# Human Circulatory System - I

Course on Human Physiology: Body Fluids & Circulation

Dr Amit Gupta • Lesson 6 • Sept 14, 2021

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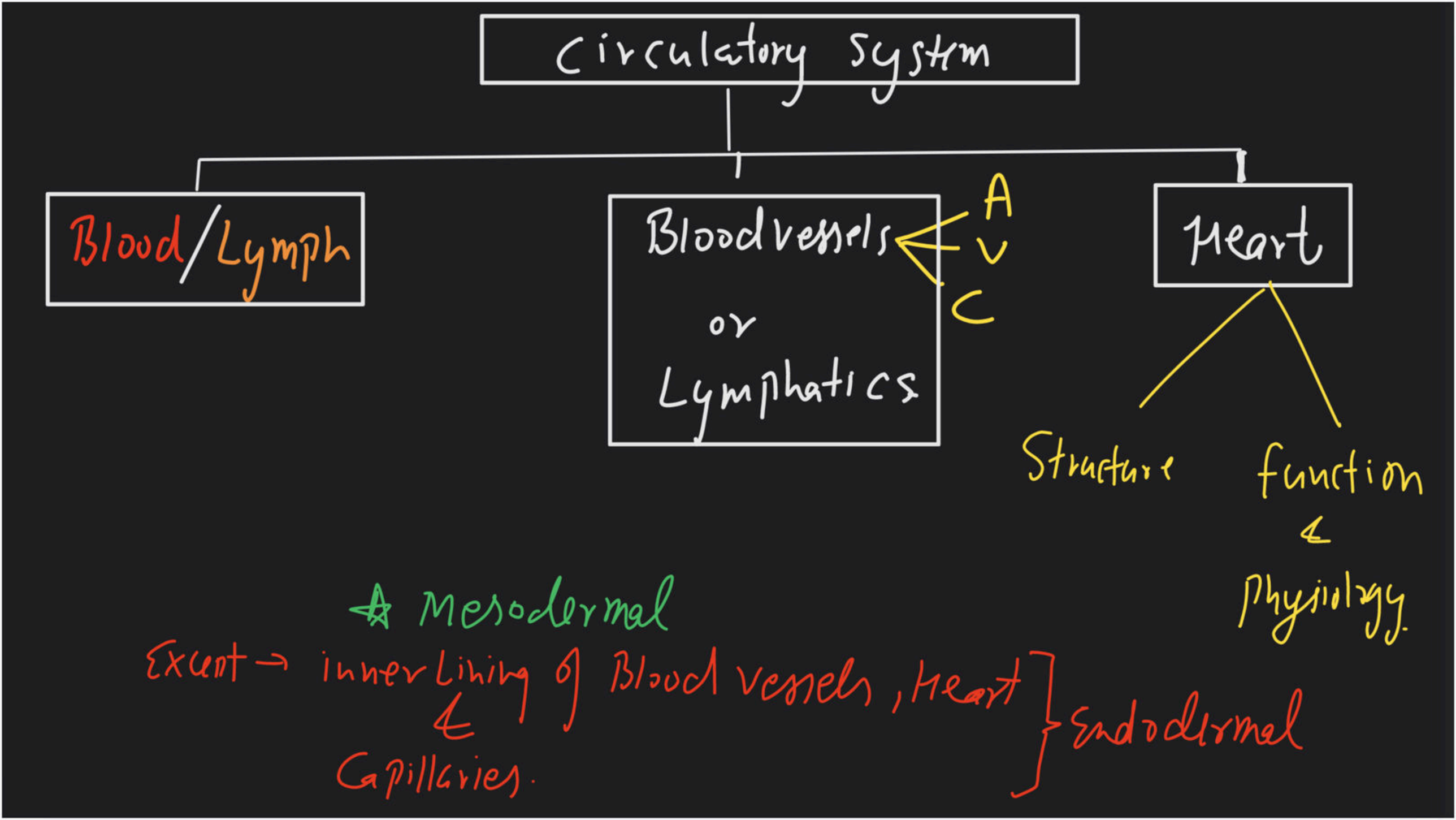
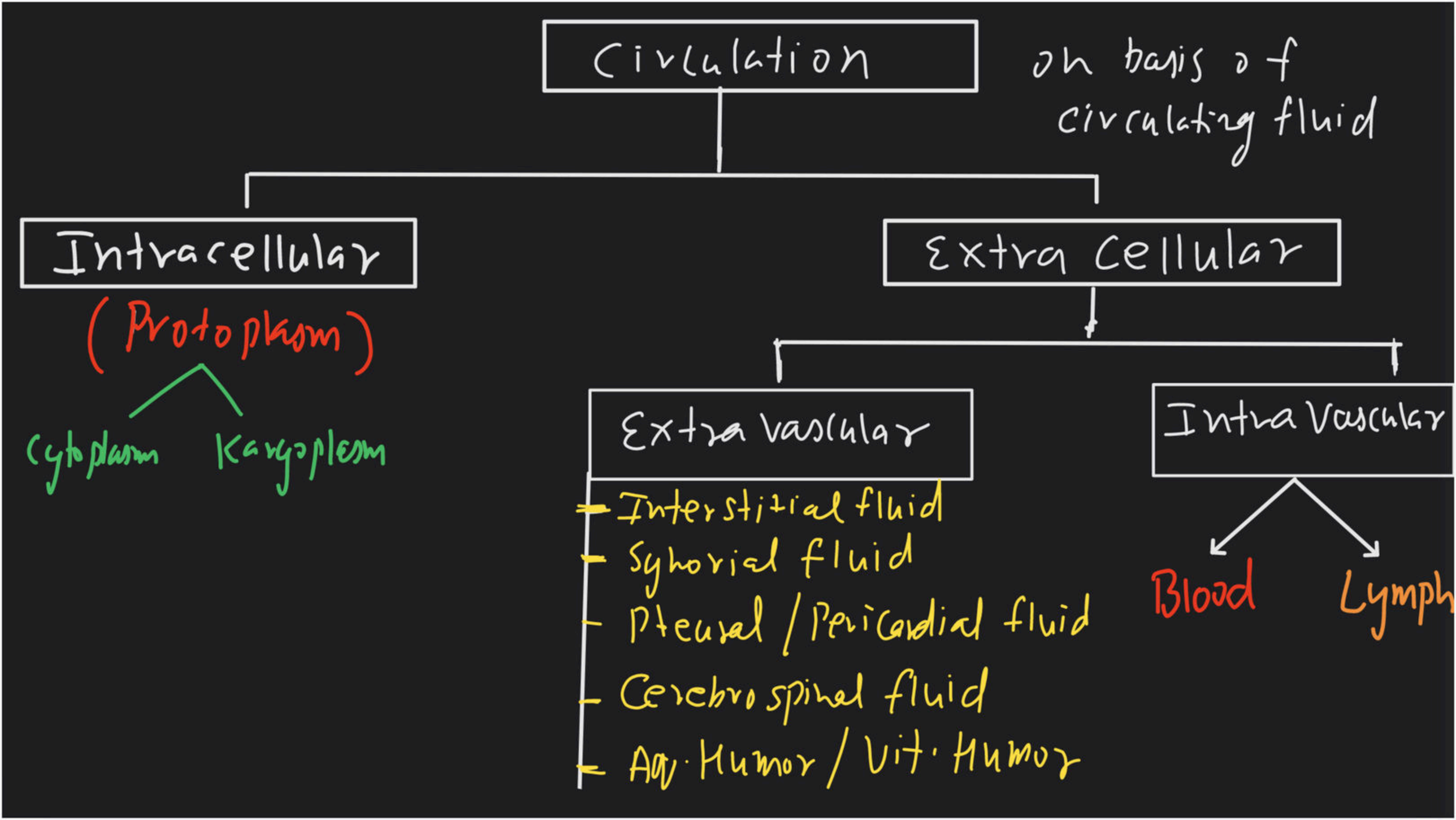

