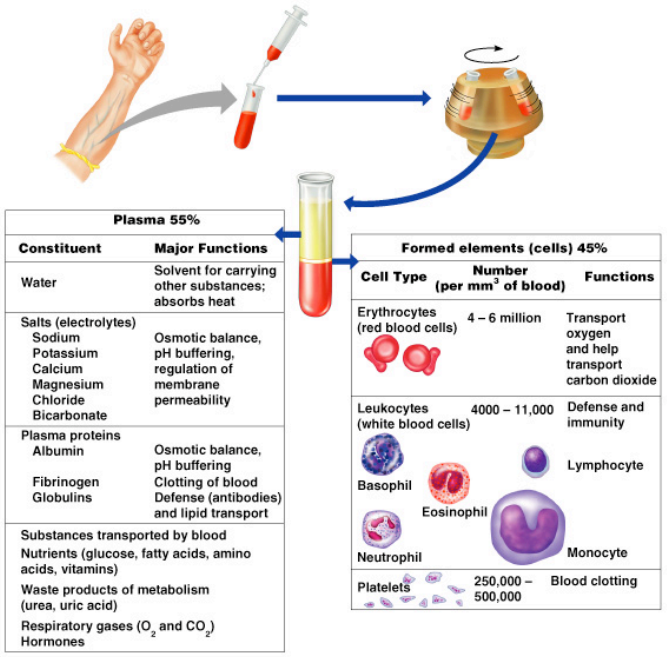
BLOOD CLASS NOTES

Blood is the only _____ tissue in the human body. It is composed of living cells (_____) and non-living cells (_____)

The color of blood ranges. Oxygen rich blood is _____ while oxygen poor blood is a _____. The pH must remain between _____ and its temperature is slightly _____than the body's temperature. Blood plasma is composed of about _____ water and includes many dissolved substances. These include:



Plasma 55%

Constituent	Major Functions
Water	Solvent for carrying other substances; absorbs heat
Salts (electrolytes) Sodium Potassium Calcium Magnesium Chloride Bicarbonate	Osmotic balance, pH buffering, regulation of membrane permeability
Plasma proteins Albumin Fibrinogen Globulins	Osmotic balance, pH buffering Clotting of blood Defense (antibodies) and lipid transport
Substances transported by blood Nutrients (glucose, fatty acids, amino acids, vitamins) Waste products of metabolism (urea, uric acid) Respiratory gases (O_2 and CO_2) Hormones	

Formed elements (cells) 45%

Cell Type	Number (per mm^3 of blood)	Functions
Erythrocytes (red blood cells)	4 – 6 million	Transport oxygen and help transport carbon dioxide
Leukocytes (white blood cells)	4000 – 11,000	Defense and immunity
Basophil		
Eosinophil		Lymphocyte
Neutrophil		Monocyte
Platelets	250,000 – 500,000	Blood clotting

Blood plasma proteins include:

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-

The formed elements in blood include:

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-
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Cell type	Occurrence in blood (per mm^3)	Cell anatomy*	Function
Erythrocytes (red blood cells, or RBCs)	4–6 million	Salmon-colored biconcave disks; anucleate; literally, sacs of hemoglobin; most organelles have been ejected	Transport oxygen bound to hemoglobin molecules; also transport small amount of carbon dioxide
Leukocytes (white blood cells, or WBCs)	4000–11,000		
Granulocytes			
• Neutrophils	3000–7000 (40–70% of WBCs)	Cytoplasm stains pale pink and contains fine granules, which are difficult to see; deep purple nucleus consists of three to seven lobes connected by thin strands of nucleoplasm	Active phagocytes; number increases rapidly during short-term or acute infections
• Eosinophils	100–400 (1–4% of WBCs)	Red coarse cytoplasmic granules; figure-8 or bilobed nucleus stains blue-red	Kill parasitic worms; increase during allergy attacks; might phagocytize antigen-antibody complexes and inactivate

Cell type	Occurrence in blood (per mm^3)	Cell anatomy*	Function
• Basophils 	20–50 (0–1% of WBCs)	Cytoplasm has a few large blue-purple granules; U- or S-shaped nucleus with constrictions, stains dark blue	Granules contain histamine (vasodilator chemical), which is discharged at sites of inflammation
Agranulocytes			
• Lymphocytes 	1500–3000 (20–45% of WBCs)	Cytoplasm pale blue and appears as thin rim around nucleus; spherical (or slightly indented) dark purple-blue nucleus	Part of immune system; one group (B lymphocytes) produces antibodies; other group (T lymphocytes) involved in graft rejection, fighting tumors and viruses, and activating B lymphocytes
• Monocytes 	100–700 (4–8% of WBCs)	Abundant gray-blue cytoplasm; dark blue-purple nucleus often kidney-shaped	Active phagocytes that become macrophages in the tissues; long-term "clean-up team"; increase in number during chronic infections such as tuberculosis
Platelets 	250,000–500,000	Essentially irregularly shaped cell fragments; stain deep purple	Needed for normal blood clotting; initiate clotting cascade by clinging to broken area; help to control blood loss from broken blood vessels

*Appearance when stained with Wright's stain.

