

YAKEEN NEET 2.0

25.07.2025

2026

BODY FLUIDS AND CIRCULATIONS

ZOOLOGY

Lecture – 8

By- SAMAPTI MAM





Topics to be covered

1

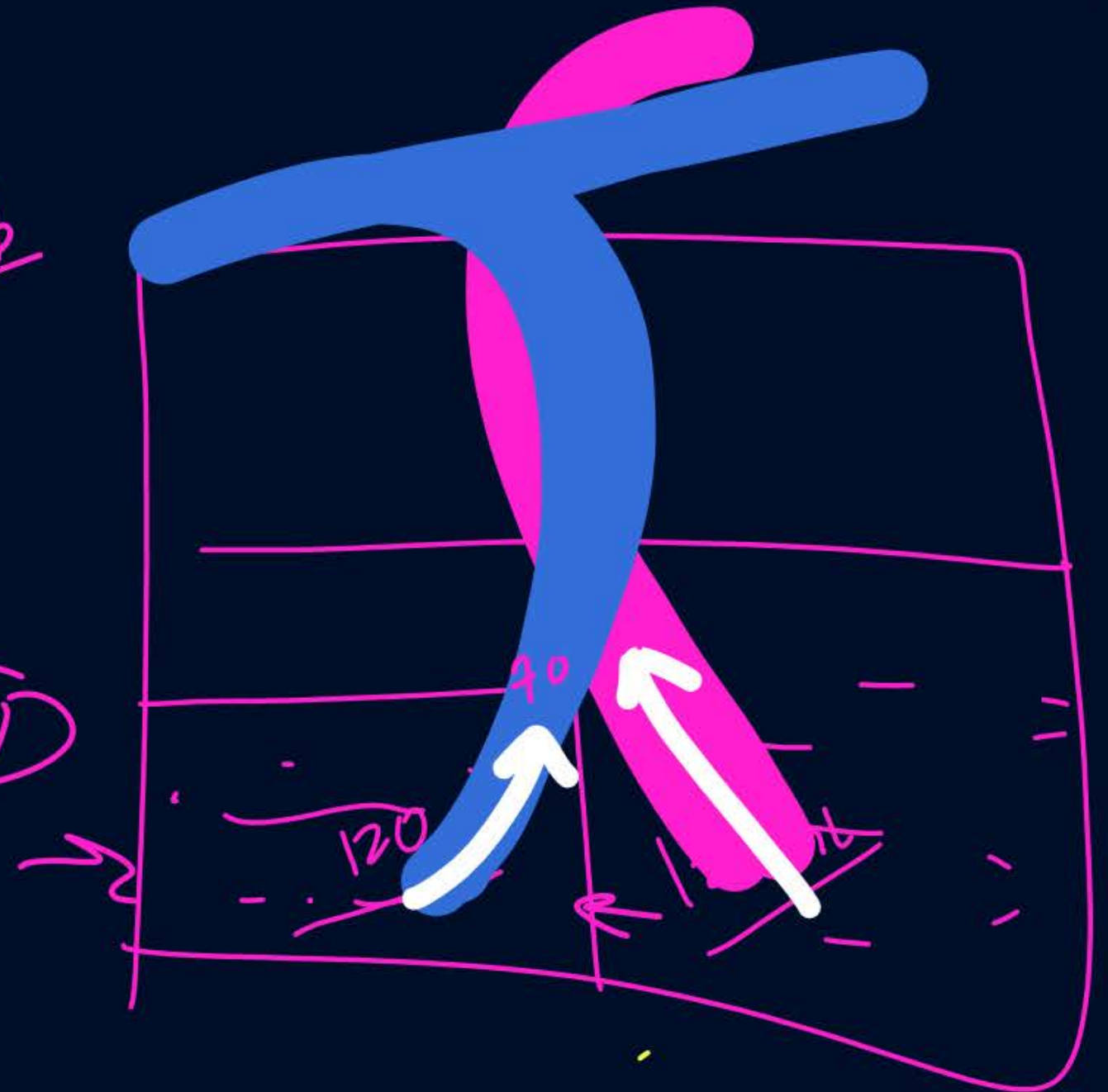
✓ ✓ ✓ ✓
ECG, double circulation, coronary, hepatic circulation

