BLOOD VASCULAR SYSTEM

1. Blood vascular system first appears in Annelida.
2. Blood vascular system is of **closed** type.
3. Blood is red in colour due to the presenpe of haemoglobin dissolved in plasma.
4. The corpuscles are colourless and *nucleated.*
5. The blood carries the digested food from intestine to different tissues.
6. Blood carries oxygen from skin to tissues and carbondioxide from tissues to skin.
7. Blood collects nitrogenous wastes from tissues and transports to excretory organs nephridia.
8. Blood protects the body from the invasion of pathogenic microbes.

BLOOD VESSELS

1. There arc five longitudinal blood vessels in the first 13 segments.

DORSAL BLOOD VESSEL

1. It is the largest vessel present on dorsal side of alimentary canal.
2. It is thickwalled, muscular, valvular and contractile blood vessel.
3. In dorsal blood vessel, blood Hows from posterior to anterior.
4. Dorsal blood vessel acts as distributing vessel in the first 13th segments and acts as collccing vessel behind the $13^{,h}$ segment.

VENTRAL BLOOD VESSEL

1. It is present on the ventral side of alimentary canal.
2. It is situated between alimentary canal and nerve cord.
3. It is thin walled, non-muscular, non- valvular and non-contractile.
4. In ventral vessel blood flows from anterior to posterior.
5. In each segment ventral blood vessel gives a pair or ventro tegumentary vessels supplying to body wall, septa integumentary nephridia and also to reproductive organs.
6. Ventral blood vessel is the chief distributing vessel through out the body.

LATERAL OESOPHAGEAL VESSELS

1. A pair of lateral oesophageal vessels are *present on the ventrolateral* sides of gut in the *first* thirteen segments.
2. Lateral oesophageals *collect blood* from bodywall, septum and other visceral organs like integumentary nephridia, pharyngeal nephridia, reproductive organs and alimentary canal first thirteen segments.

SUPRA OESOPHAGEAL VESSEL

1. It is the shortest vessel present on dorsal side of alimentary canal from 9th to 13th segment.

HEARTS

1. In Pheretima four pairs of hearts are present in 7, 9, 12, 13 segments connecting the dorsal and ventral blood vessel.
2. Hearts are muscular, valvular and contractile structures.
3. Lateral hearts present in 7, 9 segments contain 4 pairs of valves and carry blood from dorsal blood vessel to ventral blood vessel.

4. Lateral oesophageal hearts present in 12, 13 segments contain 3 pairs of valves. They carry blood from dorsal blood vessel and supraoesophageal vessel into ventral blood vessel.
5. The total number of valves present in hearts are 28 pairs.

ANTERIOR LOOPS

1. Two pairs of anterior loops of present in 10th and 11th segments connecting lateral oesophageals with supraoesophageal
2. Anterior loops are non-muscular, non- valvular and non-contractile
3. Anterior loops carry blood from lateral oesophageals to supraoesophageal.

RING VESSELS

1. In 10, 11, 12 and 13th segments 12 pairs of ring vessels are present in each segment connecting lateral oesophageals with supraoesophageal.
3. Through ring vessel blood flows from lateral oesophageals into supraoesophageal vessel.
4. Behind 13th segment dorsal blood vessel collects blood through two pairs of dorsointestinals from intestine and a pair of commissural vessels in each segment from sub-neural vessel.
5. The ventral vessel gives rise to ventrointegumentary vessels and ventrointestinal vessels.
6. The ventro integumentary gives the septonephridial branch supplying blood to septal nephridia.

SUBNEURAL VESSEL

1. The subneural vessel lies below the ventral nerve cord from 14th to posterior end.
2. The subneural vessel is nonmuscular nonvalvular collecting blood vessel.
3. The subneural vessel collect blood from ventral bodywall and ventral nerve cord.
4. In subneural vessel blood flows from anterior to posterior region.
5. From 14th segment a pair of commissural vessels connect subneural to dorsal vessel in each segment.
6. Commissural vessel collect blood from septal nephrida, prostate glands and bodywall.
7. Each commissural vessel gives a septo intestinal branch to intestine.
8. The commissural vessel acts as both collecting and distributing vessel.
9. In each segment two pairs of dorso intestinals carry blood from intestine to dorsal blood vessel.

INTESTINAL BLOOD PLEXUS

7. The number of capillary networks in intestine - 2.
8. The internal intestinal plexus lies between circular muscle layer and internal epithelial lining.
9. The capillaries of external network lies on the surface of gut.
10. The internal plexus absorbs nutrients from gut and connected to dorsal blood vessel through dorsointestinals.
5. The external plexus receives blood from the ventro, septo, intestinals and open into the internal plexus.
6. The collecting vessels in posterior region are dorsal vessel, subneural vessel and dorsointestinal vessel.

7. The distributing vessel in posterior region are ventral blood vessel, ventro tegumentaries and ventro intestinals.
8. The openings of dorso intestinal and commissural into dorsal blood vessel are guarded by valves.
9. From bodywall oxygenated blood is collected by the branches of subneural,
   • commissural and dorsal vessels.
10. Three pairs of follicular bodies called **blood glands** are present in 4,5 and 6th segments.
11. Blood glands produce haemoglobin and blood corpuscles.
12. A pair of whitish lymph glands occur in each segment from 26th segment onwards.
13. Lymph glands produce phagocytes.