Circulatory System
Blood/Lymph
Bloodvessels
or
Lymphatics
A
V
C
Heart
Structure
function
&
Physiology
Mesodermal
Except → inner Lining of Blood vessels, Heart
&
Capillaries.
Endodermal

# Circulatory System

Each and every cell of the body requires consistent supply of $O_2$, food etc. for energy. Similarly toxic substances like $CO_2$, ammonia, urea, uric acid are needed to get removed from the body. In lower organism cell is in direct contact of surrounding medium and there is direct exchange of material in between cell and the medium so, circulatory system is not needed. In higher and multicellular organism due to its complex form a specialized system is needed to supply useful, substance to the body cell and to remove, harmful substance out of the body. This specialized, system is called **circulatory system**. Components involved in circulatory system originate from **mesoderm** of embryo. Except the inner lining of blood vessels and capillaries which are endodermal in origin.

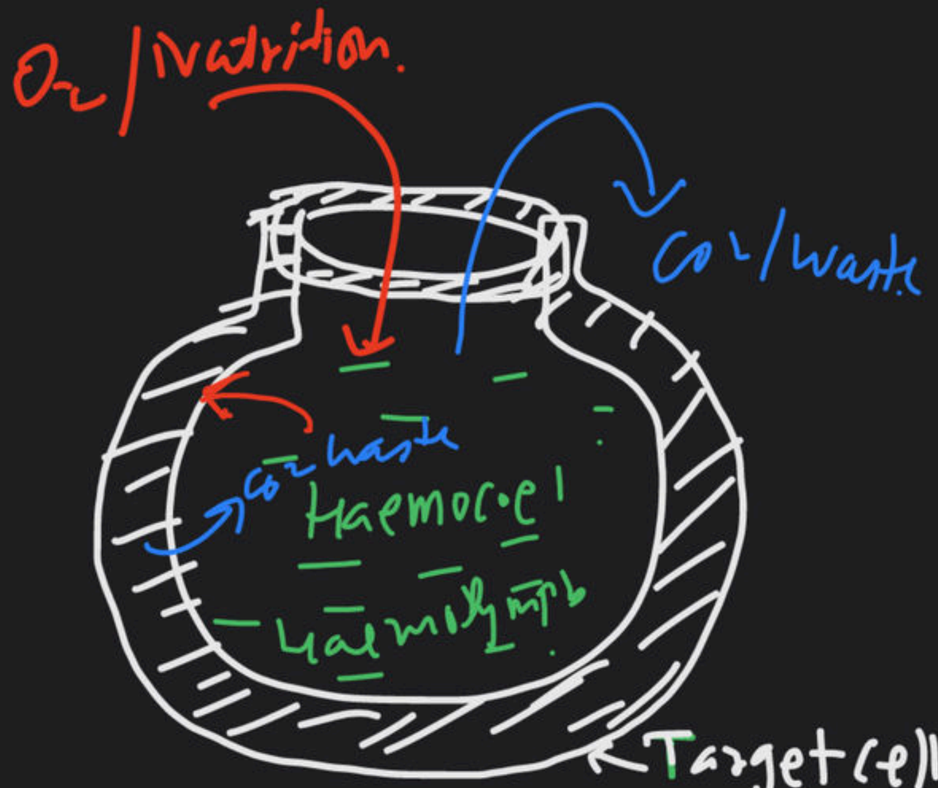

Circulation
on basis of circulating fluid
Intracellular
(Protoplasm)
Cytoplasm
Karyoplasm
Extra Cellular
Extra vascular
Interstitial fluid
Synovial fluid
Pleural / Pericardial fluid
Cerebrospinal fluid
Aq. Humor / Vit. Humor
Intra Vascular
Blood
Lymph