2

3

4



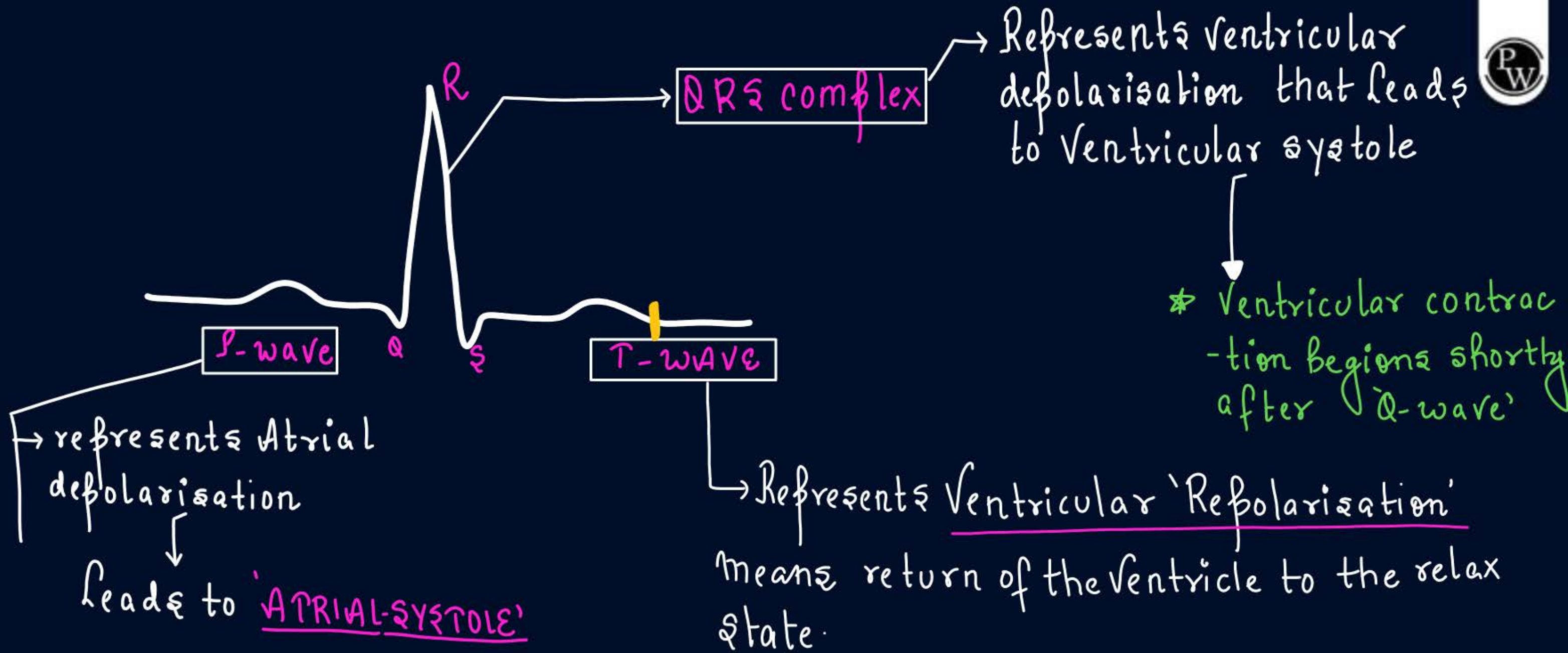


• Electrocardiogram (E.C.G.)

- To record the electrical activity of the Heart there is a device called 'ELECTROCARDIOGRAPH' that gives a graphical representation of this
K/a 'ELECTROCARDIOGRAM'



- To 'obtain' a standard 'ECG' 3 electrodes are used; one connected to each wrist & one to the left ankle.
- for detailed evaluation, multiple electrodes can be used (12 electrodes) connected to chest region as well.



