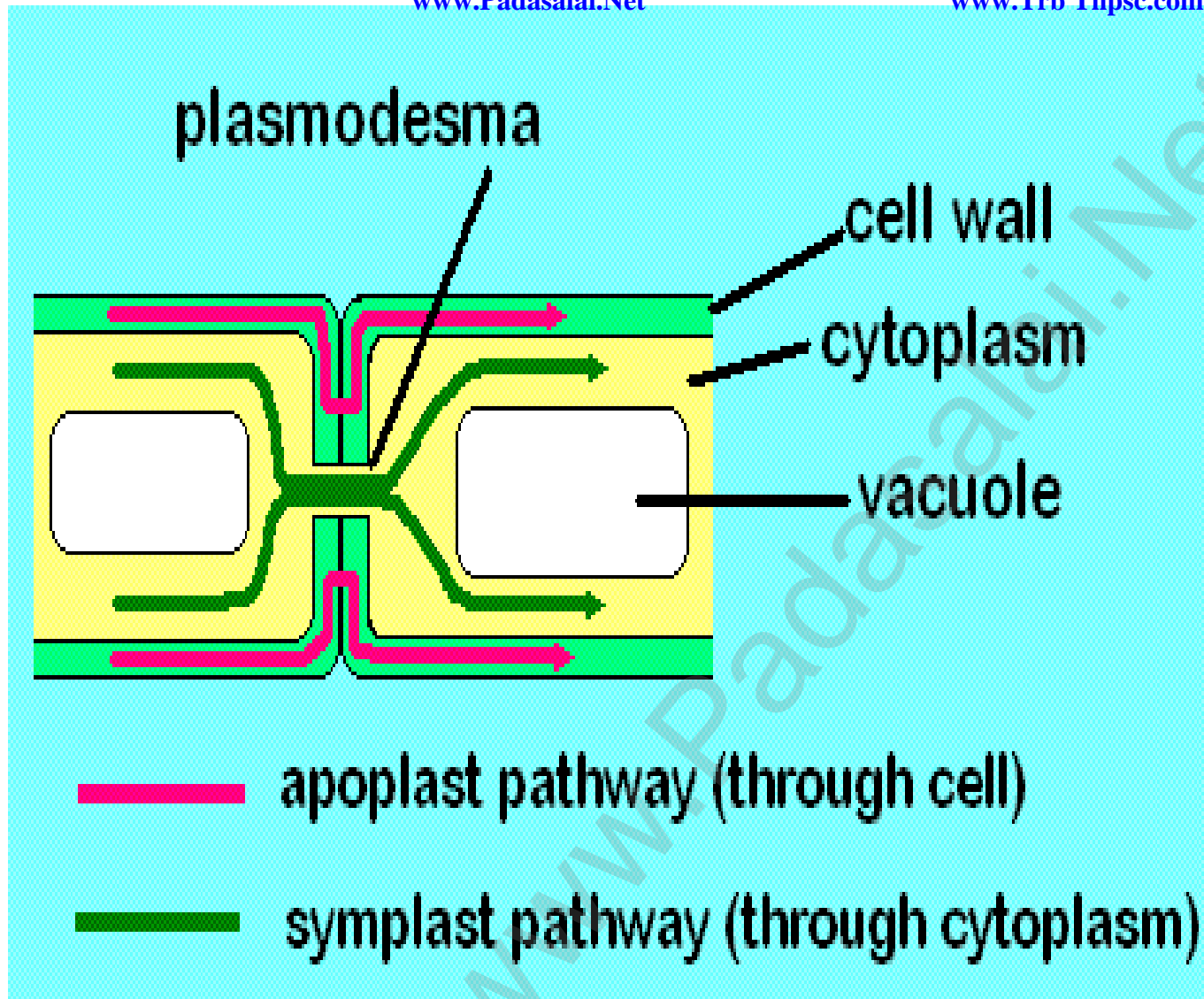
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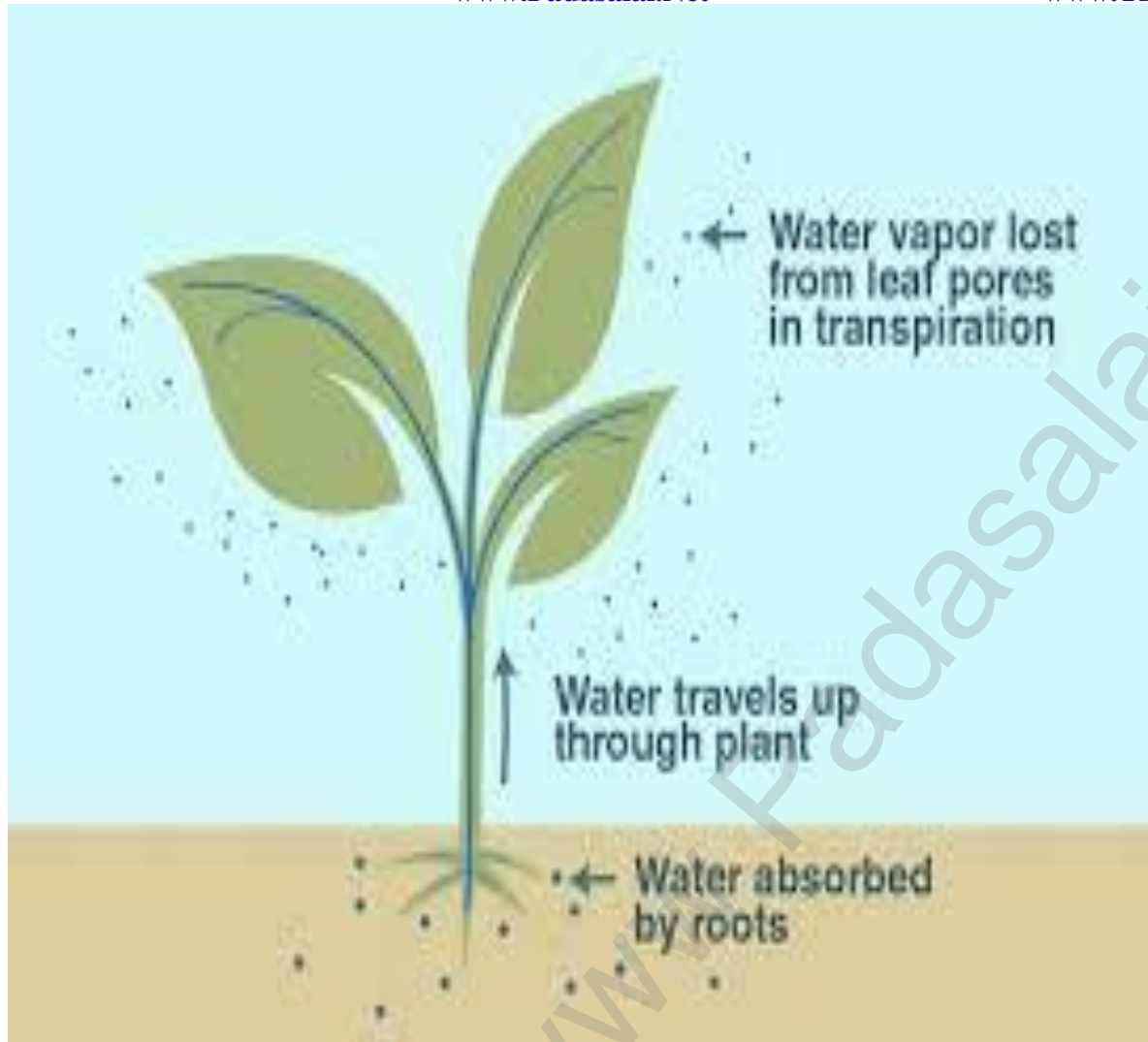
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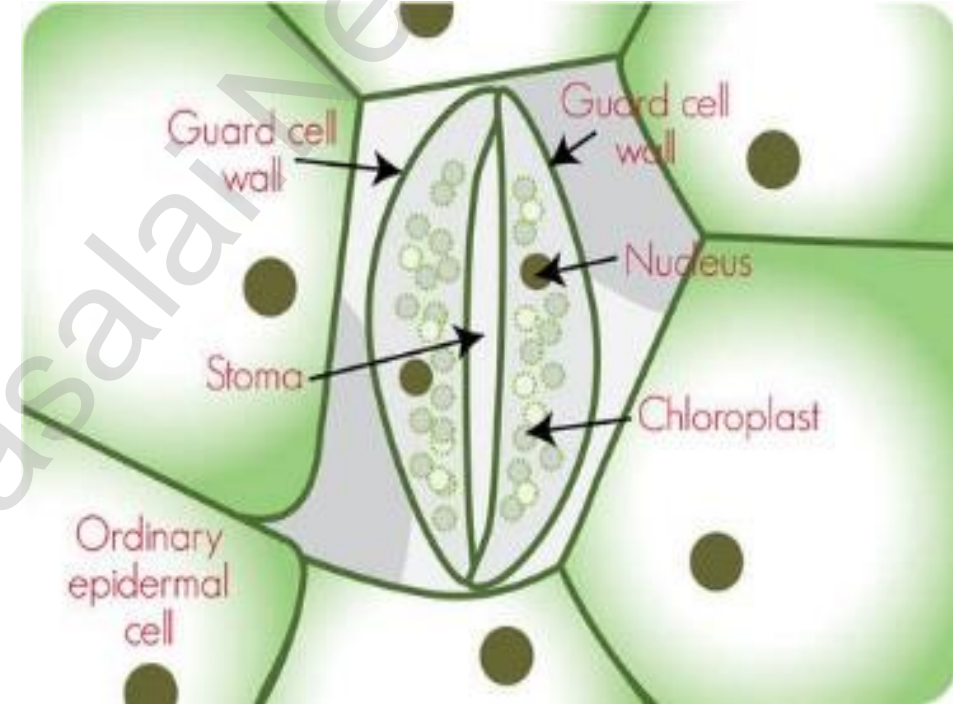
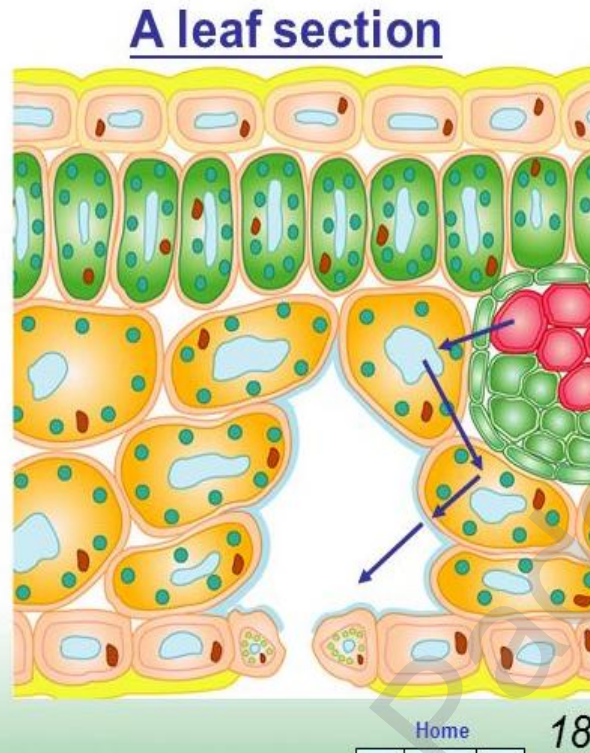
Transpiration

