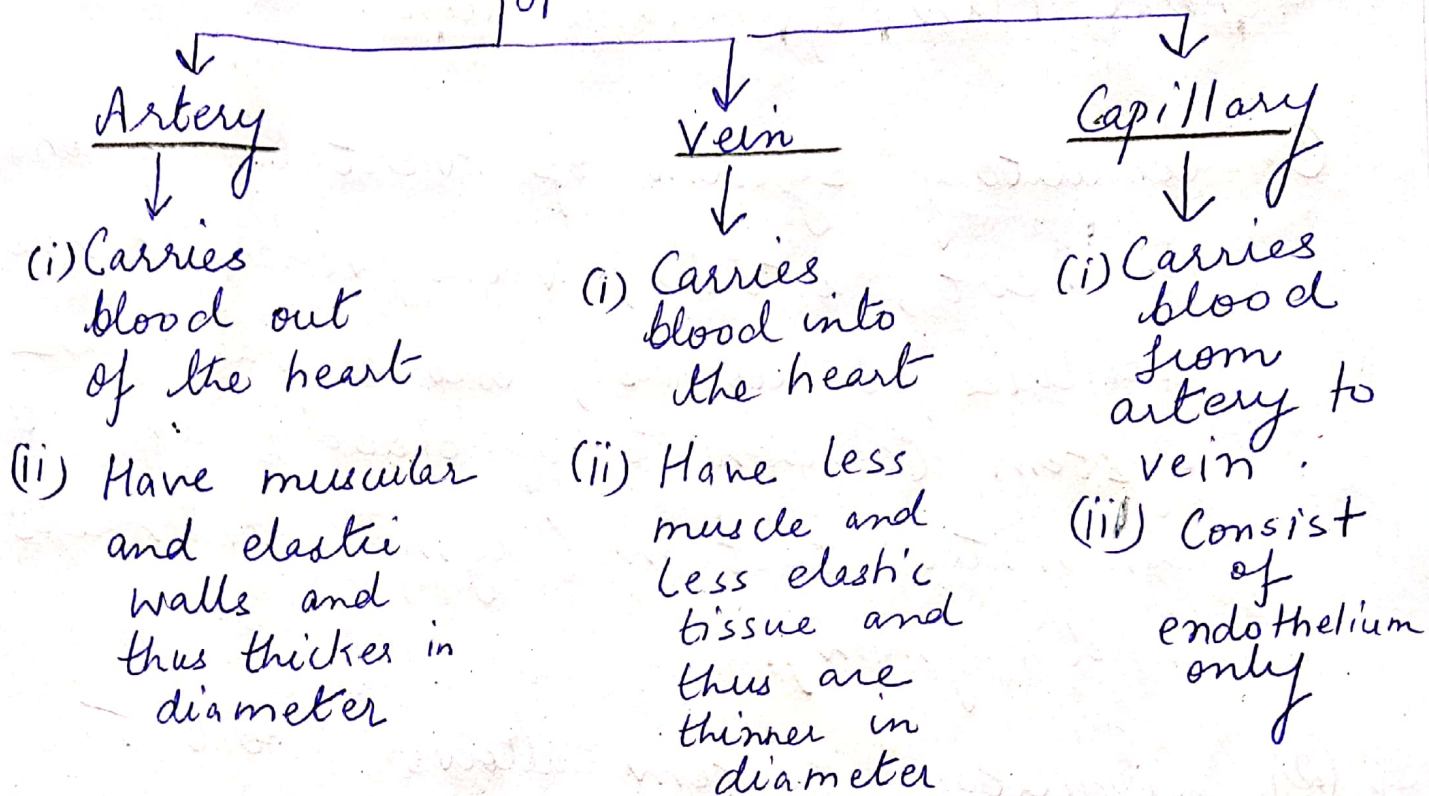


Unit-5 - Circulatory System

General Plan of Circulation

- ① Circulatory system of vertebrates consists of heart, arteries, veins/venous sinuses, capillaries/sinusoids, blood vascular system (components of blood) and the lymphatic system (lymph channels and lymph).
- ② Circulatory system allows blood to circulate and transport oxygen, carbon dioxide, nutrients, hormones etc. It removes the waste products of metabolism by transporting them to the excretory organs. It also protects the body against infection and disease.
- ③ In the vertebrates the circulatory system is of closed type as the blood flows through the closed blood vessels such as the arteries and veins.