Note: No. of QRS complex in a ECG can tell about the heart rate in a given time period (1 minute)

Extraa Gyan

- Enlarged P-wave: \uparrow Size of Atria
- Enlarged 'QRS': Condition of Myocardial infarction (Heart attack)
- Flat T-wave: Myocardial ischemia (Low O_2 supply)

• ECG is of great Clinical significance

15.3.3 Electrocardiograph (ECG)

You are probably familiar with this scene from a typical hospital television show: A patient is hooked up to a monitoring machine that shows voltage traces on a screen and makes the sound "... pip... pip... pip.... peeeeeeeeeeeeeeeeeeee" as the patient goes into cardiac arrest. This type of machine (electro-cardiograph) is used to obtain an electrocardiogram (ECG). ECG is a graphical representation of the electrical activity of the heart during a cardiac cycle. To obtain a standard ECG (as shown in the

Figure 15.3), a patient is connected to the machine with three electrical leads (one to each wrist and to the left ankle) that continuously monitor the heart activity. For a detailed evaluation of the heart's function, multiple leads are attached to the chest region. Here, we will talk only about a standard ECG.

Each peak in the ECG is identified with a letter from P to T that corresponds to a specific electrical activity of the heart.

The P-wave represents the electrical **excitation (or depolarisation) of the atria**, which leads to the contraction of both the atria.

The QRS complex represents the **depolarisation of the ventricles**, which initiates the ventricular contraction. The contraction starts shortly after Q and marks the beginning of the systole.

The T-wave represents the return of the ventricles from excited to normal state (**repolarisation**). The end of the T-wave marks the end of systole.

Obviously, by counting the number of QRS complexes that occur in a given time period, one can determine the heart beat rate of an individual. Since the ECGs obtained from different individuals have roughly the same shape for a given lead configuration, any deviation from this shape indicates a possible abnormality or disease. Hence, it is of a great clinical significance.