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The creation of transpiration pull

Cells draw water from the xylem vessels, pulling water up the plant.

→ **transpiration pull**
(蒸騰牽引力) is created



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Internal factors affecting on transpiration

- 1. Number of leaves:** More leaves (or **spines**, or other **photosynthesizing organs**) means a bigger surface area and more stomata for **gaseous exchange**. This will result in greater water loss.
- 2. Number of stomata:** more stomata will provide more pores for **transpiration**.
- 3. Size of the leaf:** A leaf with a bigger **surface area** will transpire faster than a leaf with a smaller **surface area**.
- 4. Presence of plant cuticle:** A **waxy cuticle** is relatively impermeable to water and water vapour and reduces **evaporation** from the **plant surface** except via the **stomata**.

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TRANSPORT OF WATER

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<https://www.youtube.com/watch?v=nFL2YNgNb68>



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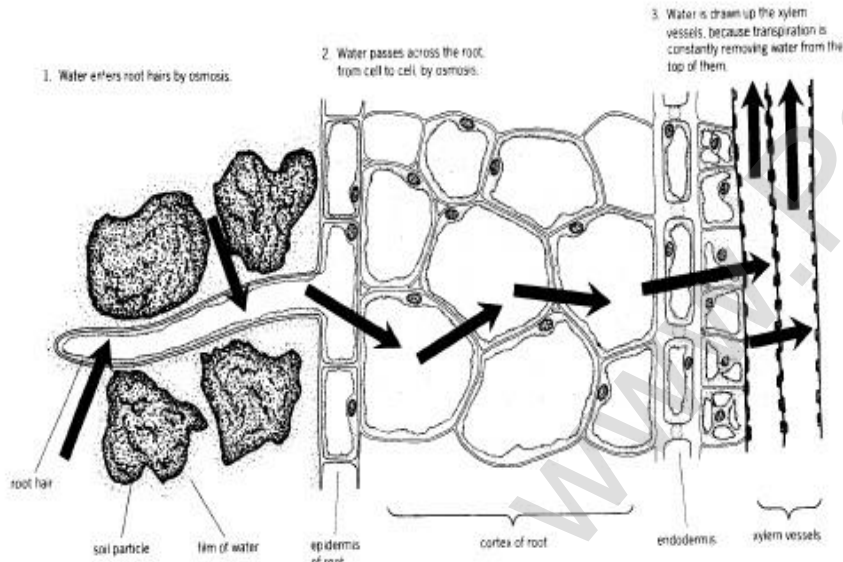
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ROOT PRESSURE

Root Pressure

- Uptake of water by the root hair by Osmosis
- Uptake of dissolved minerals through **active transport**
 - Cell sap within the root hairs becomes more concentrated than the water in the soil



Xylem



Phloem

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Ascent of sap

UPWARD MOVEMENT OF WATER AND MINERALS

<https://www.youtube.com/watch?v=15pfVed0eLk>

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PHYSICAL FORCE

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Theory of Physical Force

According to the Physical Force theories, the ascent of sap for most part is purely due to physical forces. The living cells in the stem play only a minor role in the process. Here are some physical force theories stated below:

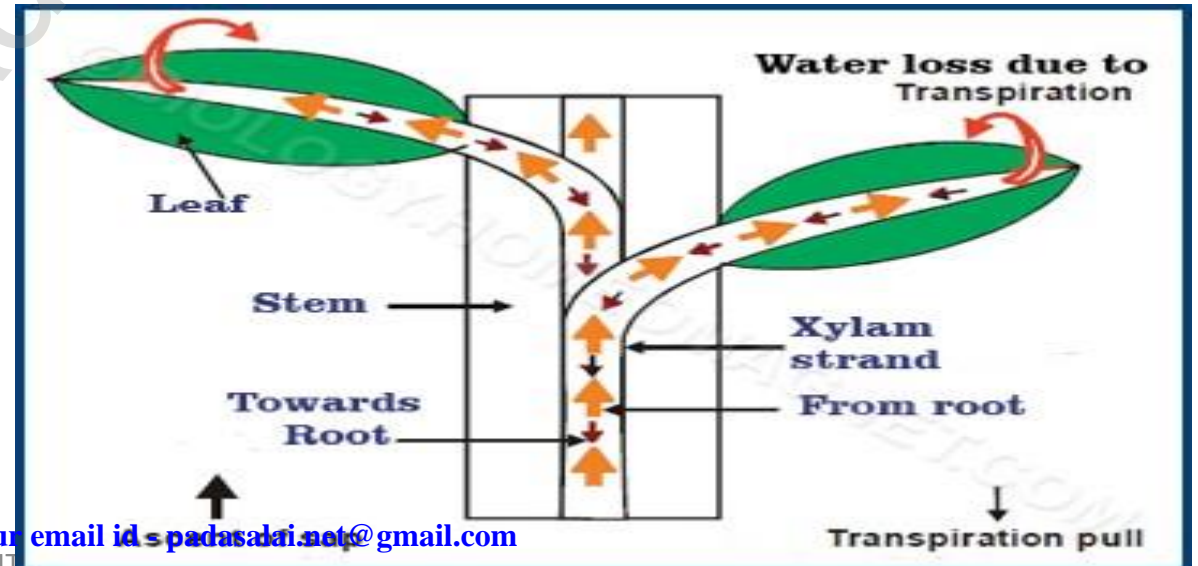
CAPILLARY FORCE THEORY

Christian Wolf proposed this theory in 1873 and he suggests that water rises up in the narrow tubes of xylem vessels by surface tension. The ascent of sap in tall trees, however, is not possible by capillary force.