# Circulation.

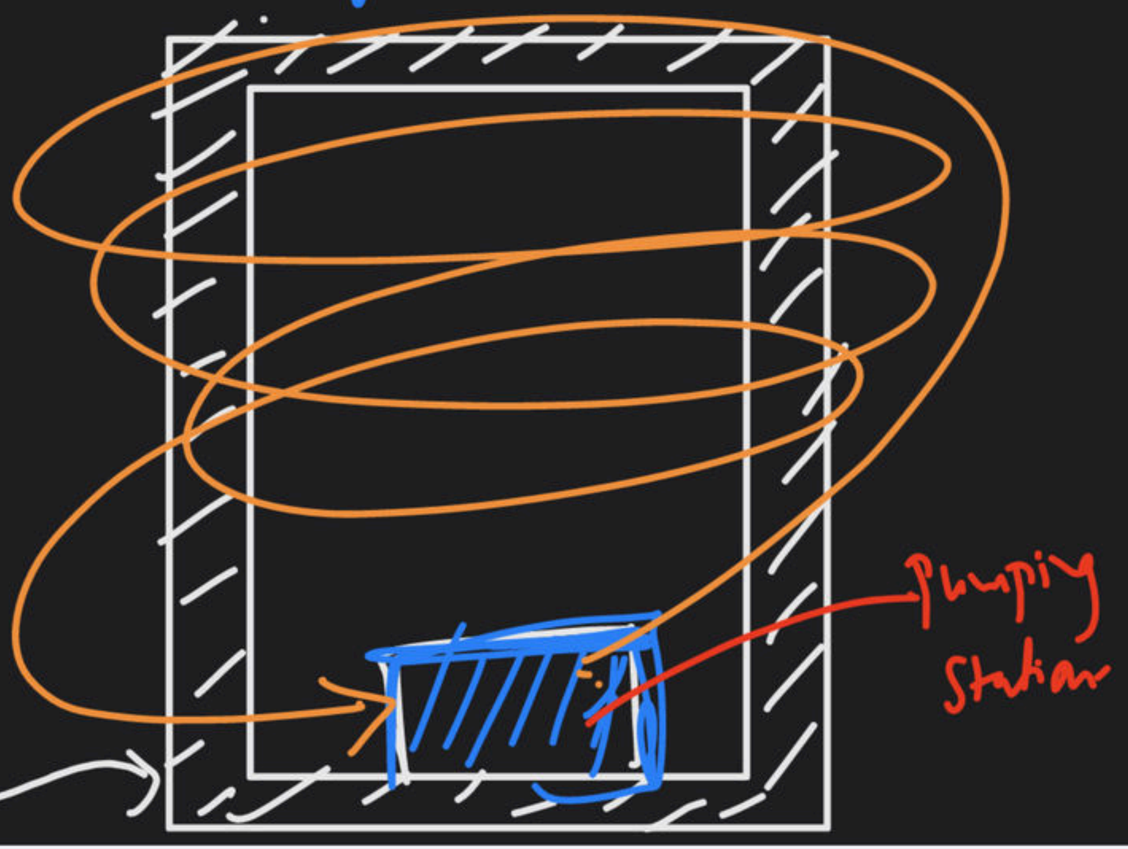
on basis of complexity / evolution

- Open
- Closed

## Lower Animals




## Higher Animals.



# TYPES OF CIRCULATION

The blood vascular system may be **open or closed circulatory system**.

**I- Open circulatory system**

(i) When the circulating fluid is present in a central cavity called Haemocoel or it flows into spaces called sinuses in the tissue, it is termed as the **open circulatory system**.

(ii) Animals in which circulatory system is open are Arthropoda (Prawn, lobsters, crabs, insects and spiders) and Mollusca (snails, oysters).

**II- Closed circulatory system**

(i) When the blood remains confined to the blood vessel it is called **closed circulatory system**.

(ii) In invertebrate, closed circulatory system is found in some annelida like earthworm and some mollusca like, squid.

(iii) In all vertebrate animals closed circulatory system is found.