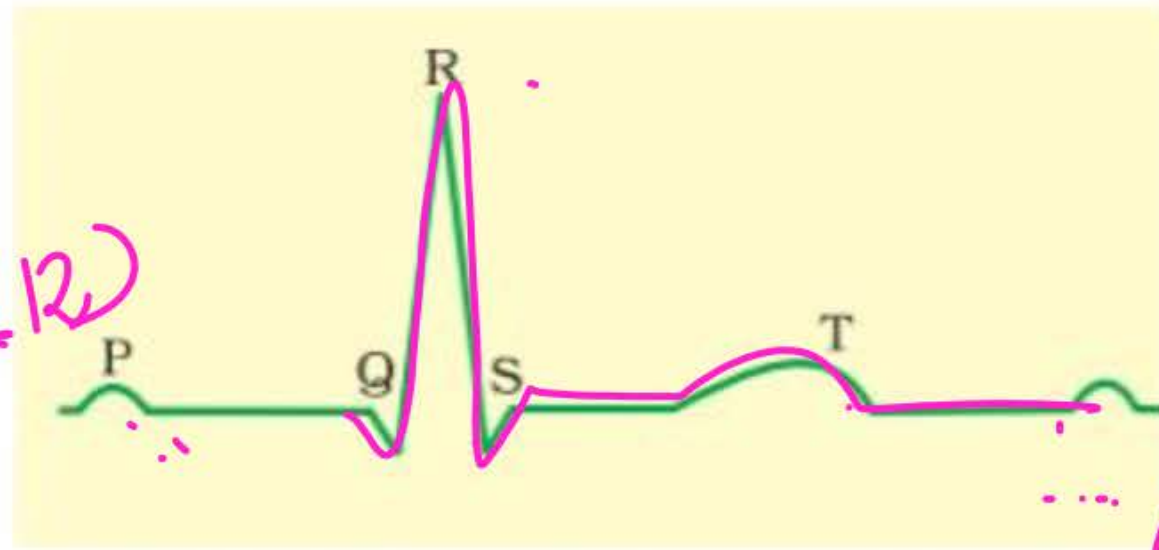
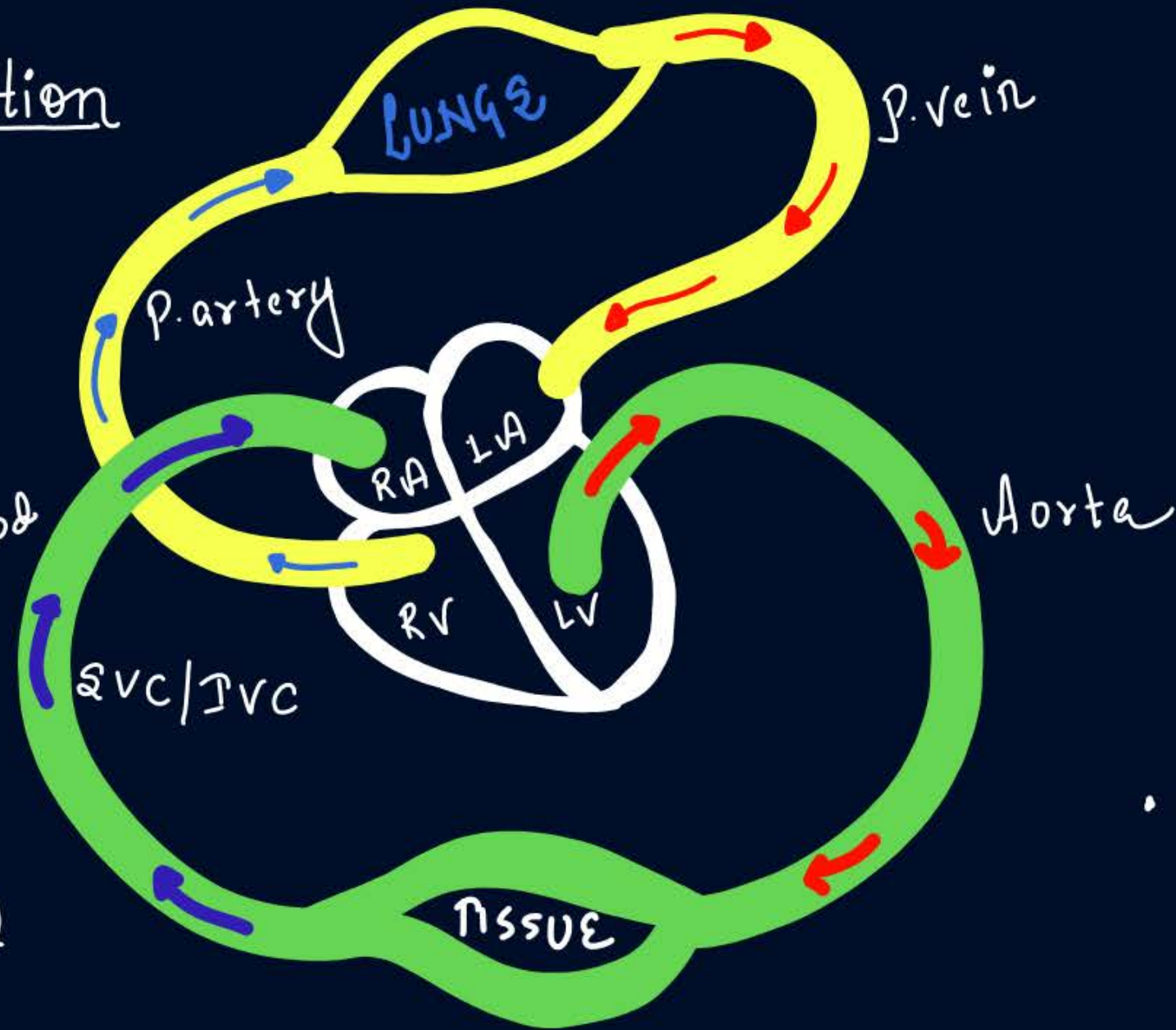


Figure 15.3 Diagrammatic presentation of a standard ECG

Double Circulation:

① Pulmonary Circulation

- $RV \rightarrow deo_2 \rightarrow P. \text{ artery}$
↓
Lungs
↓ $o_2 \text{ Blood}$
P. vein
↓
LA
- for oxygenation of Blood



② Systemic Circulation

- $LV \rightarrow O_2 \text{ Blood} \rightarrow \text{Aorta}$
↓
Tissue
↓ $deo_2 \text{ Blood}$
SVC/IVC
↓
RA
- Transport of O_2 , nutrients to the tissue & removal of harmful waste from the tissue.

