

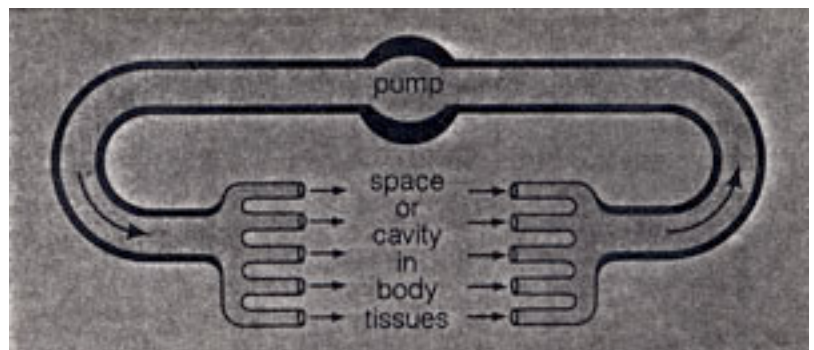
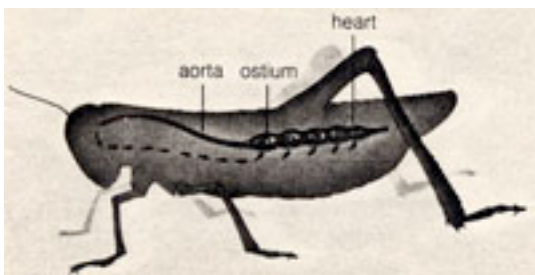
CHARACTERISTICS OF BLOOD

The simplest animals with a true circulation system are ribbon worms, the longest of which is still shorter than your big toe. Their blood functions mainly in carrying wastes away from cells; it also contains phagocytic cells (which engulf foreign particles). In many invertebrates and all vertebrates, blood not only transports products and wastes from cells but it also transports nutrients and oxygen to them. It contains specialized phagocytic cells that function as scavengers and infection fighters, and it serves as the highway for hormones. By virtue of its composition, blood helps stabilize internal pH. In birds and mammals, blood also helps equalize body temperature by carrying excess heat from regions of high metabolic activity (such as skeletal muscles) to the skin, where it can be dissipated from the body.

In most animals, blood is a transport fluid that carries raw materials to cells, carries products and wastes from them, and helps maintain an internal environment that is favorable for cell activities.

Components of Blood:

	Function	Number per Microliter	Volume Percent
Cellular Portion (40%-50% of total volume)			
1. Red blood cells	Oxygen, carbon dioxide transport	4,500,000-5,500,000	
2. White blood cells:			
Neutrophils	Phagocytosis	3,000-6,750	
Lymphocytes	Central to immune response	1,000-2,700	
Monocytes	Phagocytosis	150-720	
Eosinophils	Phagocytosis	100-360	
Basophils	Source of substances that increase capillary permeability and show anticlotting activity	25-90	
3. Platelets	Source of substances that aid in blood clotting	250,000-300,000	
Plasma Portion (50%-60% of total volume)			
1. Water	Serves as solvent		91-92
2. Plasma proteins	Play diverse roles (infection fighting, blood clotting, lipid transport, etc.)		7-8
3. Other solutes (ions, sugars, lipids, amino acids, hormones, vitamins, dissolved gases)	Play diverse roles (maintaining extracellular pH, fluid volume, etc.)		1-2



Fluid flow through an open circulatory system. The sketch above shows the open system of the grasshopper. Like other insects, the grasshopper has a "heart" in the posterior portion of its body that pumps blood through a vessel (aorta) which dumps the blood into tissues at the anterior end of the body. After diffusing through body spaces, blood moves back into the heart through lateral openings (ostia).