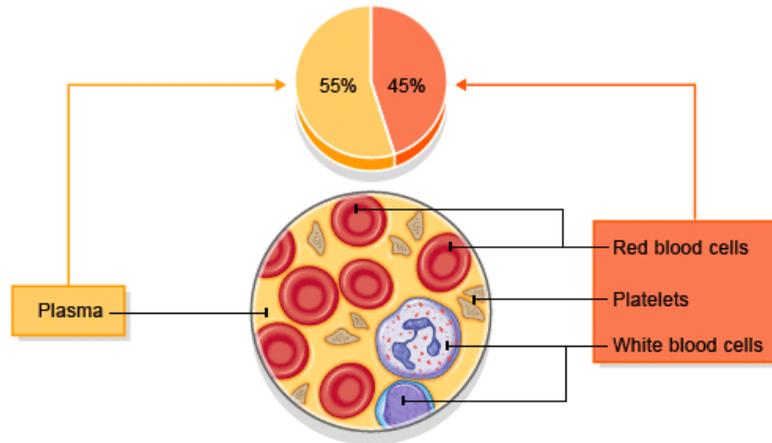


1. **The Composition of Blood:** Blood is a fluid tissue with various types of cells suspended in it.

- a. **Plasma:** contains **(a)** dissolved minerals **(b)** food substances eg glucose, amino acid, fats and vitamins **(c)** excretory products eg Urea, CO<sub>2</sub> as HCO<sub>3</sub><sup>-</sup> ions. **(d)** Hormones.



b. **Red Blood cells:**

- i. Circular biconcave shape without nucleus, contain red pigment Haemoglobin to carry oxygen.
- ii. It had thin flexible membrane to allow it to turn bell shape to squeeze through capillary blood vessels.
- iii. Produced by bone marrow, Lifespan 3-4 months after which was destroyed by spleen releasing Haemoglobin to be broken down to iron (recycled) & bile pigment.

c. **White Blood cells:**

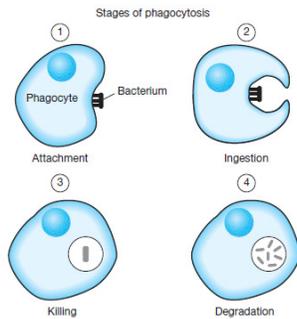
- i. Larger than red blood cell in size but lesser in number. It is irregular shapes and can squeeze through wall of capillary into the space between tissue cells.
- ii. **Lymphocytes:** Large round nucleus and little cytoplasm.
- iii. **Phagocytes:** Lobed nucleus

- d. **Platelets:** not true cells but membrane-bound fragment of certain bone marrow cells.

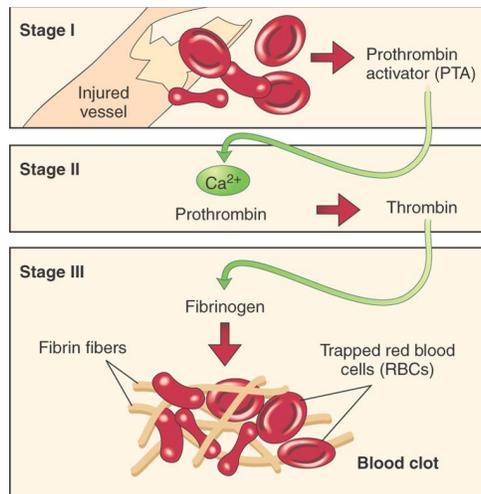
2. **Functions of Blood:**

- a. **Transportation:** blood acts as transport media carrying substances from one part of the body to another.
- b. **Protection:** blood protects the body against disease causing organisms.
  - **Phagocytosis:** phagocytes can ingest and destroy foreign particles or bacteria that enter the blood.
  - Production of antibodies by **lymphocytes** by **(a)** attaching to bacteria and rupture them **(b)** cause the bacteria to clump together and ingested by phagocytes **(c)** neutralizing the toxin produced by the bacteria **(d)** attaching to virus making them unable to bind to the host.