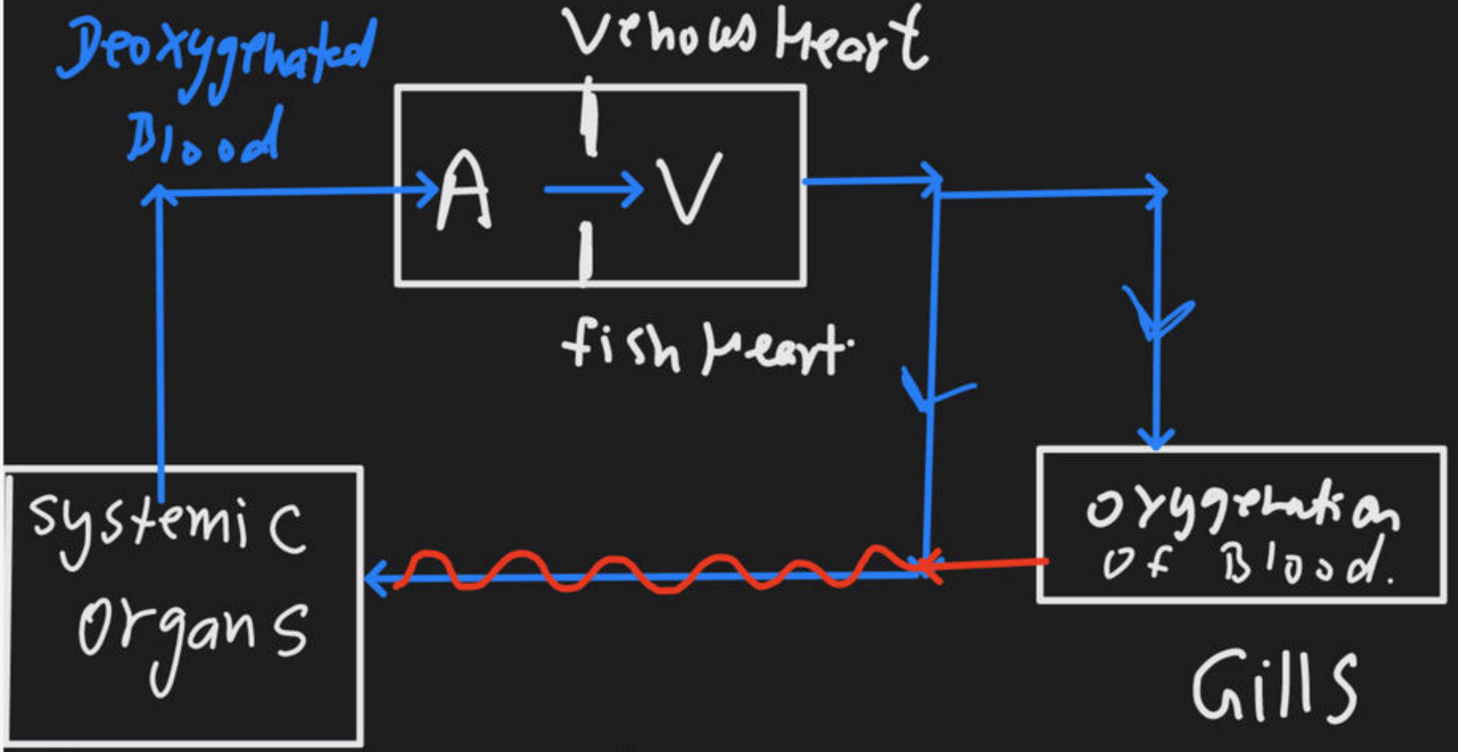
(iv) The circulation of blood in the closed circulatory system was at first discovered and demonstrated by William Harvey who is known as father of angiology. He called heart as the "Pumping station of body".