ATMOSPHERIC PRESSURE THEORY

According to this theory, atmospheric pressure is responsible for ascent of sap. This theory, however, is not applicable to tall trees as due to atmospheric pressure water can rise only up to 10.4 meters and not more. So this theory is not quite acceptable.

TRANSPIRATION PULL-COHESIVE FORCE THEORY



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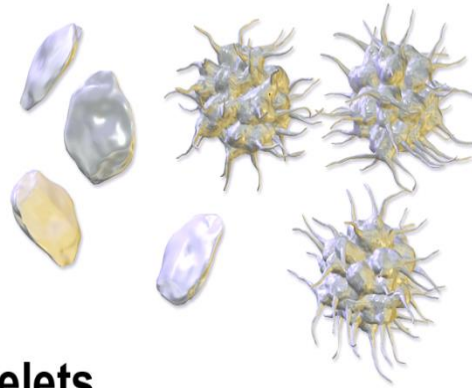
Formed Elements of Blood

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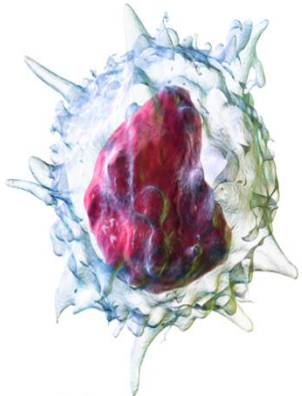
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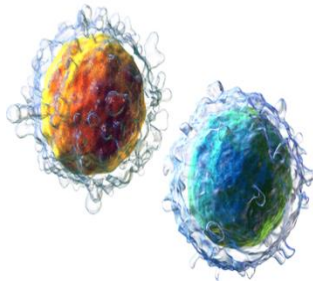
Red Blood Cells



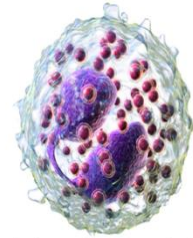
Platelets



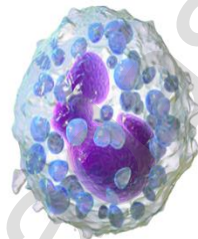
Monocyte



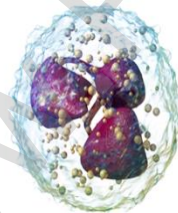
Lymphocytes



Eosinophil



Basophil



Neutrophil

White Blood Cells

Leukocytes =

Granulocytes

Neutrophils

Eosinophils

Basophils

Agranulocytes

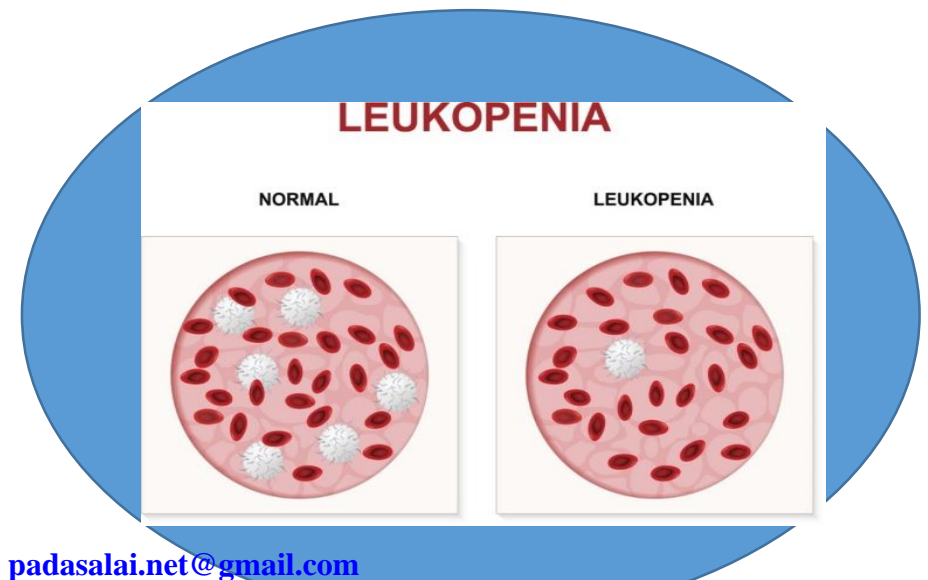
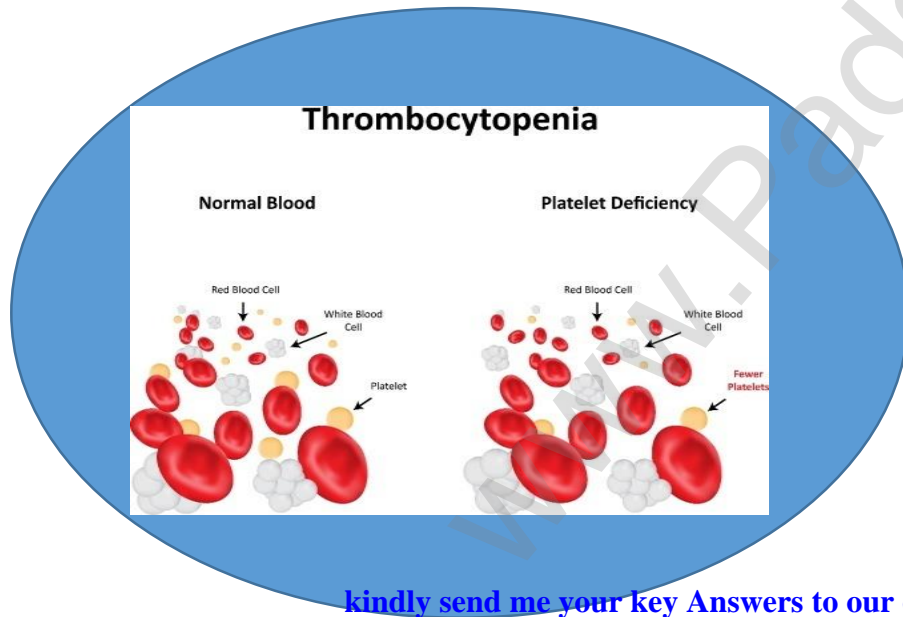
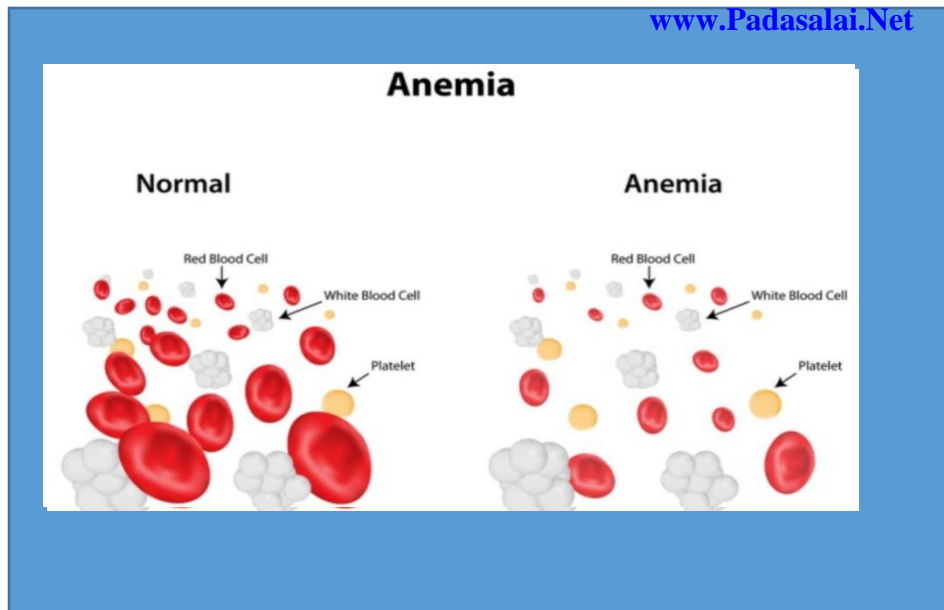
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Blood Functions