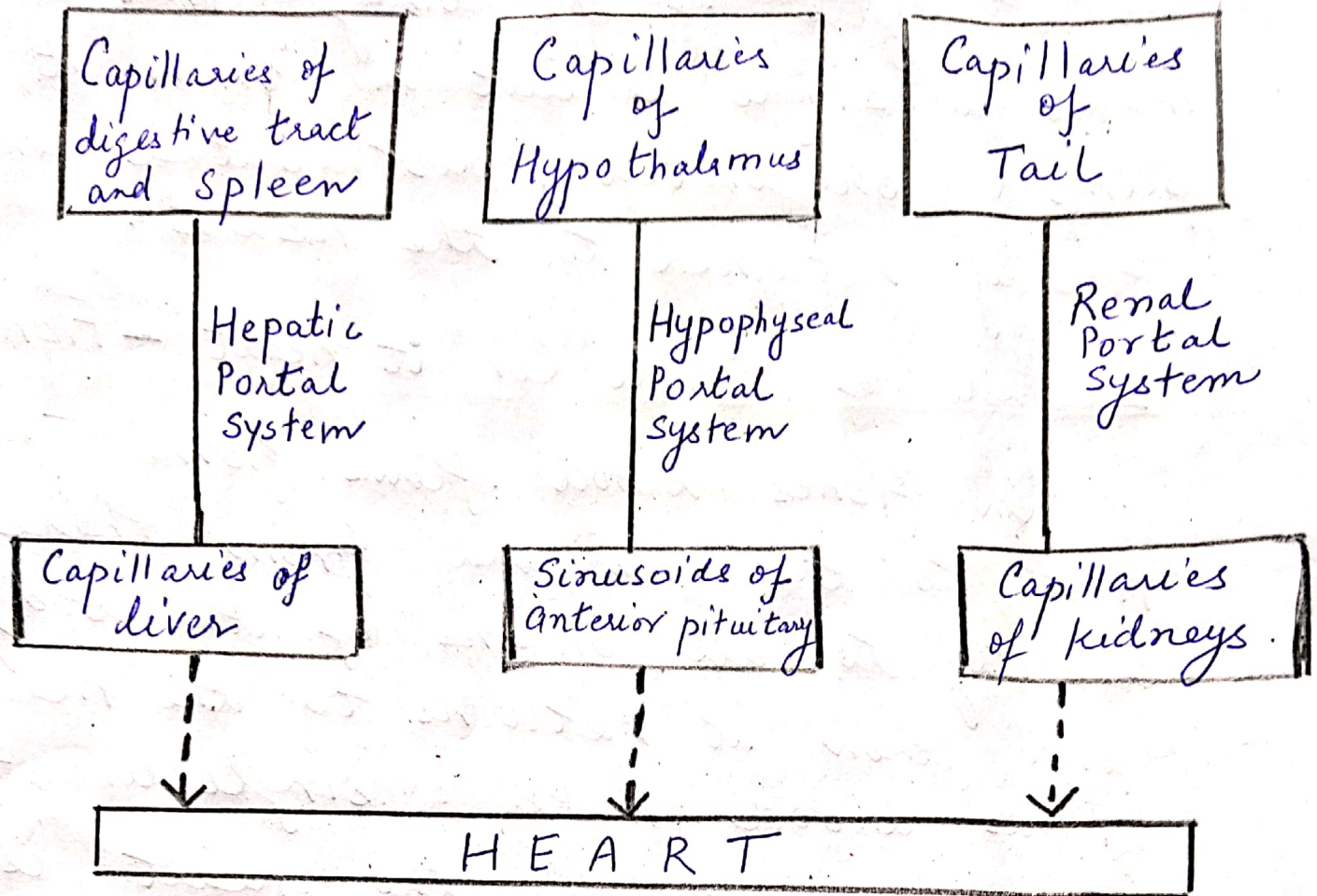
④ There are 3 types of blood vessels



⑤ Portal system

Normally the artery divides into the arterioles which further divide into fine capillaries and supply blood to the tissue. This blood is collected by the capillaries and veins are formed.

But in vertebrates there is also an arrangement where the vein before reaching the heart divides into capillary set in some organs and supply it. The blood is then collected by another set of capillaries forming venules & finally veins. This is known as a Portal System.



Main Portal Systems of Vertebrates.

(Channels indicated by broken lines are not part of a portal system)

⑥ Single circuit and Double circuit Hearts. or Single circulation and Double Circulation

(a) Single circuit heart / Single circulation.