Closed circulation

# Type of circulation (circuit)

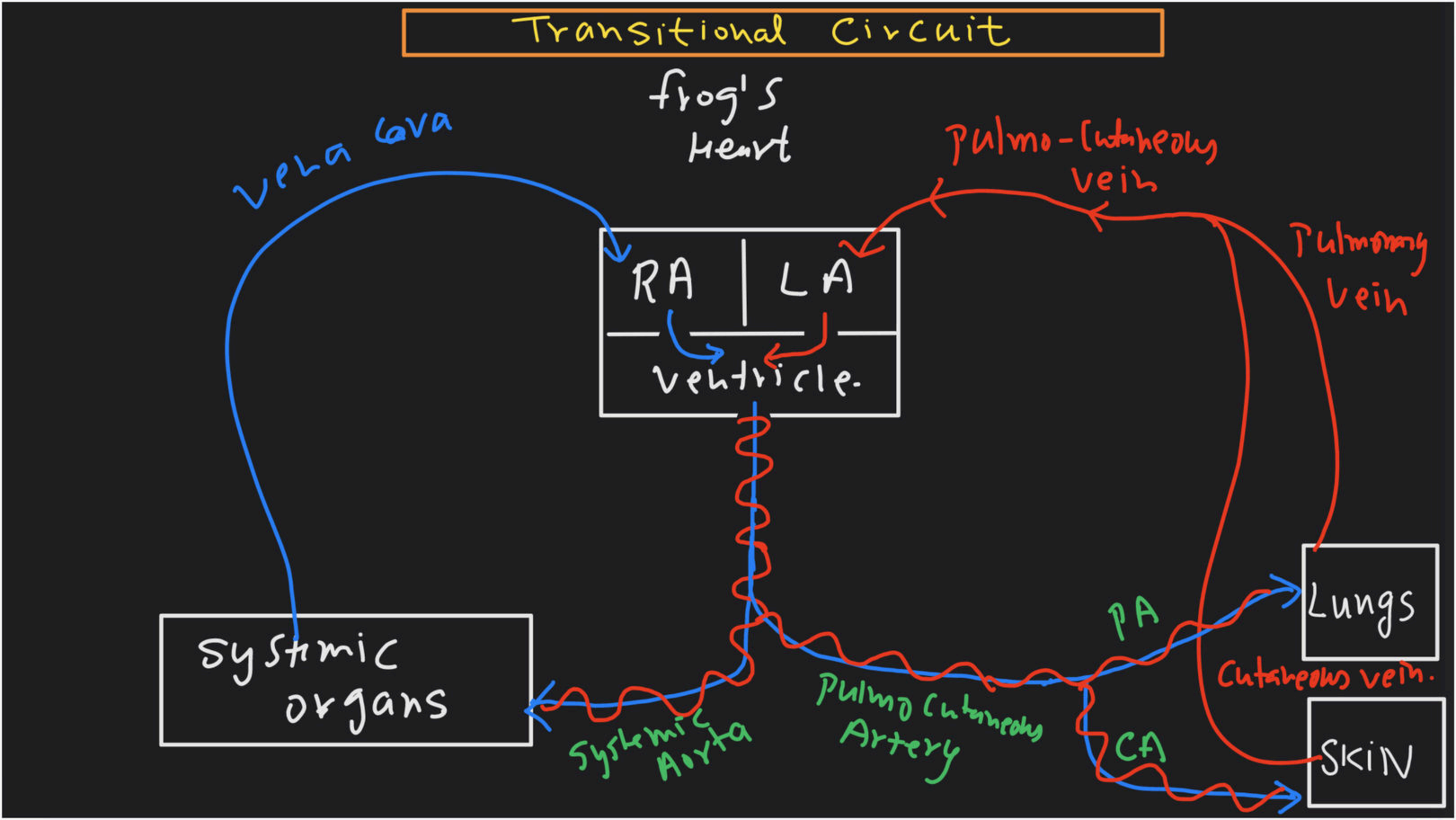
Vertebrates

Pisces → Amphibia → Reptile < Aves, mammals




Single Circuit
or
Single Circulation

Blood passes through heart only once

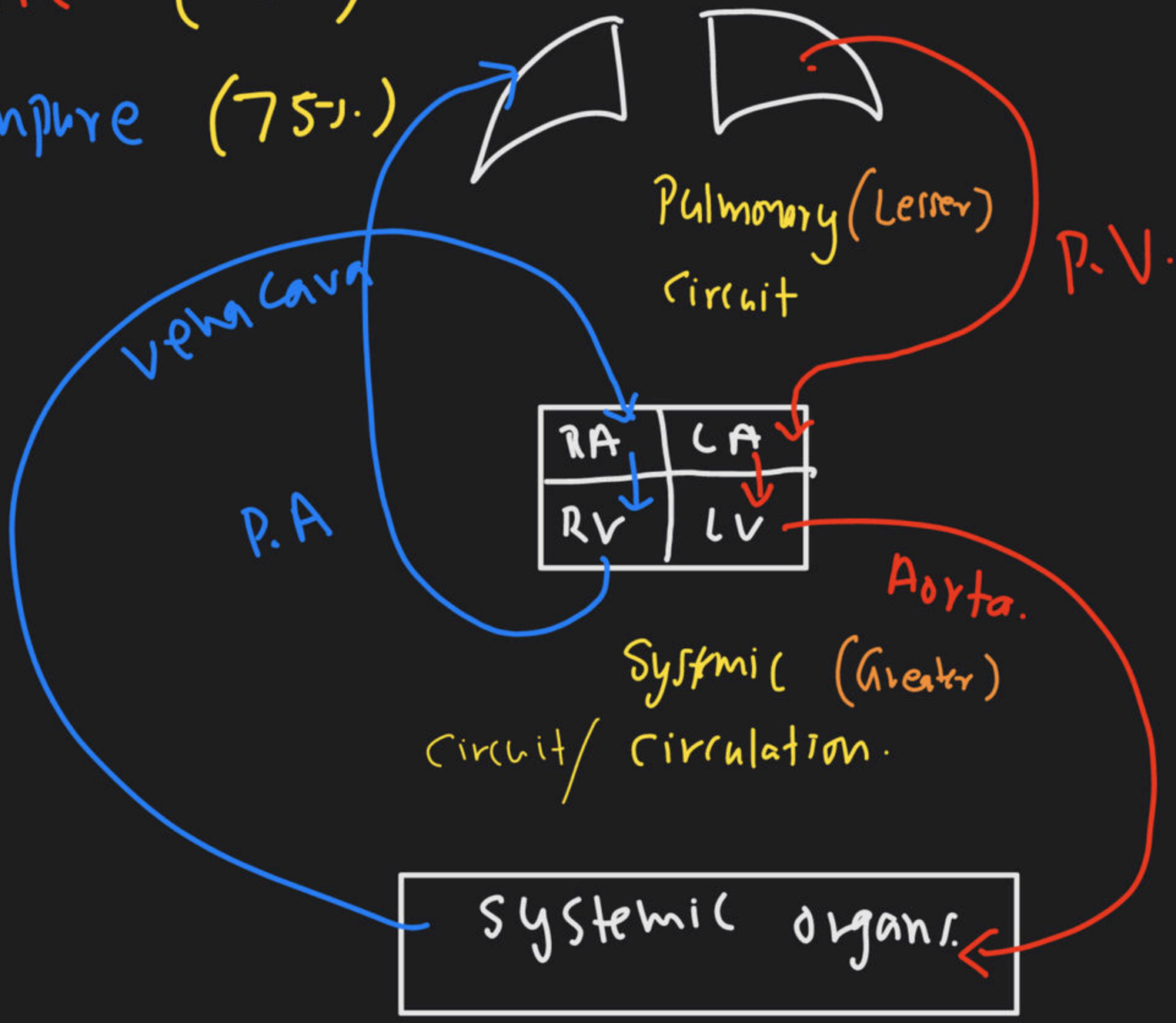

Transitional Circuit
frog's Heart
Vena Cava
Pulmo-Cutaneous Vein
Pulmonary Vein
RA
LA
Ventricle.
Systemic organs
Systemic Aorta
Pulmo Cutaneous Artery
PA
CA
Lungs
Cutaneous vein.
Skin

Oxygenated = Pure (97%)