Blood vessel:

ARTERY



- Carry blood away from heart

- Wall: Thicker (p. media)

- Lumen: Small

- Under high pressure

- Valves X

- Usually carries O_2 blood except p. artery

- Branches to form capillary
- Deeply seated

i) TUNICA EXTERNA

- outermost, Connective tissue, Collagen fibre

ii) TUNICA MEDIA

- Middle, Smooth muscle, Elastic fibres
- Thicker in Artery

iii) TUNICA INTERNA / INTIMA

- innermost, simple squamous epithelium

VEIN



- Carry blood towards heart

- Wall: Thin

- Lumen: Broad

- Under low pressure

- Valves ✓

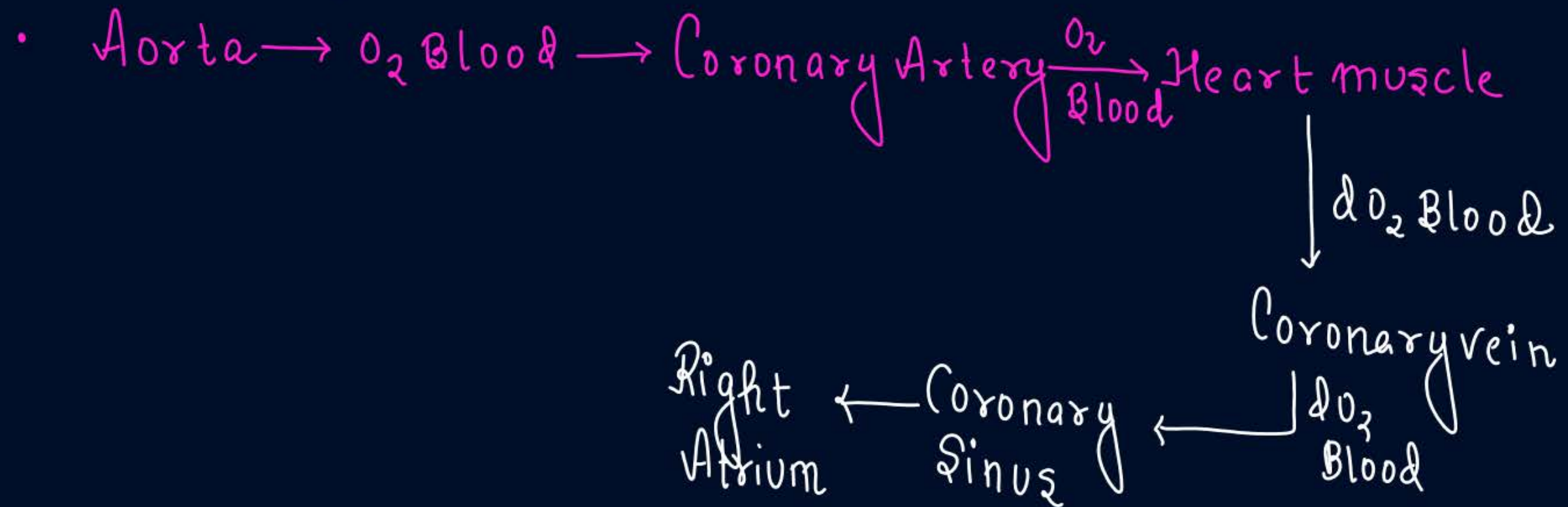
- Usually carries O_2 blood except p. vein

- Capillary merges to form vein
- Superficial

Note Capillary: Simple squamous epithelium



② Coronary Circulation: About 10% of the Blood pumped by heart is also received by the heart itself: CORONARY CIRCULATION



15.4 DOUBLE CIRCULATION

The blood flows strictly by a fixed route through **Blood Vessels**—the arteries and veins. Basically, each artery and vein consists of three layers: an inner lining of squamous endothelium, the **tunica intima**, a middle layer of smooth muscle and elastic fibres, the **tunica media**, and an external layer of fibrous connective tissue with collagen fibres, the **tunica externa**. The tunica media is comparatively thin in the veins (Figure 15.4).

As mentioned earlier, the blood pumped by the right ventricle enters the pulmonary artery, whereas the left ventricle pumps blood into the aorta. The deoxygenated blood pumped into the pulmonary artery is passed on to the lungs from where the oxygenated blood is carried by the pulmonary veins into the left atrium. This pathway constitutes the pulmonary circulation. The oxygenated blood entering the aorta is carried by a network of arteries, arterioles and capillaries to the tissues from where the deoxygenated blood is collected by a system of venules, veins and vena cava and emptied into the right atrium. This is the systemic circulation (Figure 15.4). The systemic circulation provides nutrients, O_2 and other essential substances to the tissues and takes CO_2 and other harmful substances away for elimination. A unique vascular connection exists between the digestive tract and liver called

hepatic portal system. The hepatic portal vein carries blood from intestine to the liver before it is delivered to the systemic circulation. ✓ A special coronary system of blood vessels is present in our body exclusively for the circulation of blood to and from the cardiac musculature.

