

Transport

I. ANIMALS

TWO body systems work together:

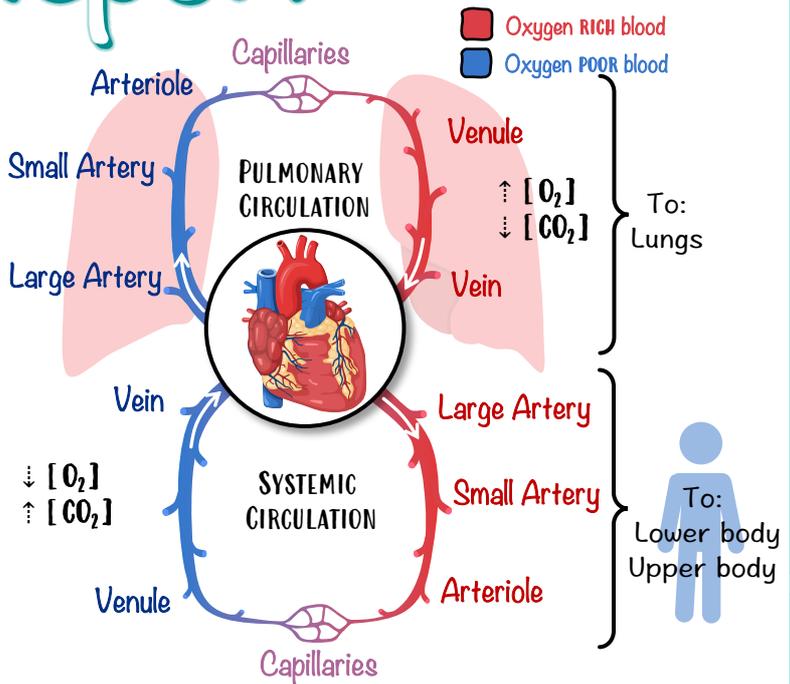
Respiratory System: Helps bring air into our body and into our blood stream.

Cardiovascular System: Helps us distribute the blood (containing nutrients and oxygen) to all the cells of our body.

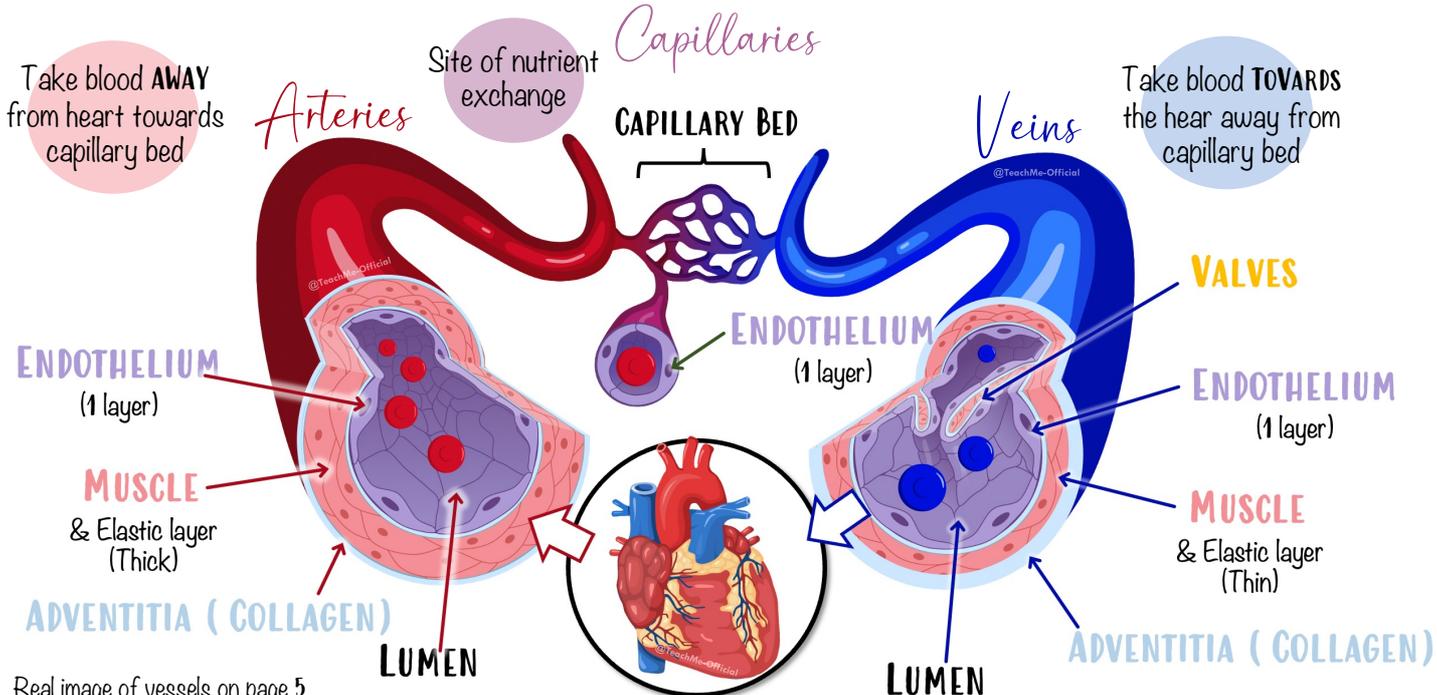
BIG BRAIN TIP!