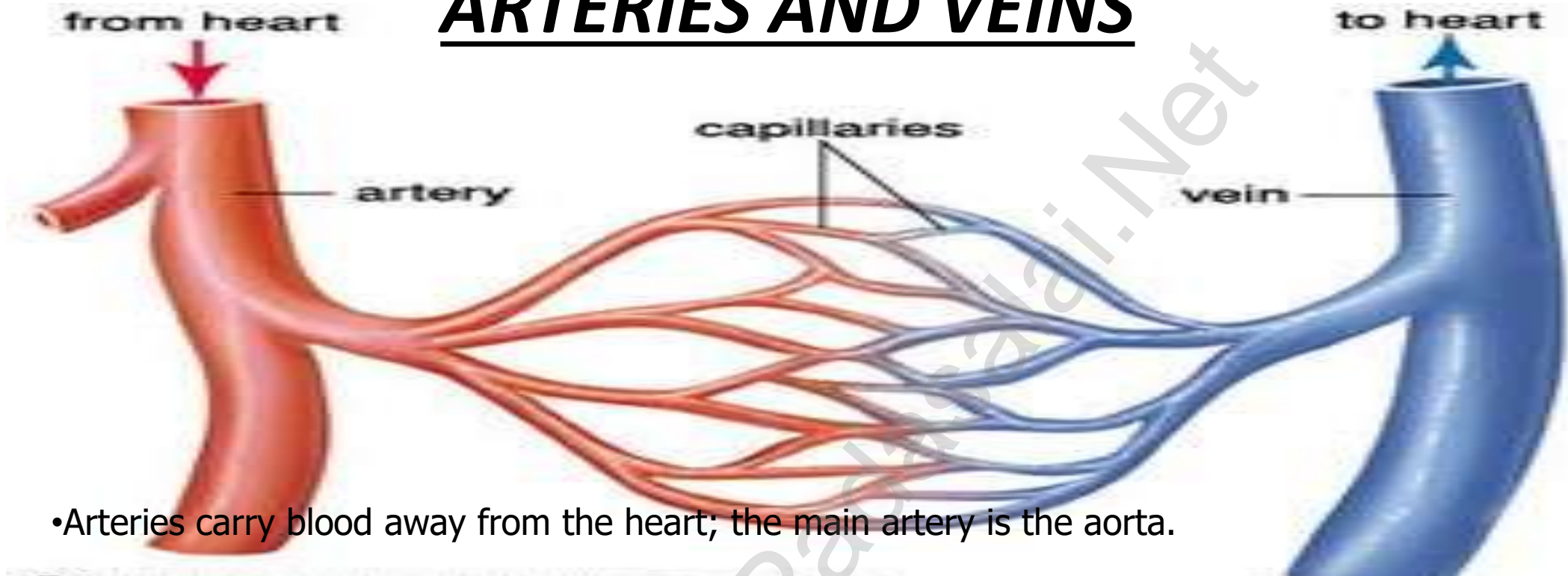
- Transportation: Blood transports oxygen and nutrients to cells, CO₂ and waste away from cells, hormones to target tissues
- Regulation: Helps maintain stable body temperature, pH, water and electrolyte levels
- Protection: Clotting prevents fluid loss, white blood cells protect body against disease



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ARTERIES AND VEINS



- Arteries carry blood away from the heart; the main artery is the aorta.
- Smaller arteries called arterioles diverge into capillary beds, which contain 10-100 capillaries that branch among the cells and tissues of the body.
- Veins are blood vessels that bring blood back to the heart and drain blood from organs and limbs.
- Capillaries carry blood away from the body and exchange nutrients, waste, and oxygen with tissues at the cellular level

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ARTERIES AND VEINS

Arteries	Veins
◆ Carry blood away from the heart	◆ Carry blood towards the heart
◆ Blood is under great pressure in arteries, hence it flows fast, in spurts, reflecting the rhythmic pumping action of the heart	◆ Blood is not under great pressure in veins, hence it flows more slowly and smoothly
◆ Have thick and elastic muscular walls	◆ Have relatively thin, slightly muscular walls
◆ Have no valves	◆ Have semi-lunar valves along their lengths to prevent back flow of blood
◆ Carry red oxygenated blood (exception: pulmonary arteries which carry deoxygenated blood from the heart to the lungs)	◆ Carry bluish-red deoxygenated blood (exception: pulmonary veins which carry oxygenated blood from the lungs to the heart)

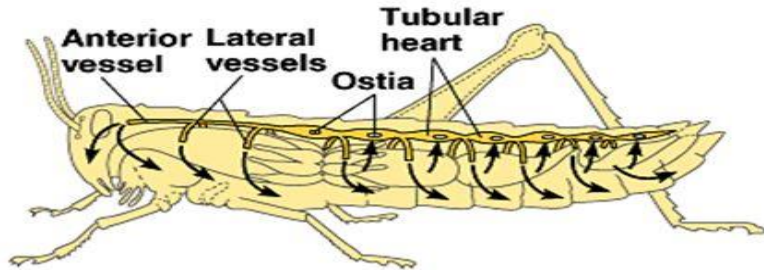
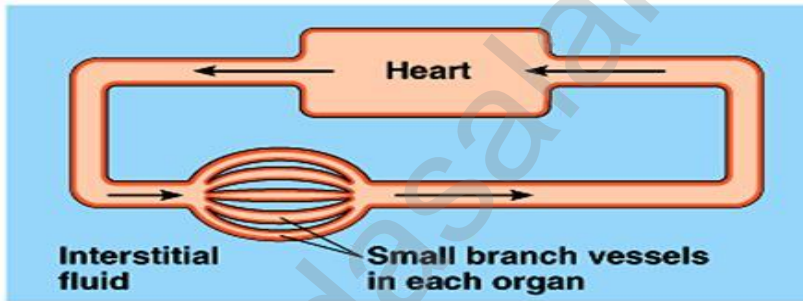
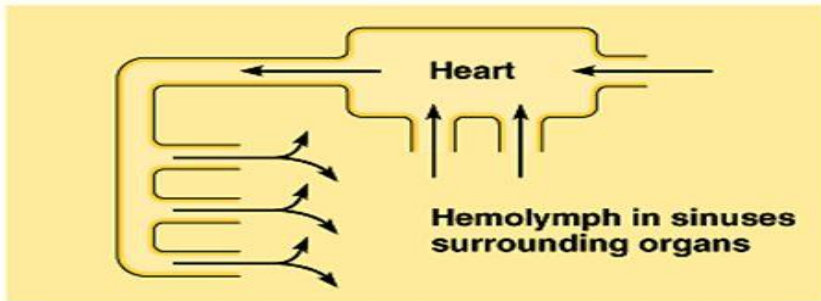
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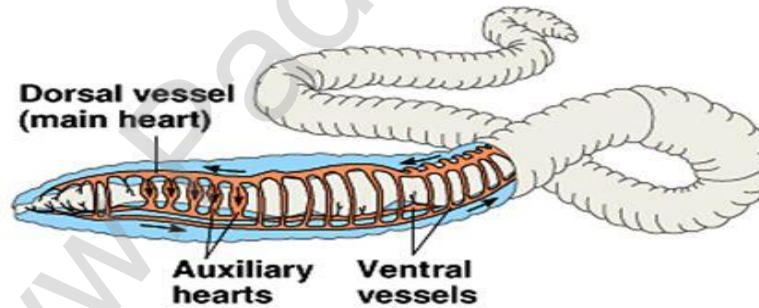
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Type of circulatory system