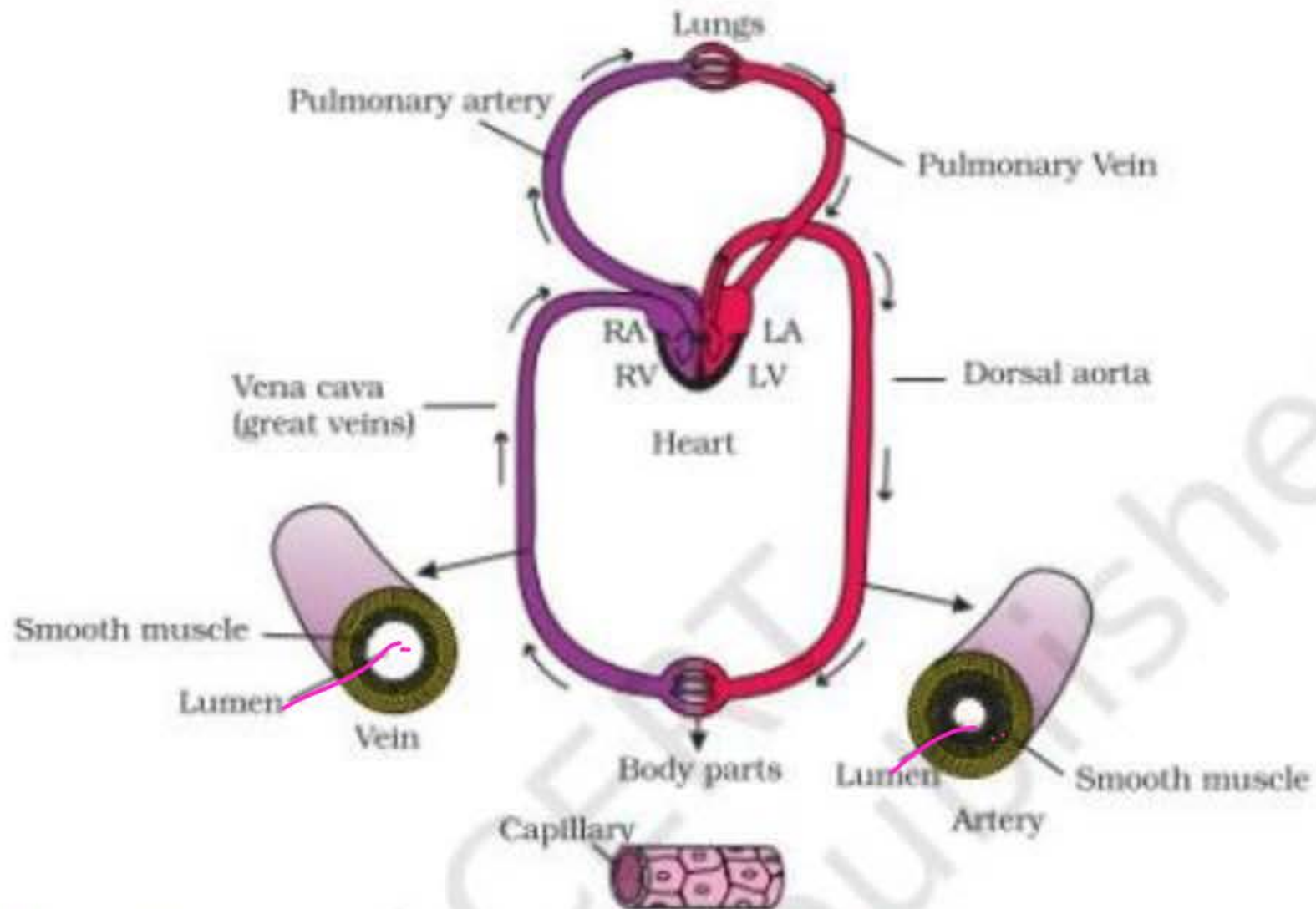