O₂ Arteries - Away from heart
CO₂ Veins - Towards the heart

The identification "artery" or "vein" is **NOT** based on the level of blood oxygenation in the blood so **NOT** color based.



THE BLOOD VESSEL SYSTEM



Real image of vessels on page 5

ARTERIES

- Thicker (Withstand more pressure)
- ENDOTHELIUM:** Reduce Friction
- MUSCLE (THICK):** Contract* (strong)
- MORE ELASTIC LAYERS:** Stretch and recoil*
- LUMEN (SMALL):** Keep pressure and blood flow
- ADVENTITIA:** Strength

*See "why are arteries elastic" on page 2

CAPILLARIES

- Very thin, and permeable.
- ENDOTHELIUM:** Reduce Friction
- 
- LUMEN (VERY SMALL):** Slow flow (exchange of waste for nutrients)
- Fenestrated (intestine, & kidney)
- Other - Highly branched (each cell is close)

VEINS

- Thinner (Withstand less pressure)
- ENDOTHELIUM:** Reduce Friction
- MUSCLE (THICK):** Contract (weak)
- LESS ELASTIC LAYERS:** Stretch and recoil
- LUMEN (LARGE):** Large capacity
- VALVES:** Prevent backflow**
- ADVENTITIA:** Strength

**See "how do valves work" on page 2

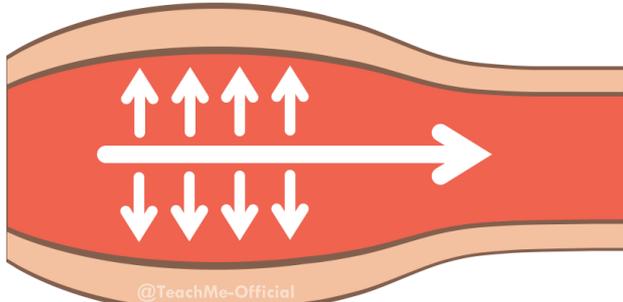


Transport

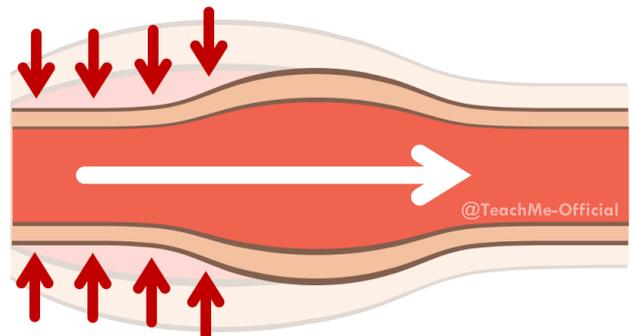


Imagine if the arteries weren't elastic...