- c. **Blood clotting at wound:** prevents excessive loss of blood and seals the wound to prevent bacteria entry into the bloodstream by 3 steps process kickoff by release of **Thrombokinase (enzyme)** from the damaged vessels



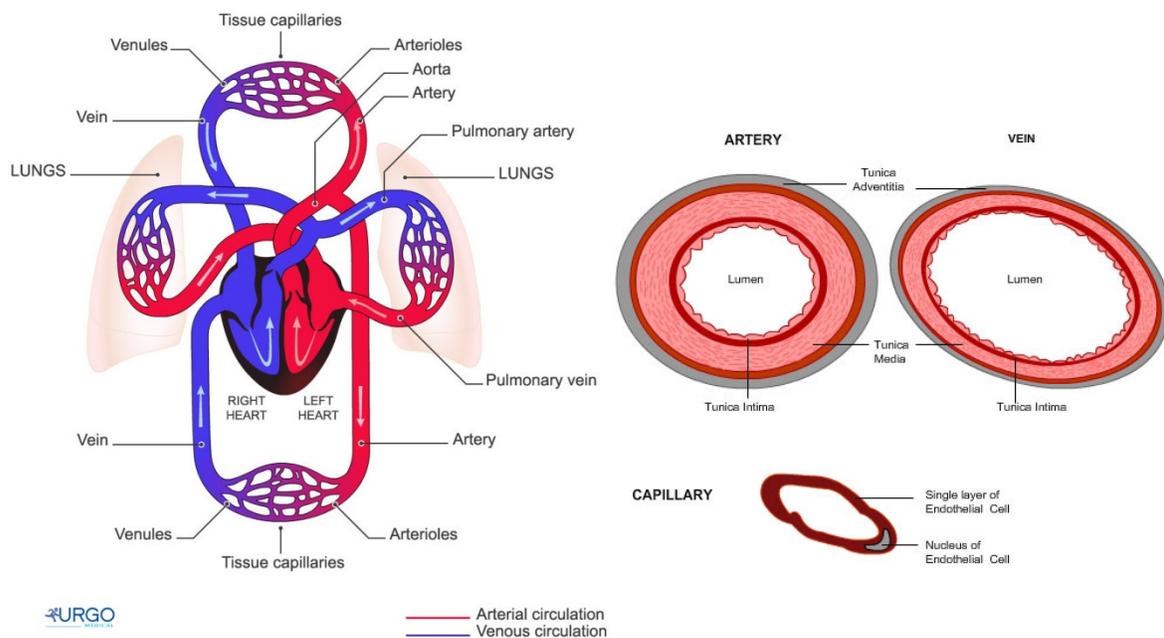
Phagocytosis



Blood clotting

### 3. The double circulatory System

- The heart:** muscular organ to drive the blood around the body.
- Arteries:** blood vessels carry blood away from the heart.
- Capillary:** single cells thick vessels to allow rapid diffusion of substances.
- Veins:** blood vessels carry blood back to the heart.

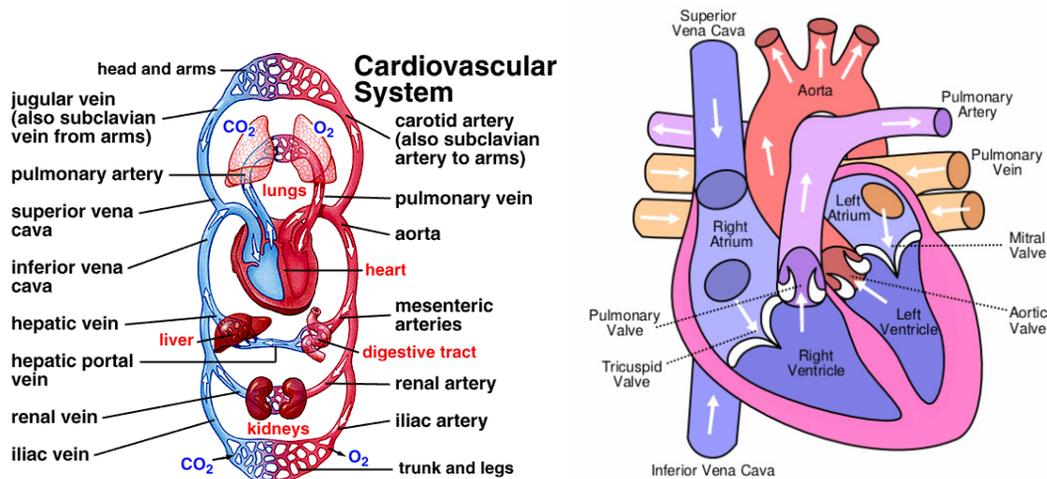


- **Pulmonary Circulation:** Circulation linking the lungs to the heart at **lower pressure** to allow the blood to flow slowly through the lungs for gaseous exchange.
- **Systemic Circulation:** Circulation of oxygen rich blood from the heart to the various systems around the body at **higher pressure** to ensure blood flow quickly to the various tissues.
- Comparison of Vein and Artery