Open circulatory system- hemolymph- sinuses- arthropods respiratory pigment hemocyanin is not contain in cells and is very diffuse in the hemolymph



(a) Open circulatory system



(b) Closed circulatory system

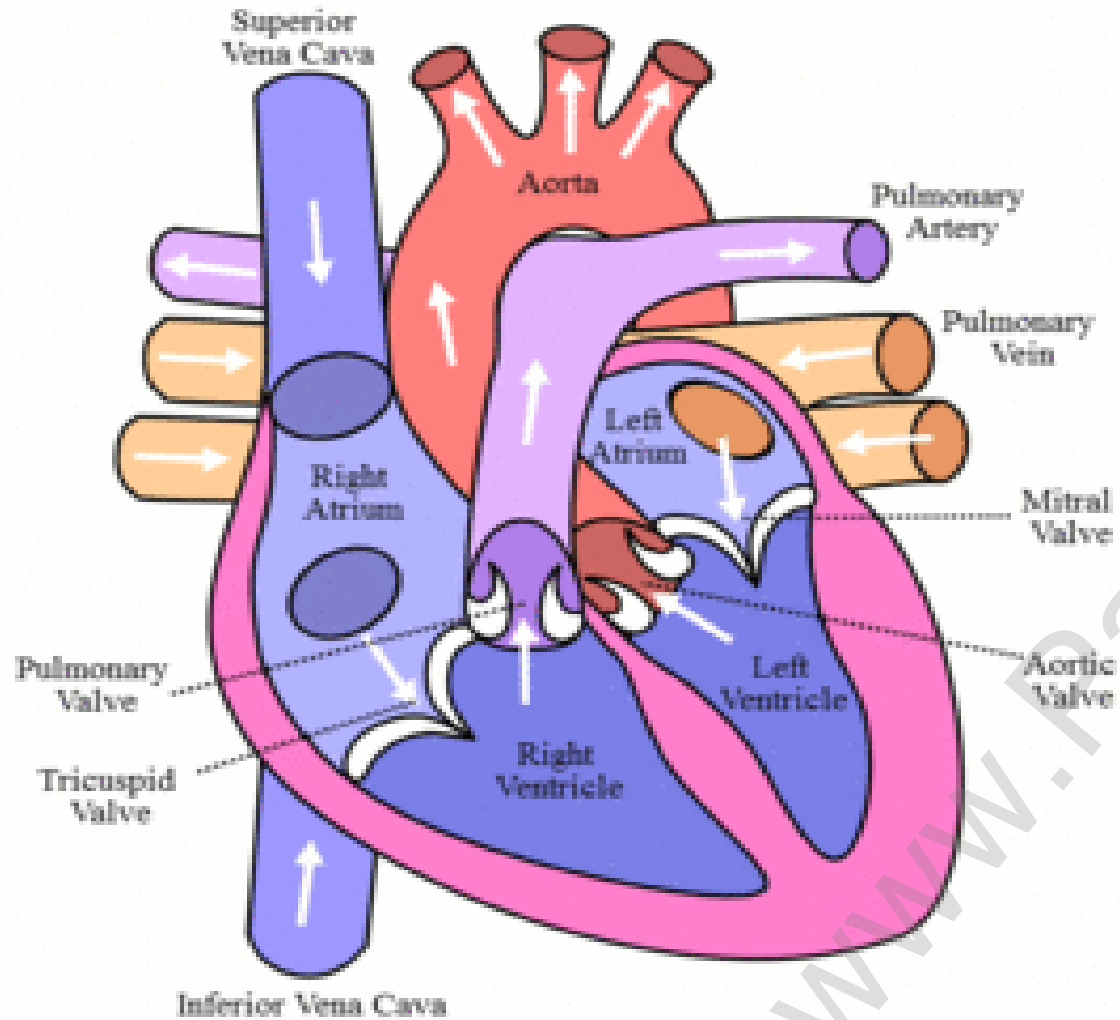
I- Circulation

1. open circulatory system: blood does not stay within vessels, empties into sinuses; examples: arthropods, most mollusks
2. closed circulatory system: blood remains within vessels examples: annelids, some mollusks and vertebrates

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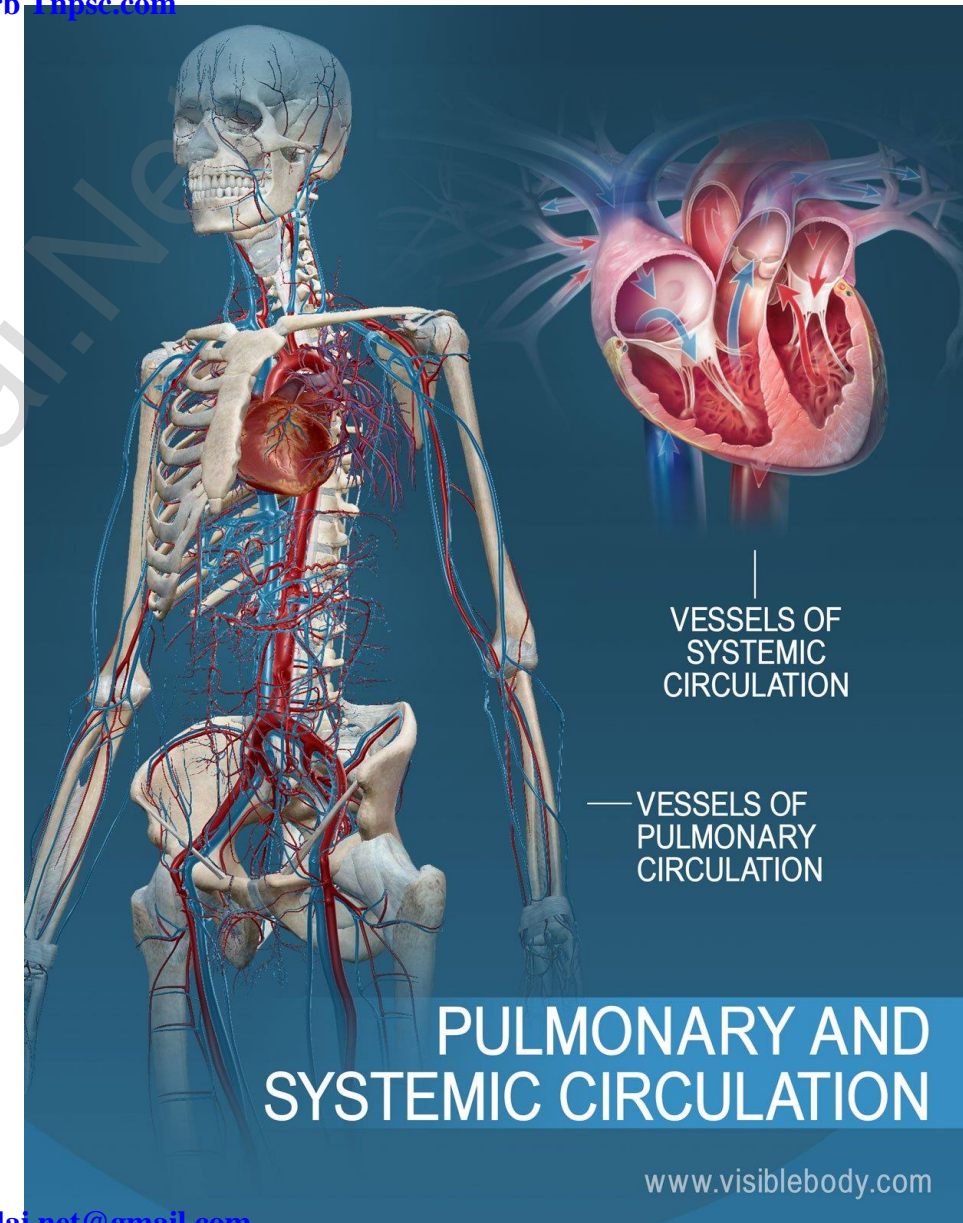
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TYPES OF CIRCULATION

