Lab no 5

The cardiovascular system

The cardiovascular system; the term cardio referees to the heart, the terms vascular refers to blood vessels through which the heart pumps blood. Consequently the cardiovascular consists from three major parts; the heart, blood vessels, and blood.

Blood Vessels

The blood vessels, which make up the cardiovascular system, consist of:

a) **Arteries:** which are thick-walled and carry the oxygenated (arterial) blood away from the heart?

b) **Arterioles:** which are the smaller vessels into which the arteries lead?

c) **Capillaries:** which are the smallest blood vessels; these form a network through all the organs and tissues of the body. As the blood circulates in the capillaries through the organs and tissues, oxygen and nutrients are removed from it.

d) **Venules:** which are the small vessels that collect the venous blood from capillaries?

e) **Veins:** which are the thin-walled vessels that containing valves that collect the venous blood from venules and return it to the heart?
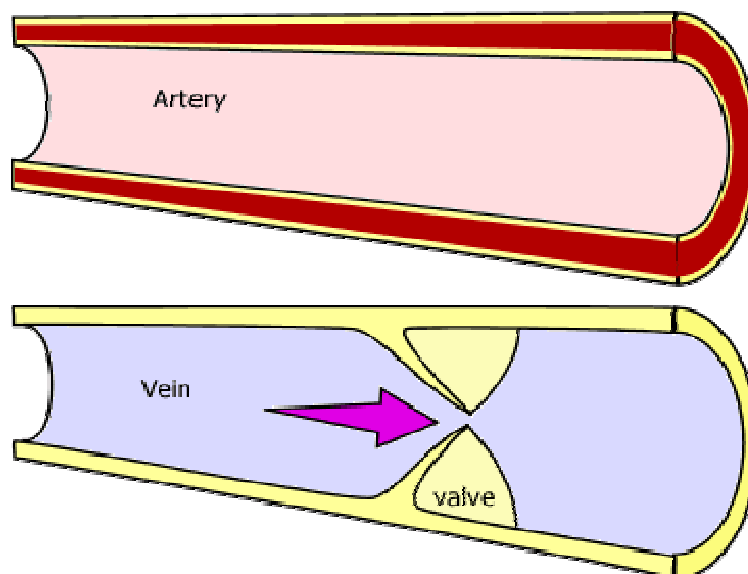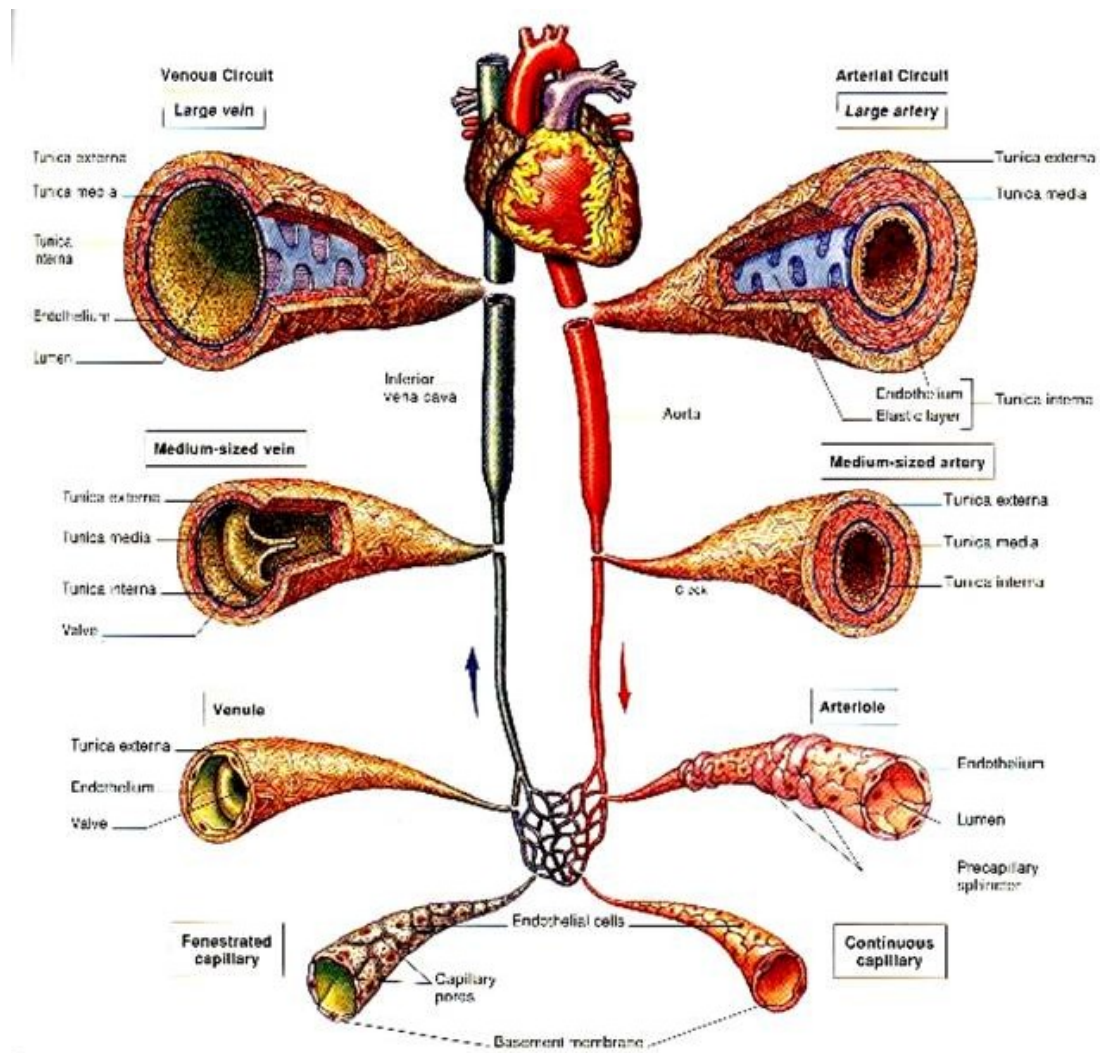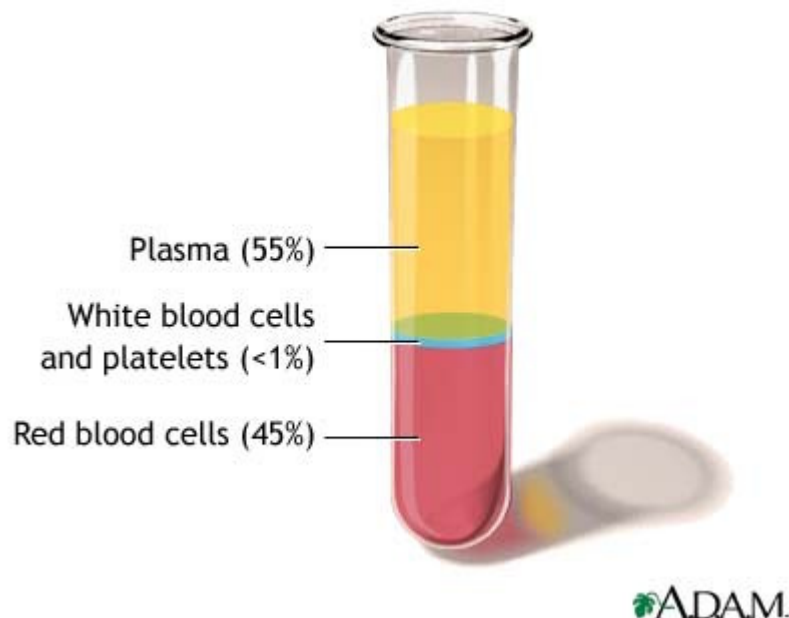
Blood