Erythrocytes (_____)

- The main function is to carry _____
- Anatomy of circulating erythrocytes
    -
    -
    -
    -
- Outnumber white blood cells _____

Hemoglobin

- _____containing protein
- Binds _____ but reversibly to _____
- Each molecule has _____ binding cites
- Each erythrocyte contains _____ million hemoglobin molecules

Leukocytes (_____)

- Crucial in the body's defense against _____
- These contain a _____ and _____
- Able to move into and out of blood _____
- Can move by _____motion
- Can respond to chemicals released by _____ tissues

Normal levels are between _____ and _____ per millimeter.

Abnormal leukocyte levels

- Leukocytosis
  -
  -
- Leukopenia
  -
  -

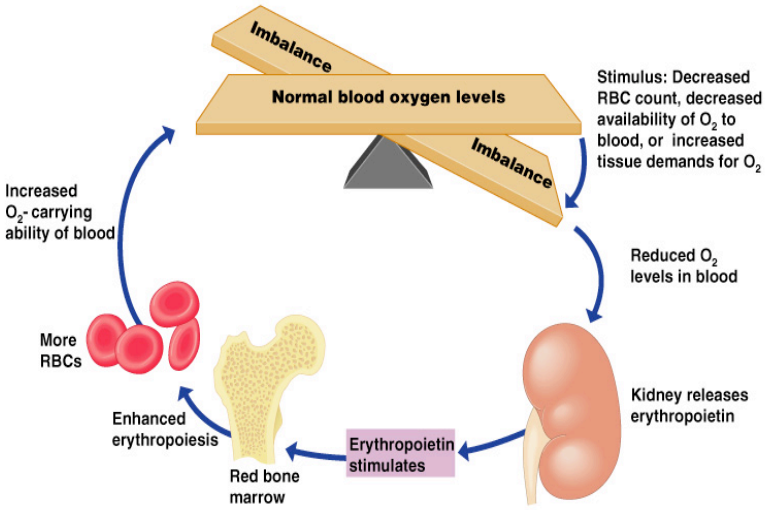
Platelets

Derived from ruptured _____cells and are needed for the _____ process.

The normal platelet count is _____per cubic mm.

Hematopoiesis

This is _____cell formation that occurs in the _____ bone marrow. All blood cells are derived from a common stem cell called a _____. Since erythrocytes do not _____ or grow them must be produced. They wear out in _____to _____ days. They are eliminated in the _____or _____. The control of formation is controlled by a hormone called _____. The _____ produce most of the erythroprotein in response to reduced _____levels in the blood. Homeostasis is controlled by a _____feedback loop.



Hemostasis

This is the _____ of blood flow which can result from a break in a _____.

This involves three phases:

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-
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To form a platelet plug, collagen fibers are exposed by a _____ in the blood vessel. The platelets become _____ and cling to the fibers. The anchored platelets release chemicals to attract _____more platelets. This causes the platelets to pile up an for a _____. Blood clots ususully occur within _____minutes. The clot remains as _____regenerates. The clot is broken down after _____repair.

Undesirable clotting can happen.

Thrombus

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-

Embolus

-
-

There are some bleeding disorders.

Thrombocytopenia

-
-

Hemophilia

-
-

Blood Groups and Transfusions

Large losses of blood will have serious consequences

- Loss of 15-30% causes _____
- Loss of over 30% will cause _____ and could be _____

Transfusions are the only way to replace blood _____ but must be the same blood _____.

Blood contains genetically determined _____. A foreign protein (_____) may be attacked by the immune system. Blood is typed using antibodies that will cause the blood to clump. There are over _____ common red blood cell antigens but the most vigorous reations are to the _____ and _____ blood group antigens.

The ABO blood group is based on the presence or absence of two antigens

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The lack of these antigens is called type ____. If both antigens are present is type _____.

The Rh portion is based on the presence or absence of one of _____ Rh antigens. Most Americans are _____. Problems will occur if Rh groups are mixed.

Dangers in mixing can occur during pregnancy. The danger is if mom is _____ and dad is _____. The problem occurs when the child inherits the _____. The first pregnancy is usually ok. However mom will produce antibodies against _____, so mom's body will attack the ssecond child if the child is Rh+.

Developmental Aspects

In the fetus, the _____ and _____ are early sites for bone cell formation. By the _____ month the bone marrow takes over for blood cell production. Fetal hemoglobin also _____ from the hemoglobin produced after _____.