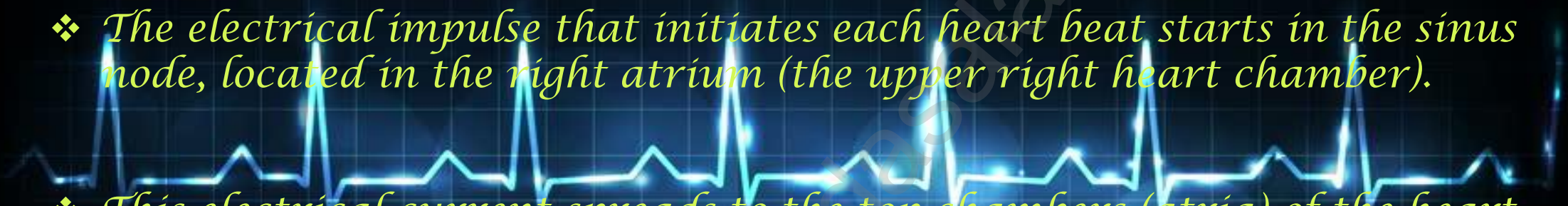
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- ❖ **Pulmonary circulation** moves blood between the heart and the lungs.
- ❖ It transports deoxygenated blood to the lungs to absorb oxygen and release carbon dioxide.
- ❖ The oxygenated blood then flows back to the heart.
- ❖ **Systemic circulation** moves blood between the heart and the rest of the body.
- ❖ It sends oxygenated blood out to cells and returns deoxygenated blood to the heart.
- ❖ **Coronary circulation** is the **circulation** of blood in the blood vessels that supply the **heart** muscle(myocardium).
- ❖ **Coronary arteries** supply oxygenated blood to the **heart** muscle, and **cardiac** veins drain away the blood once it has been deoxygenated.



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- 
- ❖ *It is the contraction of this muscle which constitutes a heart 'beat'.*
 - ❖ *The electrical impulse that initiates each heart beat starts in the sinus node, located in the right atrium (the upper right heart chamber).*
 - ❖ *This electrical current spreads to the top chambers (atria) of the heart, then to the lower chambers (ventricles), causing the muscles to contract and blood to be pumped.*
 - ❖ *72-75times per minute*

INITIATION AND CONDUCTION OF HEART BEAT

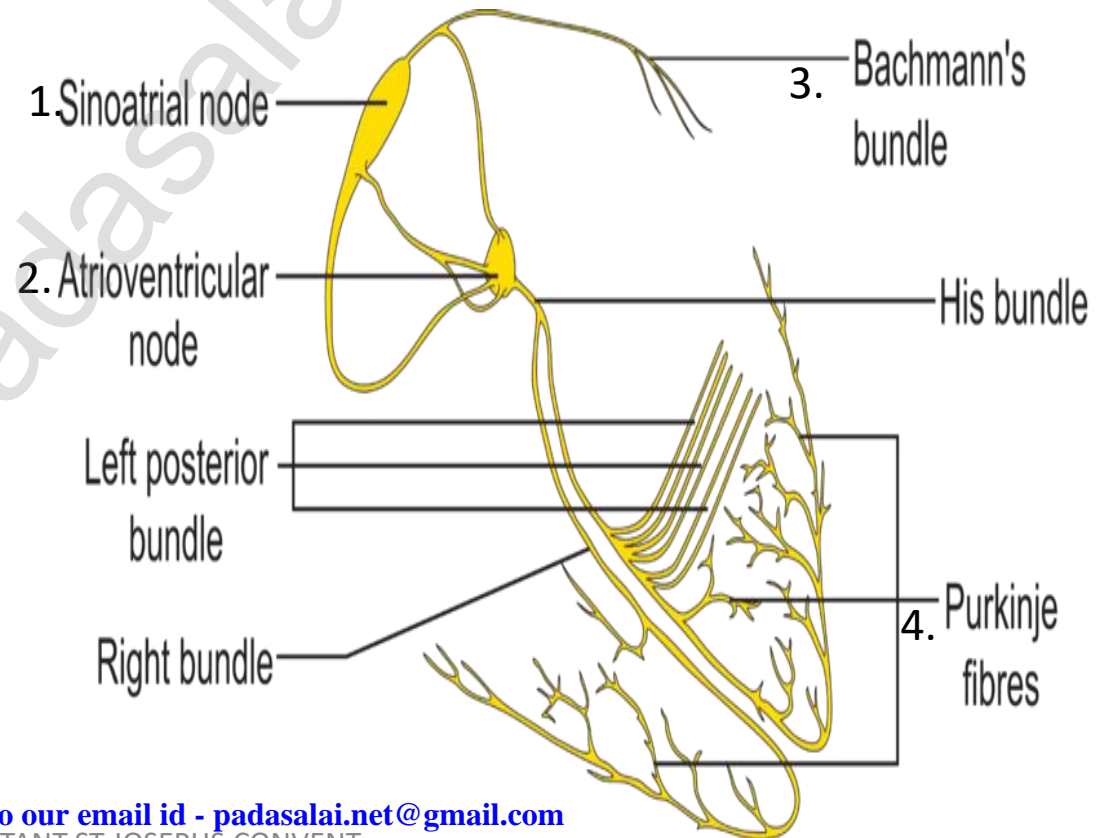
MYOGENIC

Step 1: SA NODE Pacemaker Impulse Generation

Step 2: AV Node Impulse Conduction

Step 3: AV Bundle Impulse Conduction

Step 4: **Purkinje Fibers Impulse Conduction**



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PULSE:

Pulse: The rhythmic dilation of an artery that results from beating of the heart. Pulse is often measured by feeling the artery on the wrist or neck.

A normal resting heart rate is between 60 and 100 beats per minute (bpm), depending on the person's physical condition and age. For children ages 6 to 15, the normal resting heart rate is between 70 and 100 bpm,