Artery	Vein
a. Carry blood away from heart	Carry blood back to heart
b. Blood pressure is high	Blood pressure is slow
c. Thick and elastic muscular walls	Thinner muscular walls
d. No semi-lunar valve	Semi-lunar valves to prevent back flow
e. Small lumen to diameter ratio	Large lumen to diameter ratio

#### 4. The Flow path of blood through the heart

- The **left ventricle has thicker wall** than right ventricle in order to pump blood at higher pressure to the systemic circulation.
- **Tricuspid** valve and **bicuspid** valve prevent back flow of blood into the atrium when the ventricle contracts.
- **Semi-lunar** valves prevent back flow of blood to the ventricle when it expands.

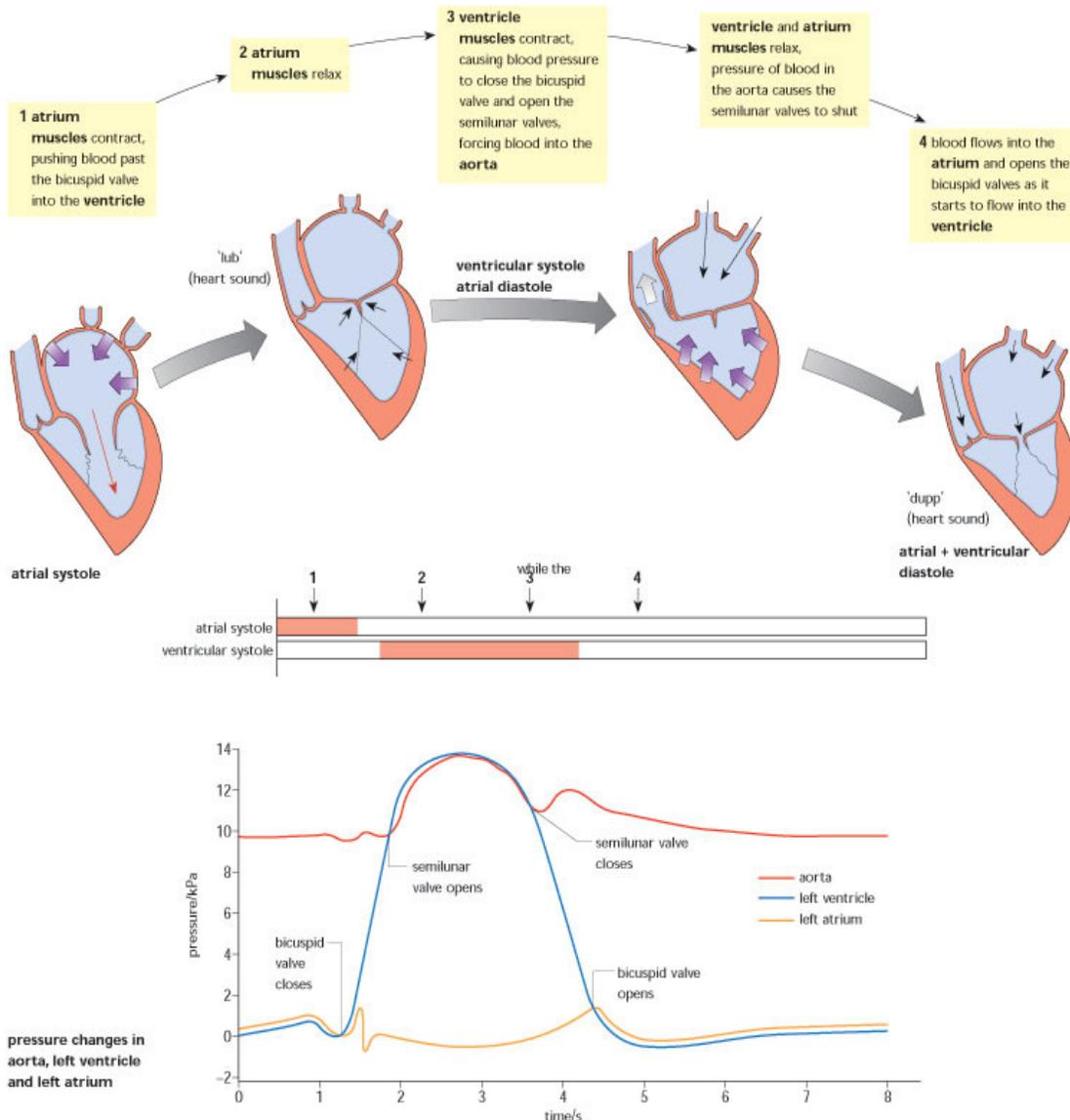


- Deoxygenated blood from body return to the right atrium from the anterior & posterior vena cava.
- Right atrium contracts forcing blood to enter the right ventricle through the tricuspid valve.
- Right ventricle contracts forces blood to the lungs through the pulmonary arteries.
- Blood flow through the lungs at **lower pressure** (slow speed) to exchange gases.
- Oxygenated blood return to the left atrium and then to the left ventricles when the left atrium contracts.
- Left ventricle contracts forcing the blood at **high pressure** to the systemic circulation system through the aortic arch.

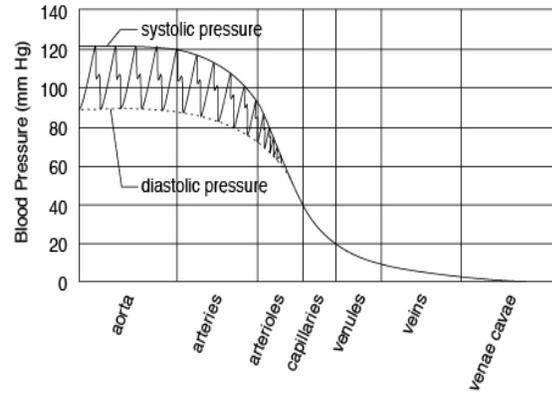
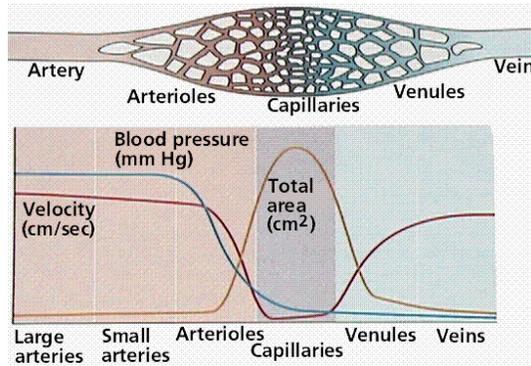
- vii. **2 small coronary arteries** emerge from the aortic arch to bring blood to the heart muscles.

**5. The Cardiac Cycle:** the following steps

- i. Both atria and ventricles relax.