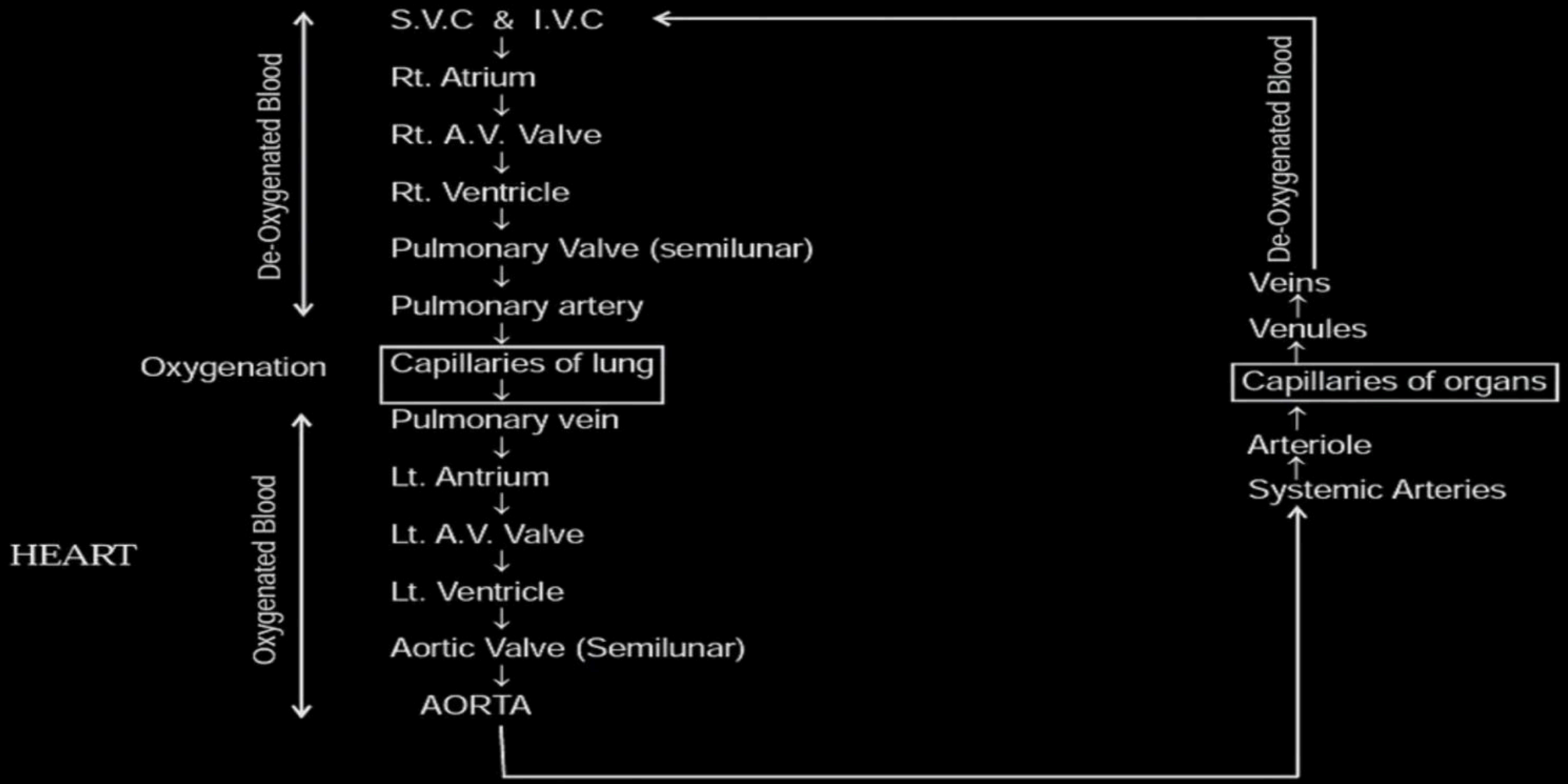
Deoxygenated = impure (75%)