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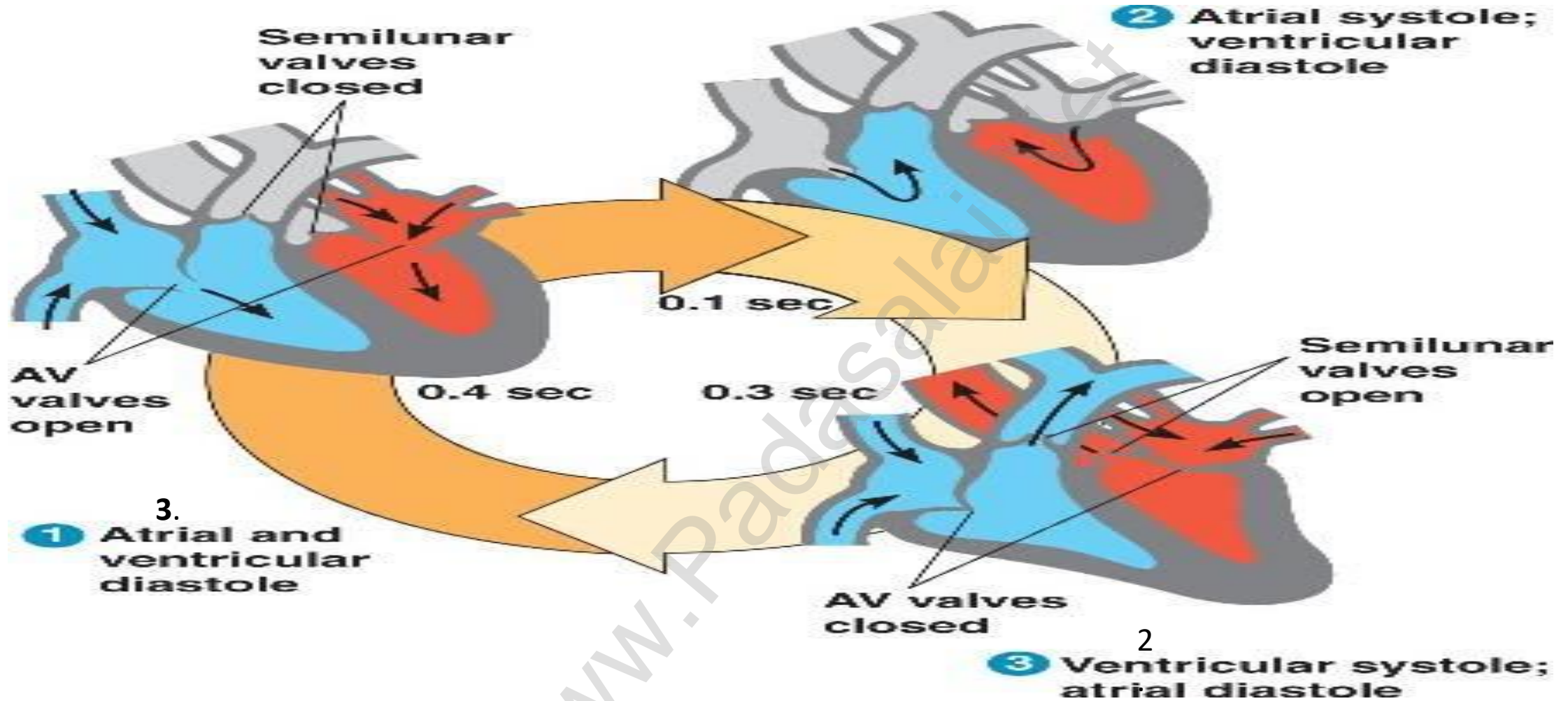
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CARDIAC CYCLE

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1.



The **cardiac cycle** comprises a complete relaxation and contraction of both the atria and ventricles, and lasts approximately 0.8 seconds.

Beginning with all chambers in diastole, blood flows passively from the veins into the atria and past the atrioventricular valves into the ventricles.

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HEART SOUND

LUBB-closure of tricuspid valve
DUPP-closure of semilunar valve

<https://www.youtube.com/watch?v=pMV3y8r6WOU>

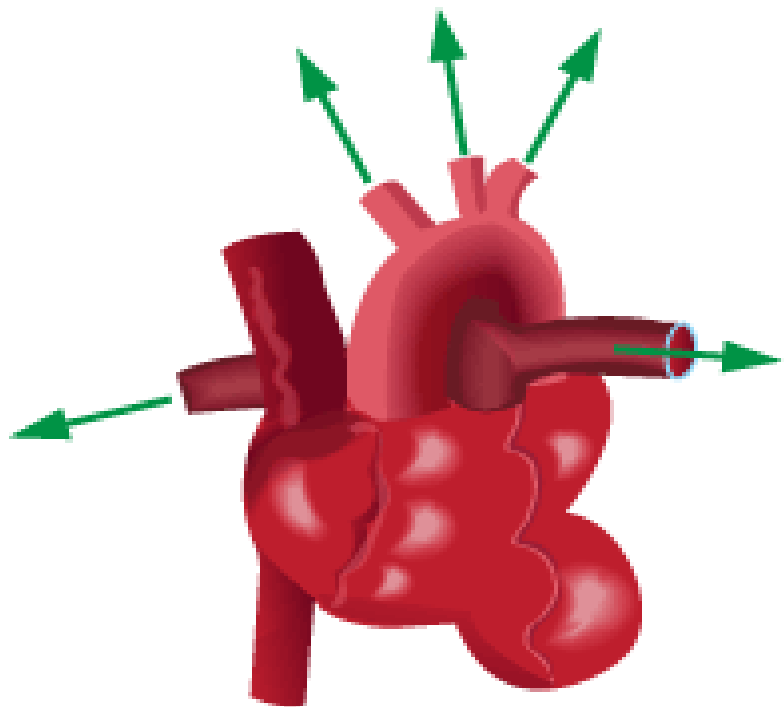
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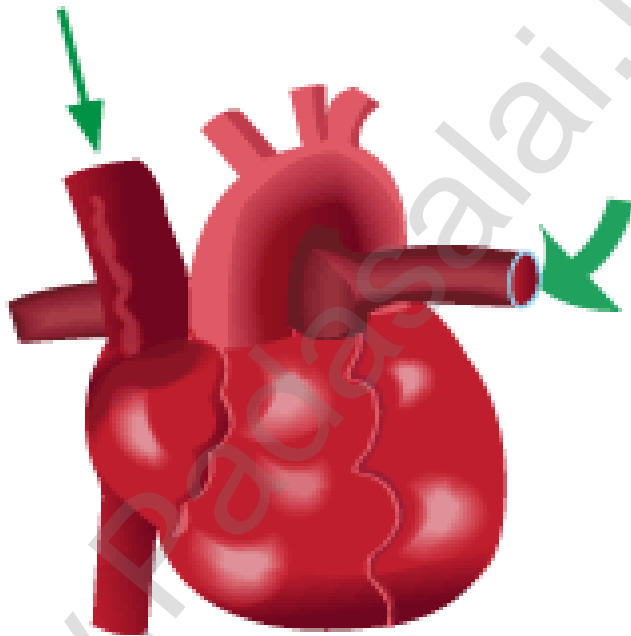
BLOOD PRESSURE

120mg/80mm Hg



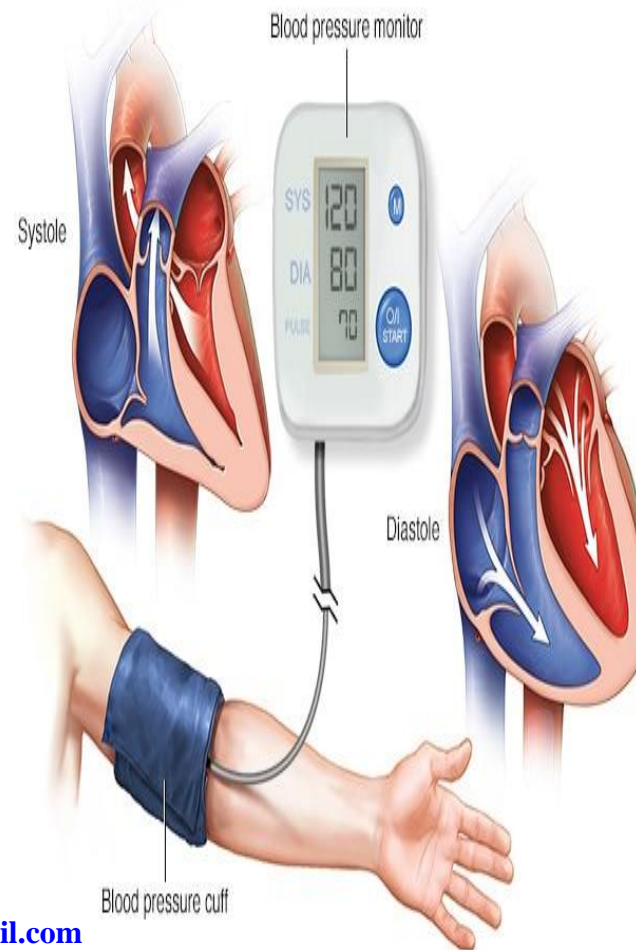
SYSTOLIC

In the systolic phase the heart contracts, blood pressure rises and blood moves out along the vessels



