CIRCULATORY SYSTEM: HEART

I. General Characteristics

A. 4 chambers

B. Located in the mediastinum (between lungs)

C. 2/3 of the heart is to the left of the midline

D. Apex points downward & contacts the diaphragm

E. It lies in the pericardial cavity

F. It is separated from the other organs by a double-layered membrane = Pericardium

G. The Pericardium is composed of a Fibrous Pericardium & a Serous Pericardium.

The serous pericardium has 2 parts:

1. Parietal layer – attached to the back of the fibrous pericardium
2. Visceral layer (epicardium) – attached to the heart muscle.

These two are separated by a fluid filled space = pericardial cavity

II. Heart wall: 3 layers

A. Epicardium – outermost. This is the visceral layer of the serous pericardium.

B. Myocardium – middle. Composed of cardiac muscle cells (very thick)

C. Endocardium – innermost. Forms valves and is continuous with the endothelium of the blood vessels that enter & leave the heart.

III. Chambers & valves

A. 4 chambers

1. 2 upper: L. & R. Atria (sing. = atrium)
2. 2 lower: L. & R. Ventricle

B. 4 valves

1. 2 Atrioventricular (AV) Valves

a. R. AV valve = tricuspid

b. L. AV valve = bicuspid, mitral

2. 2 semilunar valves: found at the base of 2 large vessels leaving the heart

= Pulmonary & Aortic Semilunar valves.

IV. Blood flow

A. R. Atrium: receives deoxygenated blood from 3 vessels;

1. Superior vena cava – blood from above the heart.
2. Inferior vena cava – blood from below the heart.
3. Coronary sinus – blood from the heart muscle (myocardium)

B. Blood flows through R. AV valve into R. Ventricle. The flaps of the AV valves are held in place by chordae tendinae & papillary muscles to prevent backflow.

C. Rt. Ventricle contracts & blood exits through the Pulmonary Semilunar valve. (It can't go back into the R. atrium, because the R. AV valve closes.)

It enters the Pulmonary trunk which divides into L. & R. Pulmonary arteries. Blood goes to lungs (carbon dioxide out; oxygen in)

D. Oxygenated blood returns from the lungs through the Pulmonary veins (4: two left & two right) to the Lt. Atrium

E. Blood flows through the L. AV (bicuspid, mitral) valve to the L. Ventricle.

F. L. Ventricle contracts & blood exits through the Aortic Semilunar valve & enters Ascending Aorta. (It can't go back into the L. atrium, because the

L. AV valve closes.)

V. Coronary circulation: the first vessels off of the Ascending Aorta = L. & R. Coronary Arteries (these supply oxygenated blood to the myocardium)

A. L Coronary Artery: gives rise to;

1. Anterior Interventricular Artery – supplies oxygenated blood to anterior wall of ventricles (primarily left).

2. Circumflex Artery – supplies oxygenated blood to L. Atrium & posterior and lateral walls of L. Ventricle. Obstruction of the coronary arteries and their branches are the most common cause of heart attack.

B. R. Coronary Artery: supplies oxygenated blood to the R. Atrium and Anterior R. Ventricle and gives rise to;

1. Marginal Artery – supplies oxygenated blood to lateral wall of R. ventricle

2. Posterior Interventricular Artery – supplies oxygenated blood to posterior walls of ventricles (primarily R.)

C. The blood returns from the heart muscle via 2 major veins:

1. Great Cardiac vein: brings deoxygenated blood back from the anterior heart wall.

2. Middle Cardiac vein: brings deoxygenated blood back from the posterior heart wall.

-Both vessels empty into the Coronary Sinus (a large vein on the back of the heart). It empties into R. atrium.

VI. Conduction system

A. An electrical system. It determines the rate & rhythm of the heartbeat. It has 5 components.

1. Sinoatrial (SA) node (pacemaker) – a mass of neurons which “fire” at 70-80 times per minute; causes Atria to contract.