

Introduction - General Functions of the Cardiovascular System

Introduction

In this lesson, you will be learning about blood, its composition, formed elements and plasma, and hematopoiesis.

The topics covered in this concept include:

- Major functions of each component of the cardiovascular system (i.e., blood, heart, blood vessels)
- General composition of blood (e.g., plasma, formed elements)
- Composition of blood plasma
- Major types of plasma proteins
 - Their functions
 - Sites of production
- Hematopoiesis
 - Locations of hematopoiesis (hemopoiesis) and the significance of the hematopoietic stem cell (HSC or hemocytoblast)
 - Basic process of erythropoiesis
 - Significance of the reticulocyte
 - Regulation through erythropoietin (EPO)
 - Basic process of leukopoiesis and thrombopoiesis

Introduction to the Cardiovascular System

The circulatory system consists of the heart, blood vessels and blood. The heart and blood vessels form the circulatory system and the study of blood is called hematology.

Blood is the liquid connective tissue that supports the cellular needs of nutrition and the elimination of waste.

It has three major functions:

- Transportation: Transports oxygen, carbon dioxide, nutrients (from intestine), hormones, heat, and metabolic wastes.

- Regulation: Regulates homeostasis of all body fluids, intracellular fluids, pH, and metabolic heat.
- Protection: Protects against excessive loss by clotting, against infections, cancerous cells by WBCs, and toxins by antibodies.

General Characteristics of Blood

Blood is more viscous than water with the solutes, nutrients, gases, cells, and proteins dissolved.

- It is a warmer fluid with a

Characteristics	Normal Values
Color	Scarlet red (oxygen-rich) to dark red (oxygen-poor)
Volume	4 - 5 L (females) 5 - 6 L (males)
Viscosity (relative to water)	4.5 - 5.5x (whole blood)
Plasma concentration	0.09%
Temperature	38°C (100.4°F)
pH	7.35 - 7.45

- The color of blood ranges from bright red, when it is oxygenated, to dark red in a deoxygenated form.
- The normal blood volume range for men is between 5-6L and for women it is between 4-5L.
- The normal pH of blood has a range between 7.35-7.45. A number of buffer systems help regulate pH levels.

The General Composition of Blood

Blood is the liquid connective tissue with

- Plasma, a clear yellow fluid as matrix that makes about 55% of the blood volume
- Formed elements (membrane-enclosed bodies) that include platelets (thrombocytes), white blood cells (leukocytes) and red blood cells (erythrocytes).

These components can be separated by a process called fractionation which uses centrifugation of the blood sample. After centrifugation (fig 18.2) erythrocytes settle at the bottom of the tube, their packed volume when compared to total blood is called hematocrit or packed cell volume (37-52%).