Why ARE ARTERIES ELASTIC?



Pressure stretches elastic fibres

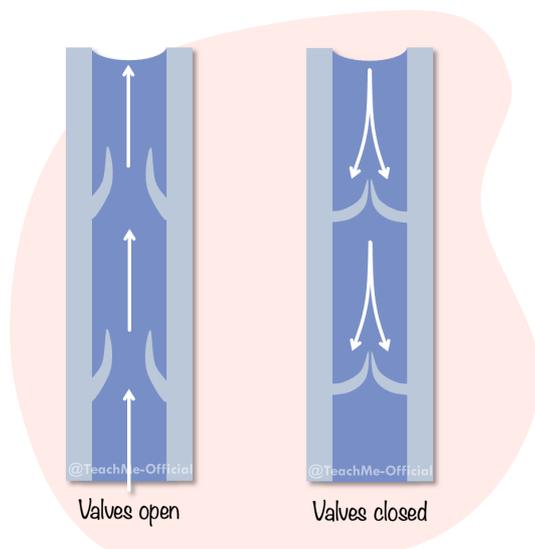


Recoil of elastic fibres

High pressure caused by each contraction of the heart pushes outwards on the elastic wall of the artery. In between contractions the stretched area **RECOILS** and helps maintain the high-pressure characteristics of arteries. It allows for:

PULSATING & CONTINUOUS FLOW

How DO VALVES WORK?

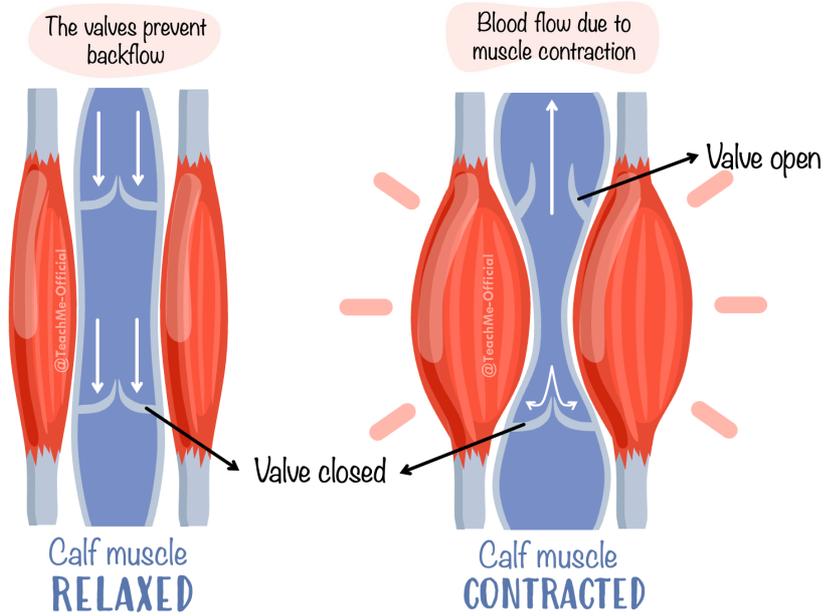


Valves open

Valves closed

In veins blood flow is so **SLOW**: valves ensure **UNIDIRECTIONAL** blood flow (no backflow) back to the heart. It is a one-way valve.

CALF MUSCLES ACT AS PUMP FOR DEEP LEG VEIN
THIN wall allows compression by muscles to help blood flow return to heart.



Calf muscle **RELAXED**

Calf muscle **CONTRACTED**

Summary

	ARTERIES	CAPILLARIES	VEINS
Walls	Thick	Thin (1 cell)	Thin
Valves	None	None	Yes
Blood Pressure	High	Low	Low
Purpose	Carries blood AWAY from heart	Links arteries & veins Nutrient EXCHANGE	Carries blood back TOWARDS heart



Transport

MEASURING PULSE RATE... (number of times your heart beats per minute)

HOW TO?