Double circuit
or
Double circulation

Aves | mammals



# Path of Blood in Double Circuit (Man)

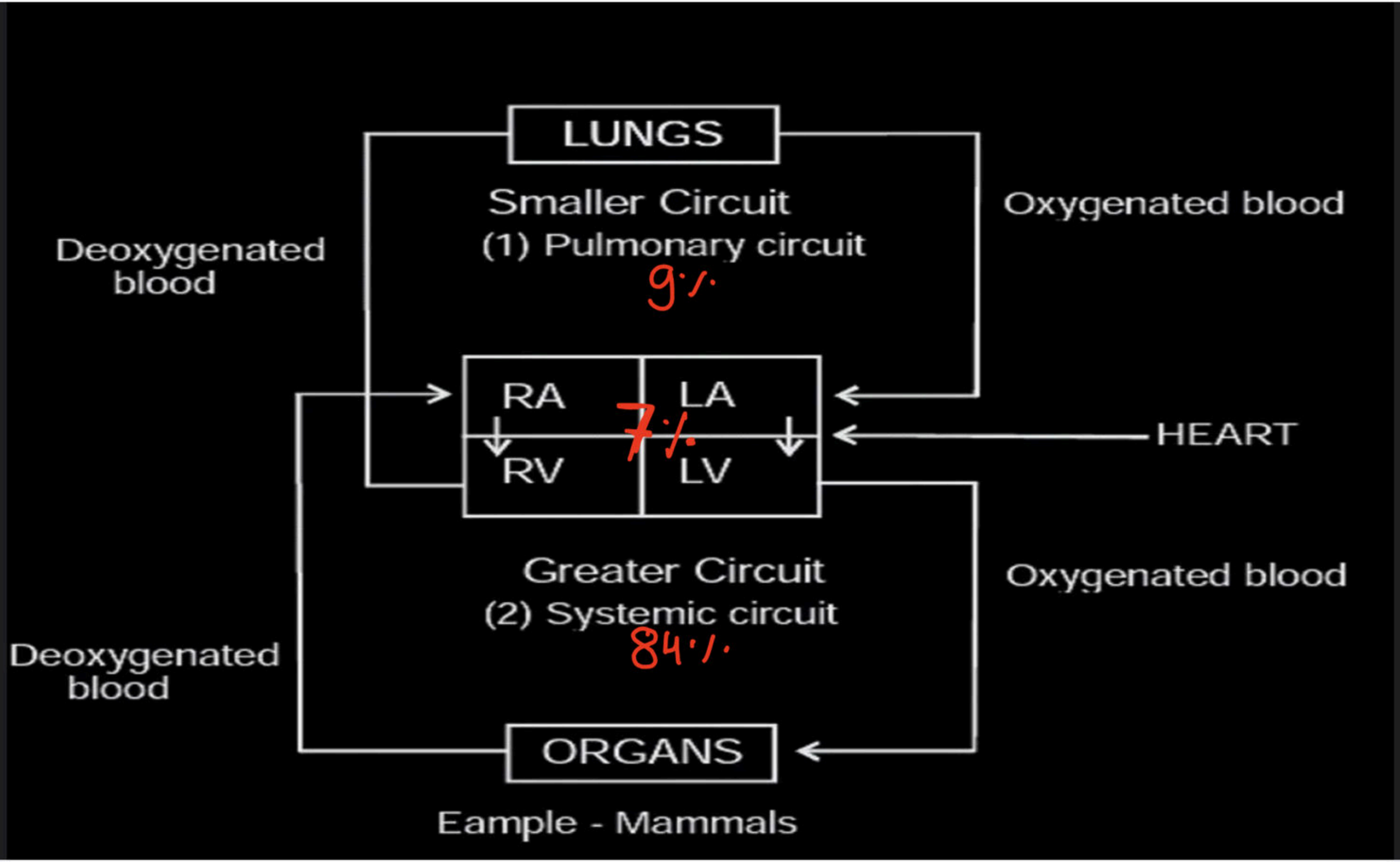


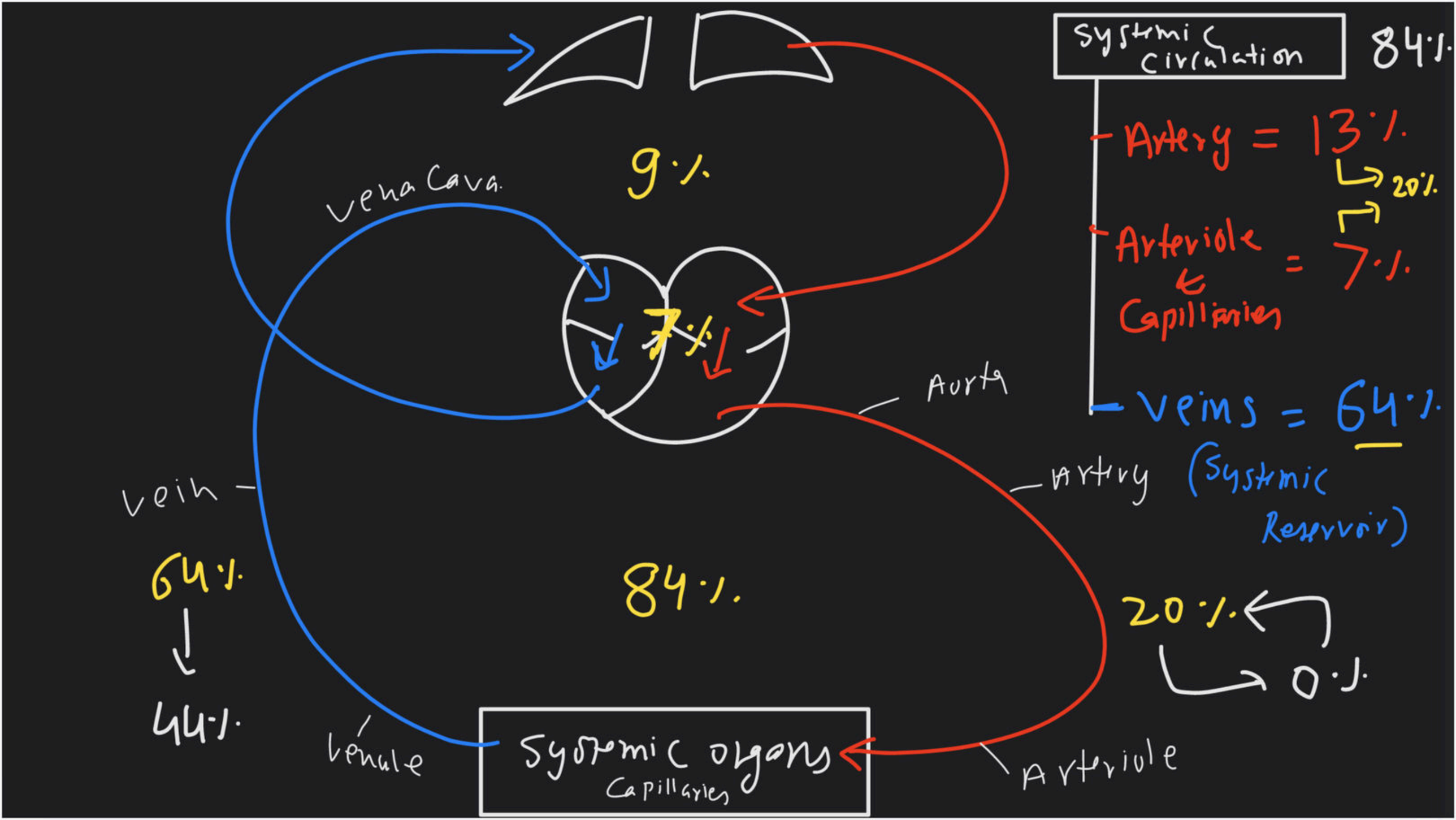
Double circulation involves two circulation which are as follow :-

## SYSTEMIC CIRCULATION

(i) In this type of circulation, blood completes its circulation from left ventricle to right auricle through body organs.