As you know the blood consists of two parts;
A fluid portion (plasma) and formed elements (blood cells). The cells are of several types and functions.
1. **The erythrocytes (Red blood cells); contain hemoglobin, biconcave in shape, and Play important role in transport of O_2 and CO_2.**
2. **The leukocytes (white blood cells); true cells, with nucleus, and play a role in the body's defense mechanisms.**
3. **Thrombocytes (blood platelets); have a part to play, a long with some other components of the blood, in the process of blood coagulation.**

Determination of the Hematocrite percentage (HCT %)

**Defined as percentage of blood volume that consists of erythrocytes.**
"The volume of erythrocyte (RBC) expressed as a percentage of the volume of whole blood in the sample".
Hematocrite may also called: packed cell volume (P.C.V).
The venous HCT is almost same as that obtained from a skin puncture.
HCT or P.C.V can be determined by centrifuging a sample of blood in a special capillary tube coated by anticoagulant.
The RBC will move to the bottom of the tube and plasma to the top, the leucocytes (WBC) and platelets forming a very thin layer between them figure no 36.

Air

Plasma

Buff

Red Blood Cells

Clay plug
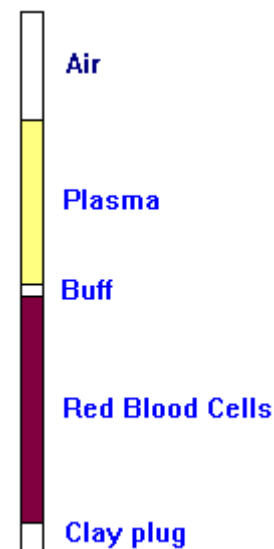
According to the HEAVEST EQUAL FIRST
HCT is the volume of packed red cells in relation to the total blood volume.
The normal HCT is approximately 45% in men and 42% in women.
The total blood volume of an average person is approximately 5.5 (5-6L).
If we take the HCT to be 45%, then:

$$\text{Total RBC volume} = \frac{45}{100} \text{X } 5.5 \text{ L} = 2.5 \text{ L}$$

Therefore:
Plasma volume = 5.5 L – 2.5 L = 3.0 L
This last calculation ignores the volume occupied by the WBC and platelets because it is normally so small.

Procedure;
Obtain a capillary tube treated with anticoagulant such as heparin, clean the tip of finger with 70% alcohol, and pick it with a sterile blood lancet so that a large drop of blood will flow out without squeezing the fingertip.
Hold the capillary tube horizontally with one tip in the drop of blood until the blood column almost reaches the end of the tube. Seal the

bottom of the tube by sticking it in a small piece of modeling clay to plug it. The tube must be tightly sealed or the blood will be lost during centrifugation.

Place the tube in one of the slots in the centrifuge head. Centrifuge the tube for 5min. at 12000rpm, remove the tube from the centrifuge and determine the percentage of the blood column that consists of red blood cells.

Direction for using the hematocrite graph;

If possible, effect reading immediately after centrifugation. For this purpose shift the capillary along the graph overleaf until the fluid column is just inside the bold lateral lines. The sealed end must point towards the O-line (left). The division coinciding with the boundary line between red blood cells sediment and plasma indicates the hematocrite value in % of volume.

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