Feel for pulse. Once pulse is felt, then start timer for 60 seconds. During these 60 seconds count the number of pulses.

Eg. You count 80 beats within the minute: pulse is 80bpm (beats per minute)

Quicker: Can also do for 30 seconds and multiply pulse number by two.



Radial artery

Can feel for this artery on the thumb side of the wrist with the palm facing up, 2 cm from the base of thumb.

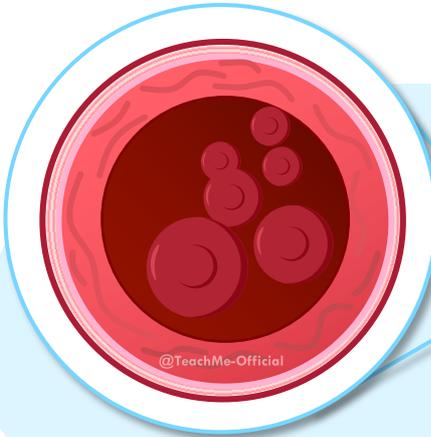


Carotid artery

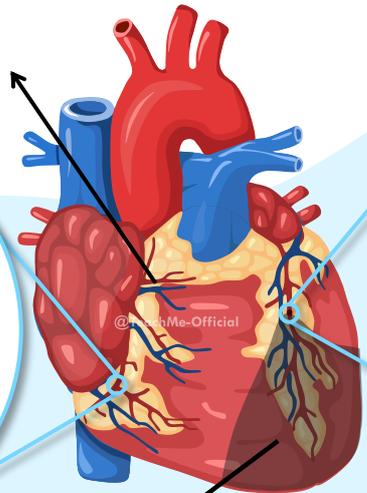
Can feel for this large artery on either side of your neck (either side of trachea).

What if...
blood flow **ISN'T** normal?

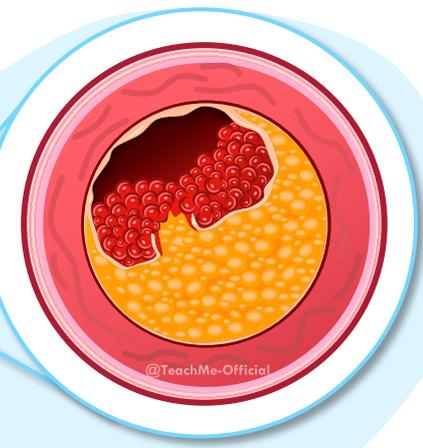
NORMAL ARTERY
Normal blood flow can supply the heart muscle with sufficient nutrients



Coronary arteries (an example)
The arteries that supply blood to cardiac muscle



Heart muscle death



OCCLUDED ARTERY

PLAQUE BUILDUP PROGRESSIVELY narrows the lumen of the coronary artery, preventing blood flow to the heart muscle - also called **CORONARY HEART DISEASE (CHD)**

DID YOU KNOW?

Occlusion of a coronary artery can cause what we call a "HEART ATTACK" !

CORONARY HEART DISEASE is a multifactorial disease (many factors are correlated with it)