(ii) From the left ventricle blood is pumped into the aorta and then to various part of the body (except lungs) Deoxygenated blood from these organs is returned to the right auricle through two large veins superior and inferior vena cava. From right auricle blood comes to right ventricle.


LUNGS
Smaller Circuit
(1) Pulmonary circuit
9:1.
Deoxygenated blood
Oxygenated blood
RA
LA
7:1.
RV
LV
HEART
Greater Circuit
(2) Systemic circuit
84:1.
Deoxygenated blood
Oxygenated blood
ORGANS
Eample - Mammals


Systemic Circulation
84%
Artery = 13%
20%
Arteriole = 7%
Capillaries
Veins = 64%
(Systemic Reservoir)
9%
Vena Cava
7%
Aorta
Vein
Artery
64%
44%
84%
20%
0%
Venule
Systemic organs
Capillaries
Arteriole

# Blood Loss management

Blood transfusion

Systemic vein

Spleen

Arterial Blood Loss

Wallet ← Reservoir ← Bank.

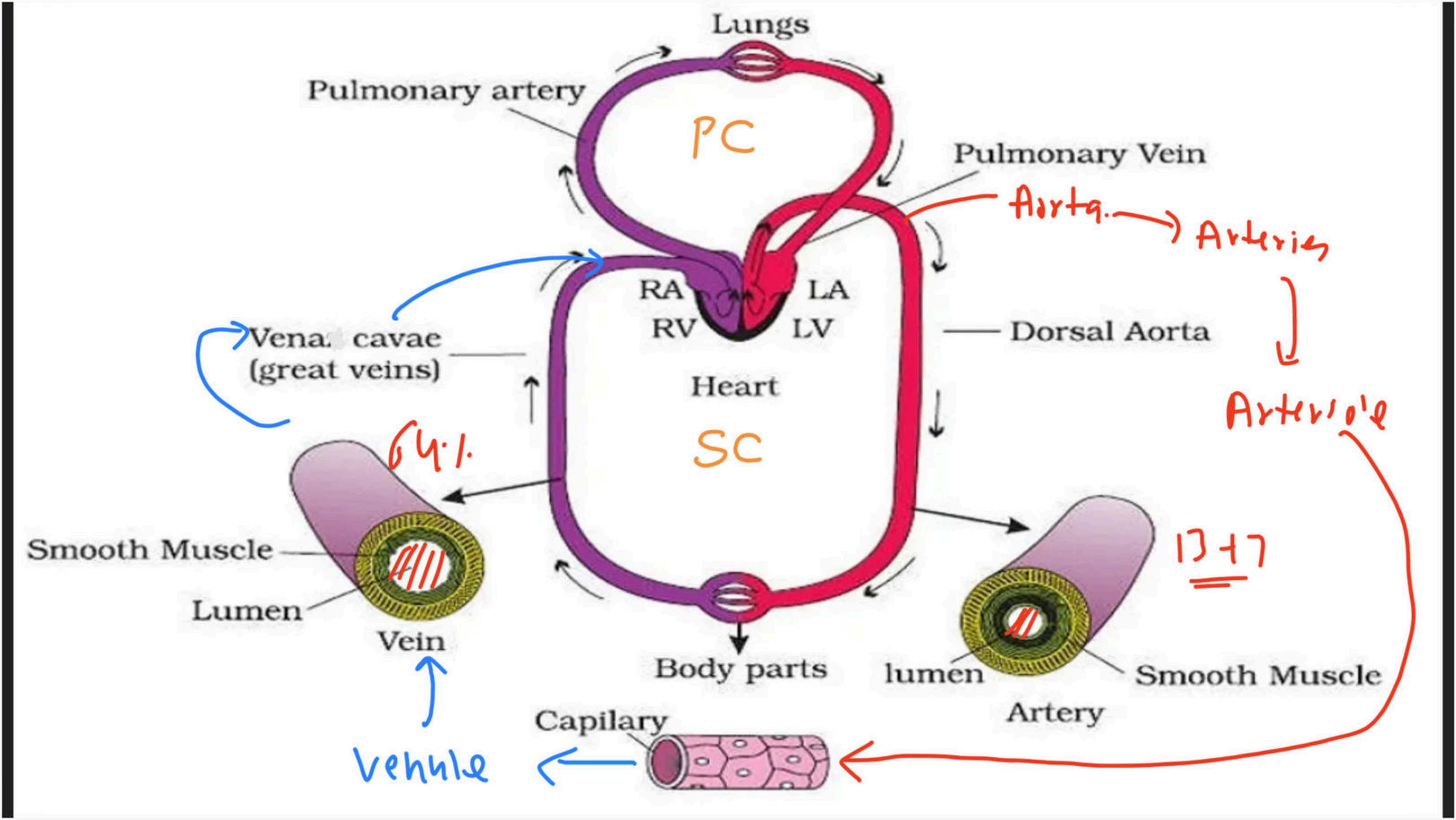
ATM

# After Death

Arteries become Empty

&

Veins are filled with Blood.


Lungs
Pulmonary artery
PC
Pulmonary Vein
Aorta
Arteries
RA
LA
RV
LV
Vena cavae
(great veins)
Dorsal Aorta
Heart
SC
Arteriole
Smooth Muscle
Lumen
Vein
Body parts
lumen
Smooth Muscle
Artery
Capilary
Vehule