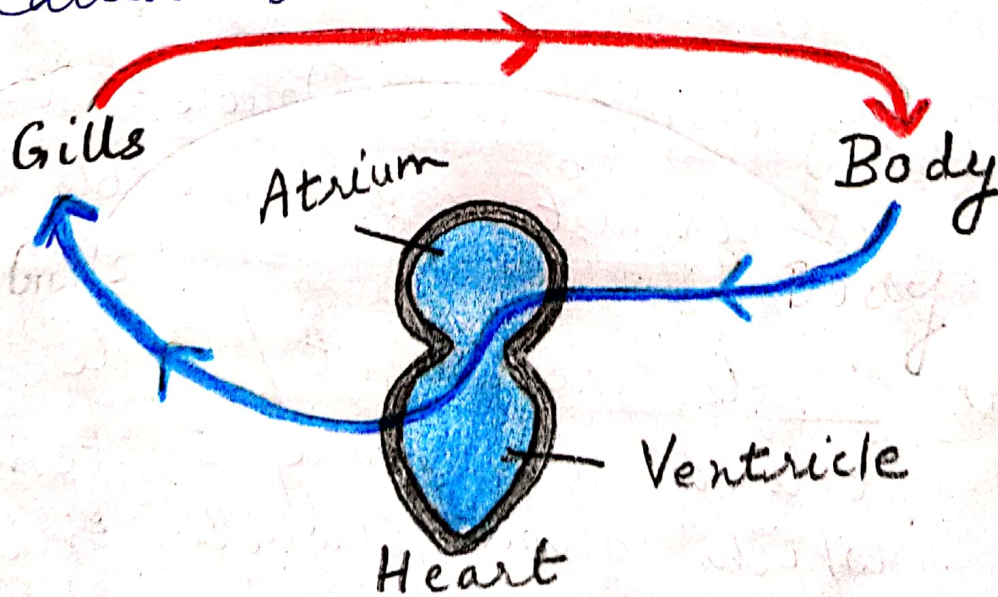
It is a circulatory system in which blood travels only once through the heart in one

complete cycle of the body. Thus blood makes a single circuit in which it is pumped, oxygenated, distributed and finally returned to the heart.

Example of Single Circuit heart - Fishes.

In fishes blood flows from the heart to the gills and from there directly to all organs of the body, and then it returns to the heart. Thus blood makes a single circuit.

All the blood in the heart is non-oxygenated or deoxygenated and thus such a heart is also called branchial or venous heart.



Fishes - Single circuit

(6) Double circuit heart / Double circulation

A circulatory system in which blood flows twice through the heart in one complete cycle of the body is called double circulation.

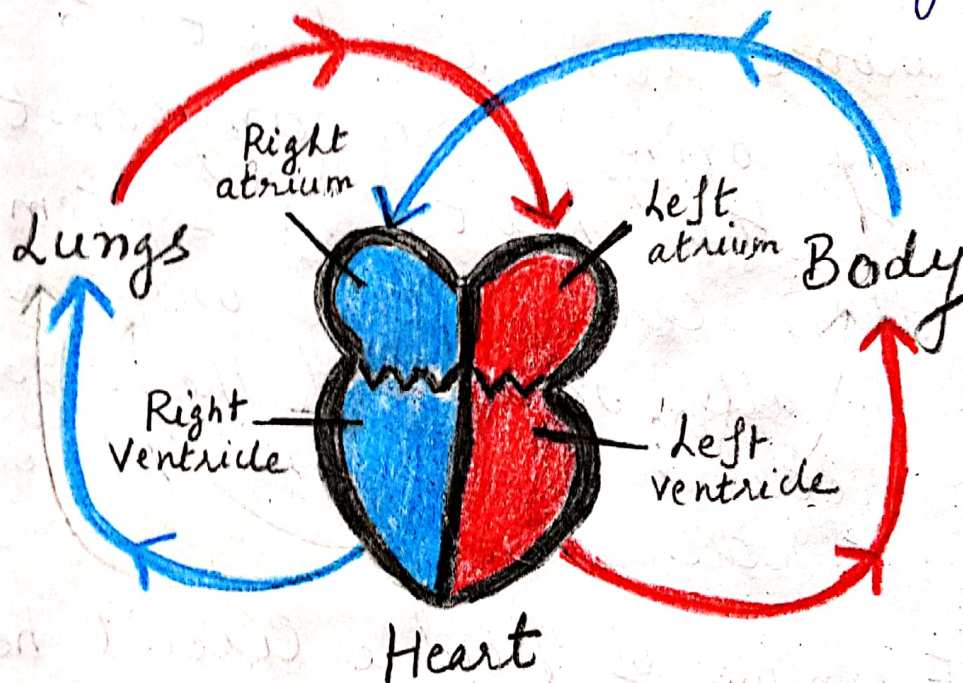
In the double circuit heart the pulmonary circuit carries deoxygenated blood from the heart to the lungs and brings back oxygenated blood to the heart. A systemic circuit then carries this oxygenated blood to all organs of the body and returns deoxygenated blood back to the heart.

Example of Double Circuit heart - Amniotes

In amniotes which have no gills, the deoxygenated blood is carried from the heart to lungs and oxygenated blood is brought back to the heart via the pulmonary circuit. Then the Systemic circuit carries oxygen-rich

blood to all parts of the body and returns oxygen-poor blood to the heart.

Thus in double circulation there is no mixing of oxygenated and deoxygenated blood. Such a heart is known as Pulmonary Heart



Amniotes - Double Circuit

References.

- ① Kent, G.C and Carr R.K (2000) Comparative anatomy of the Vertebrates IX Edition. The Mc Graw-Hill Companies
- ② C.K. Weichert and W. Presch (1970) Elements of Chordate anatomy IV Edition. Mc Graw-Hill