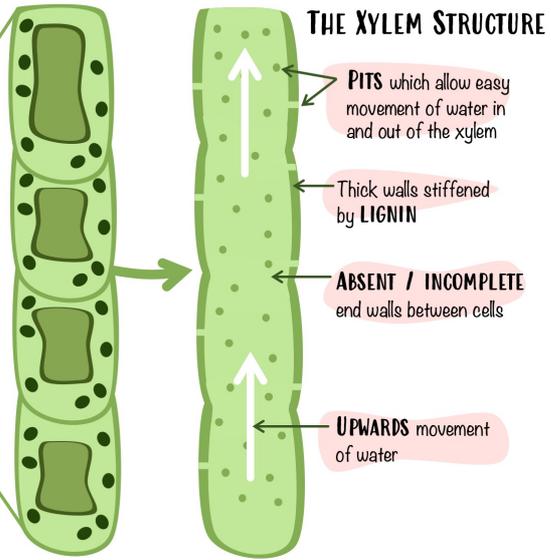
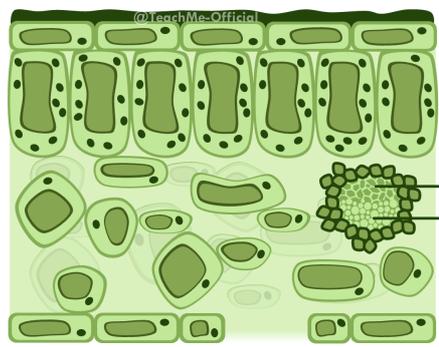
- Diet
- Family history
- Age
- Smoking
- Sex
- Diabetes
- Hypertension
- Weight
- High cholesterol



Transport

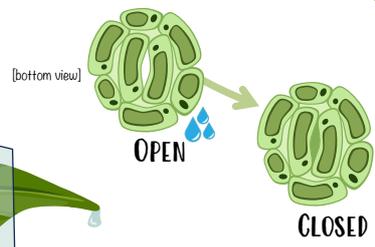
II. PLANTS

Structure of leaf is learned in B3.1

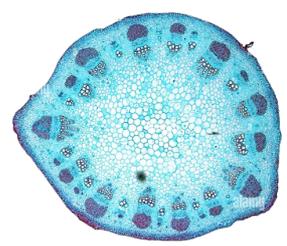
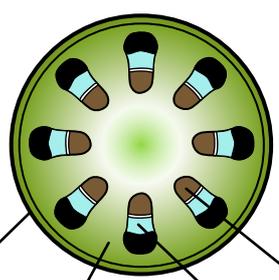


BIG BRAIN TIP!
 ? XYLEM is the DEAD leftover walls of cells, while PHLOEM is LIVING tissue.

THE LEAF
(Dicotyledon)



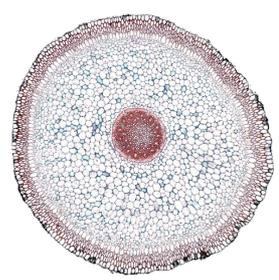
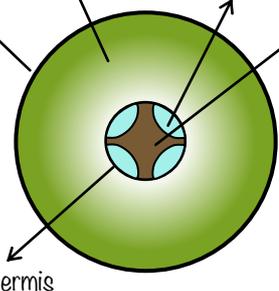
THE STEM
(Dicotyledon)



Epidermis Cortex Phloem Xylem Vascular bundle

Capillary Action

THE ROOT
(Dicotyledon)



Endodermis



Root and Stem structures and functions

STRUCTURE	FUNCTION IN THE ROOT	FUNCTION IN THE STEM
Epidermis	Grows root hairs that increase the surface area for water uptake.	Prevents water loss and provides protection from microorganisms.
Cortex	An unspecialized cell layer that stores food reserves.	An unspecialized cell layer that stores food reserves.
Xylem	Transport tubes for water and minerals, starting in the roots.	Transport tubes for water and minerals up from roots. Also serves as mechanical support.
Phloem	Transport tubes that receive sugars from leaves.	Transport tubes for transporting sugars (carbs) from leaves to other parts of the plant.
Vascular bundle	The area in the center of the root containing xylem and phloem.	Contain multiple vessels of both xylem and phloem.