- ii. Atria contract force tricuspid/bicuspid valves open.
- iii. Atria relax.
- iv. Ventricles contracts to close tricuspid/bicuspid valves close and open the semilunar valves.
- v. Ventricles relax.



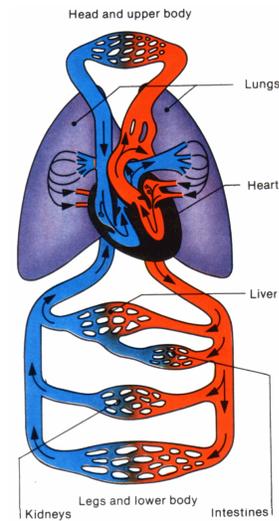
- **“Lub”** sound caused by closing of tricuspid/bicuspid valve when ventricles contracts (Systole)
- Soft **“dub”** sound produce when the semilunar valves were closed due to ventricle relax (Diastole).



- Lowest pressure at **Vena cava**. Highest pressure near the **aortic arch**.
- Normal Systolic pressure 120-140 mmHg, Diastolic pressure 75-90 mmHg measured using **sphygmomanometer**.

**6. The main veins and Artery of the body**

- Hepatic artery, Hepatic portal vein and Hepatic vein were connected to the liver.
- Renal artery and renal vein was connected to the kidneys.



**7. Coronary heart diseases**

- **Atherosclerosis**: is a condition that deposition of fatty substances such as cholesterol & poly-saturated fats on the inner surface of the coronary arteries. This led to narrowed lumen and increased blood pressure.
- **Thrombosis**: is a condition that blood clot that forms in the artery. If it happens in the coronary artery, it leads to heart attack with damage of heart muscles.
- **Factors** that increase the risk of coronary heart diseases:
  - a. Poor diet with high Cholesterol and Poly-saturated animal fats.
  - b. Emotional Stress.
  - c. Smoking cigarette. Carbon monoxide increases rate of fatty deposit in the arteries, and nicotine increases blood pressure and risk of blood clot.
  - d. Lack of physical exercises.