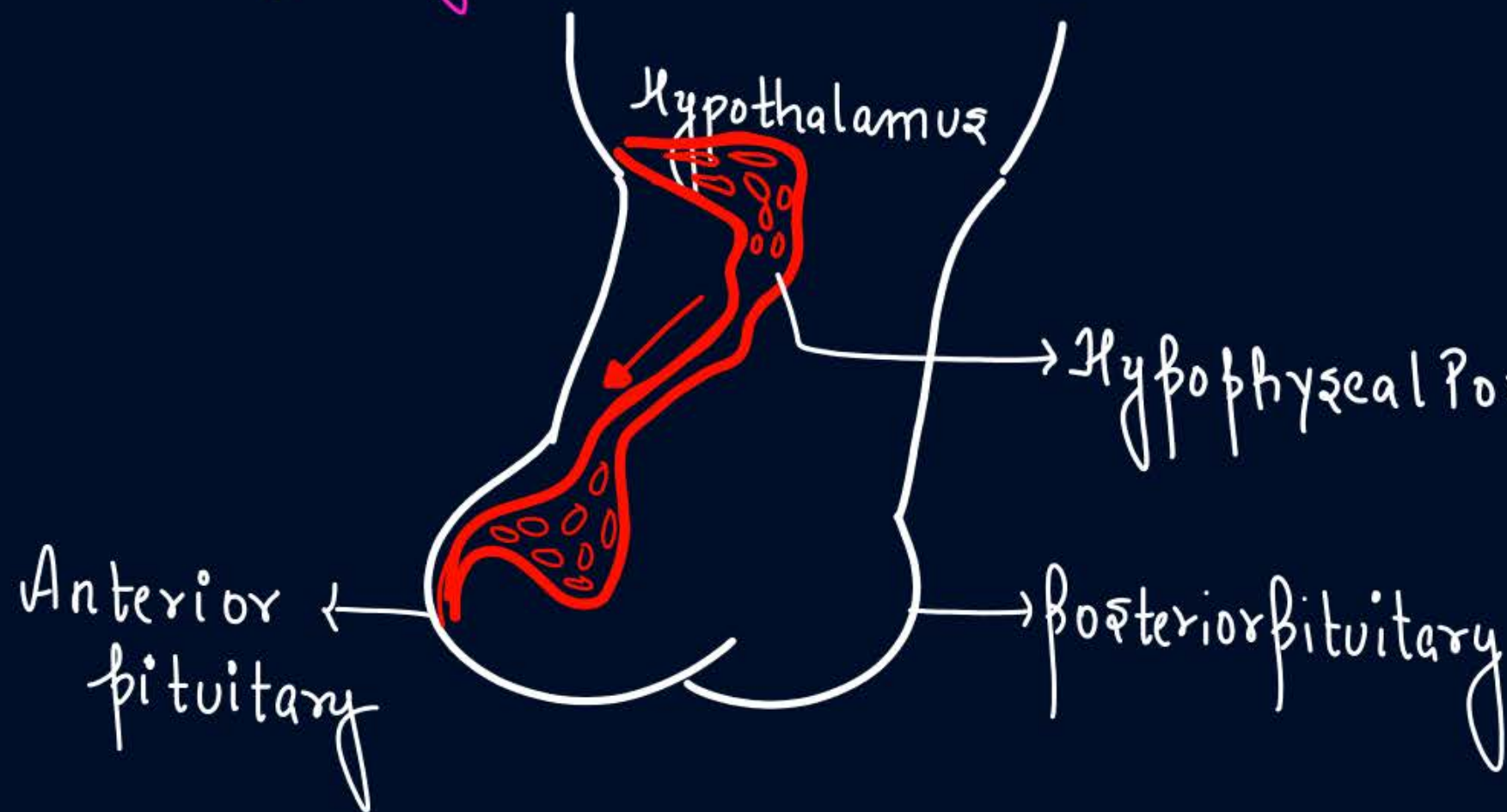