DIASTOLIC

In the diastolic phase the heart relaxes, blood pressure falls and the blood fills the heart



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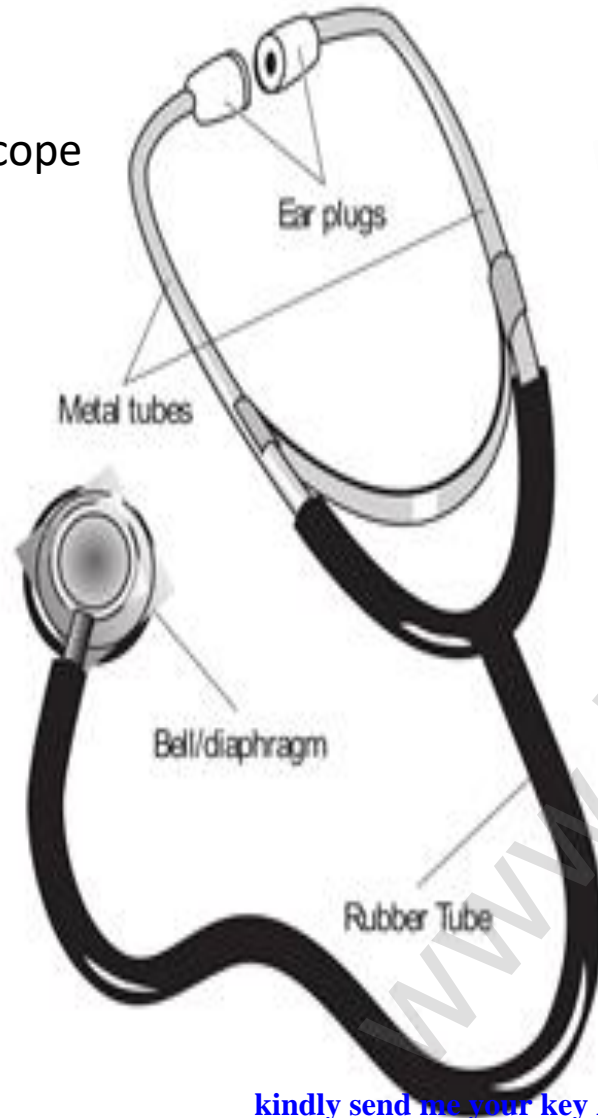
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BLOOD PRESSURE

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stethoscope



sphygmomanometer



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Blood Groups

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➤ A **Blood Type** (Also Called A **Blood Group**) Is A Classification Of **Blood**, Based On The Presence And Absence Of Antibodies And Inherited Antigenic Substances On The Surface Of Red **Blood** Cells (Rbcs).

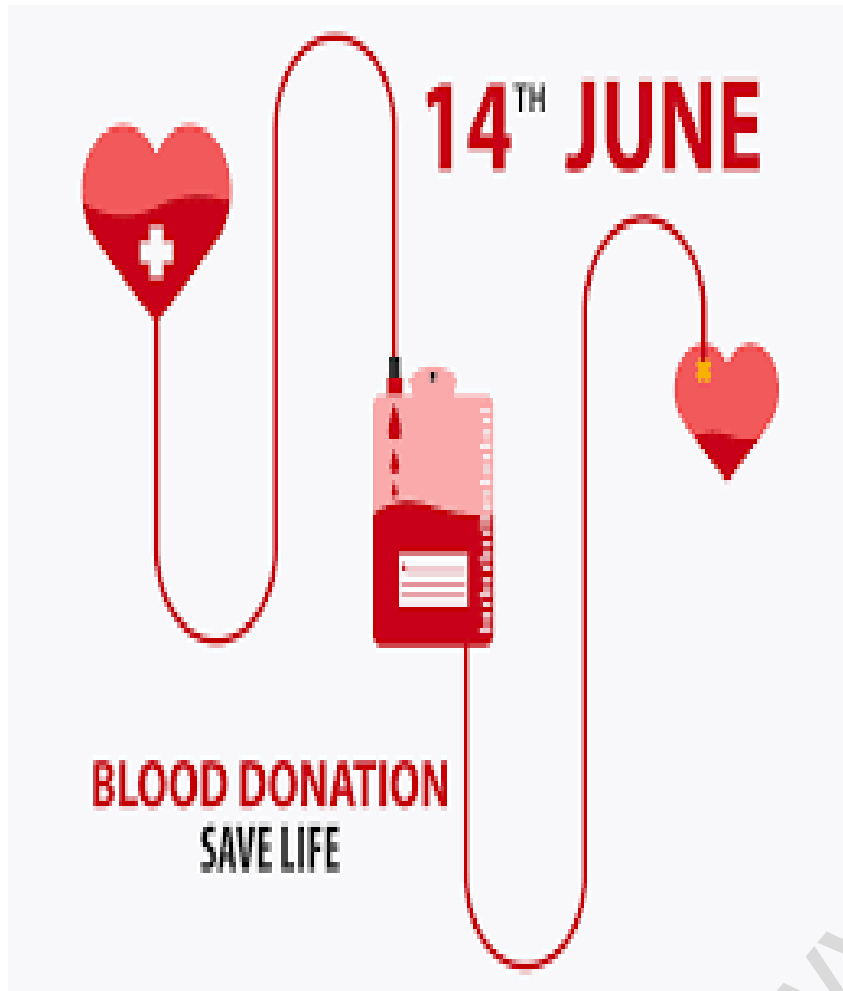
➤ These Antigens May Be Proteins, Carbohydrates, Glycoproteins, Or Glycolipids, Depending On The **Blood Group** System.

Blood Group	Gives to these groups	Receives from these groups
O ⁻	All	O ⁻ only
O ⁺	AB ⁺ , A ⁺ , B ⁺ , O ⁺	O ⁻ and O ⁺
A ⁻	AB ⁻ , AB ⁺ , A ⁺ , A ⁻	O ⁻ and A ⁻
A ⁺	AB ⁺ and A ⁺	O ⁻ , O ⁺ , A ⁻ , A ⁺
B ⁻	B ⁻ , B ⁺ , AB ⁻ , AB ⁺	O ⁻ and B ⁻
B ⁺	B ⁺ and AB ⁺	O ⁻ , O ⁺ , B ⁻ , B ⁺
AB ⁻	AB ⁻ and AB ⁺	O ⁻ , A ⁻ , B ⁻ , AB ⁻
AB ⁺	AB ⁺ only	All

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The lymphatic system

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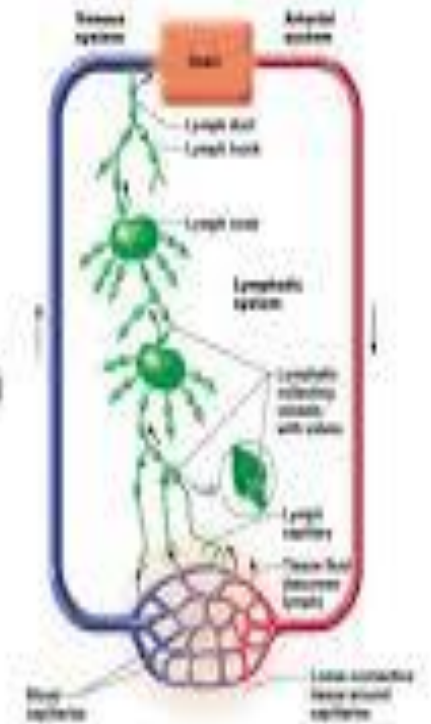
❖ The lymphatic system is A network of tissues and organs that help rid the body of toxins, waste and other unwanted materials.

❖ The primary function of the lymphatic system is to transport lymph, A fluid containing infection-fighting white blood cells, throughout the body.

The Lymphatic System

• Lymphatic system functions:

- Transport clean fluids back to the blood
- Drains excess fluids from tissues
- Removes "debris" from cells of body
- Transports fats from digestive system



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Thank you



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