Transport

TRANSPIRATION

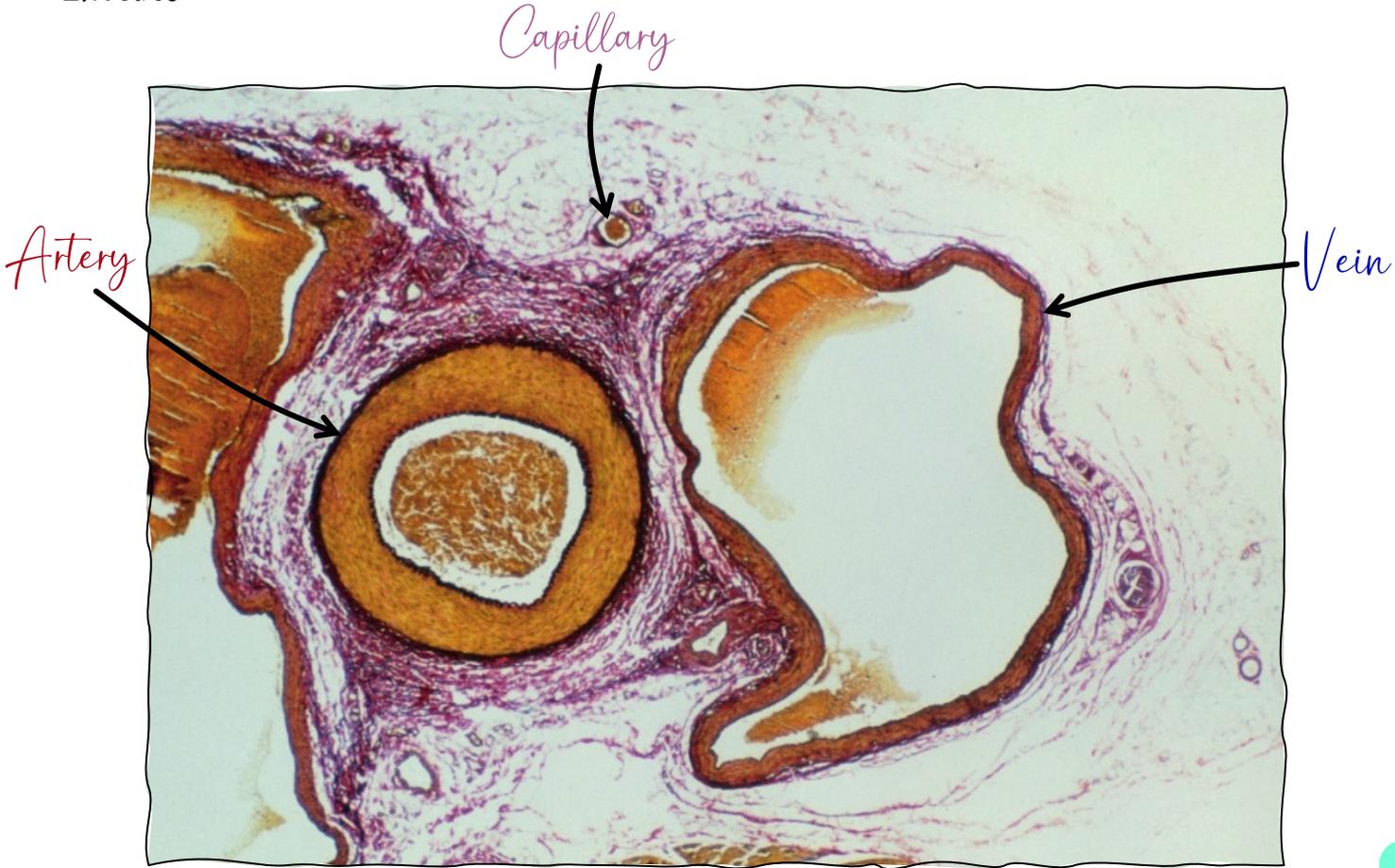
the evaporation of water through an open stomata

1. Water uptake occurs at the root.
2. Water enter the xylem & moves up the xylem
3. Water moves from the xylem to leaf cells.
4. Water evaporates into empty spaces in the leaves.
5. Water transpires out of stomata into the air.

How?

The negative pressure created by the water transpired pulls water up the xylem: with the help of the **COHESIVE** and **ADHESIVE** properties of water (learned in A1!)

EXTRAS



Real image of an artery, vein and capillary (under the microscope)