Figure 15.4 Schematic plan of blood circulation in human

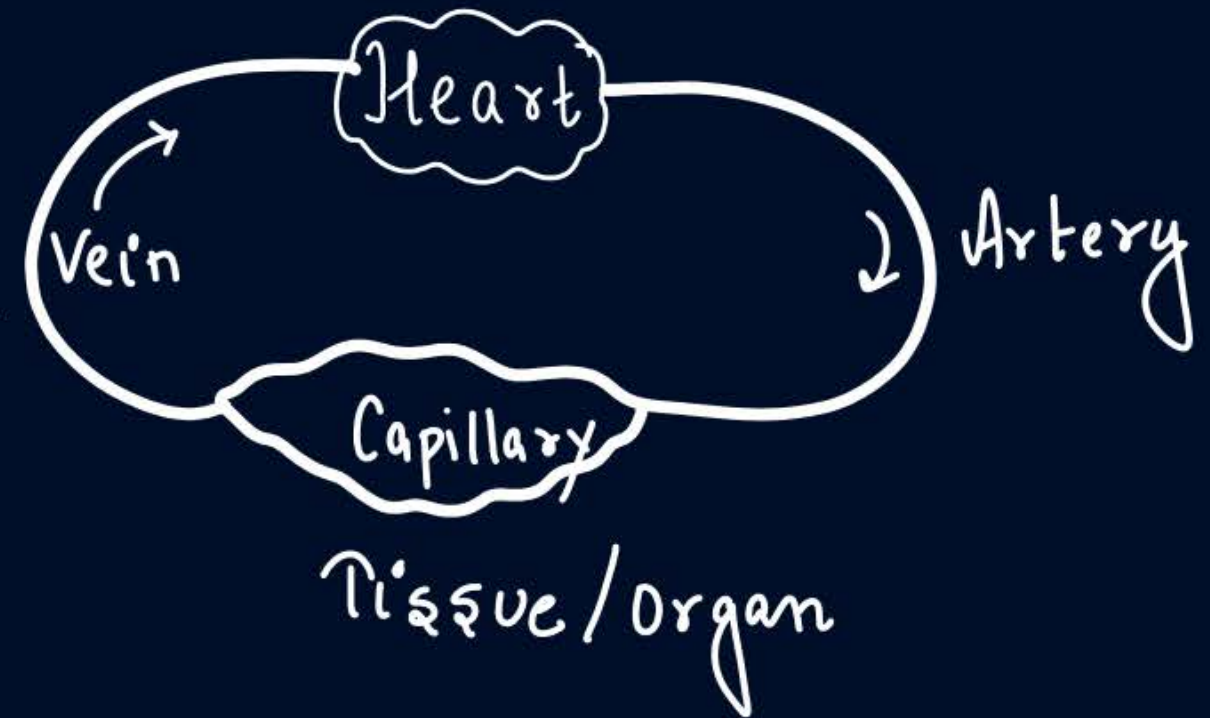
Portal Circulation:

- Special venous connection b/w 2 organs is called Portal Circulation.
- Starts with Capillary & ends with Capillary.

① Hypophyseal Portal Circulation:



Normal Circulation



↓
B/w Hypothalamus & Ant. Pituitary

- Hypothalamic hormones can reach to Pituitary via this.

18.20

Q- what causes the closure of AV valves during ventricular systole

- 1) Increased pressure in atria
- 2) decreased pressure in the ventricle X
- 3) Attempt of backflow of blood towards atria
- 4) Opening of semilunar valve

Q-1
3

STATEMENT-1- In each heartbeat, 70ml of blood is pumped by each ventricle (T)

STATEMENT-2- The duration of a cardiac cycle is directly proportional to the number of heartbeat

- 1) Statement I is correct but Statement II is incorrect.
- 2) Statement I is incorrect but Statement II is correct.
- 3) Both Statement I and Statement II are correct.
- 4) Both Statement I and Statement II are incorrect.

Time \propto No Heart Beat

$$\frac{100 \text{ Beat}}{1 \text{ Beat}} = \frac{60 \text{ sec}}{100} \Rightarrow 60 \text{ sec} = 72 \text{ Beat}$$
$$1 \text{ sec} = 1 \text{ Beat} = \frac{60 \text{ sec}}{72}$$
$$1 \text{ sec} = 0.8 \text{ sec}$$



Homework

- REVISE CLAASNOTES / ZOOLOGY MED EASY

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