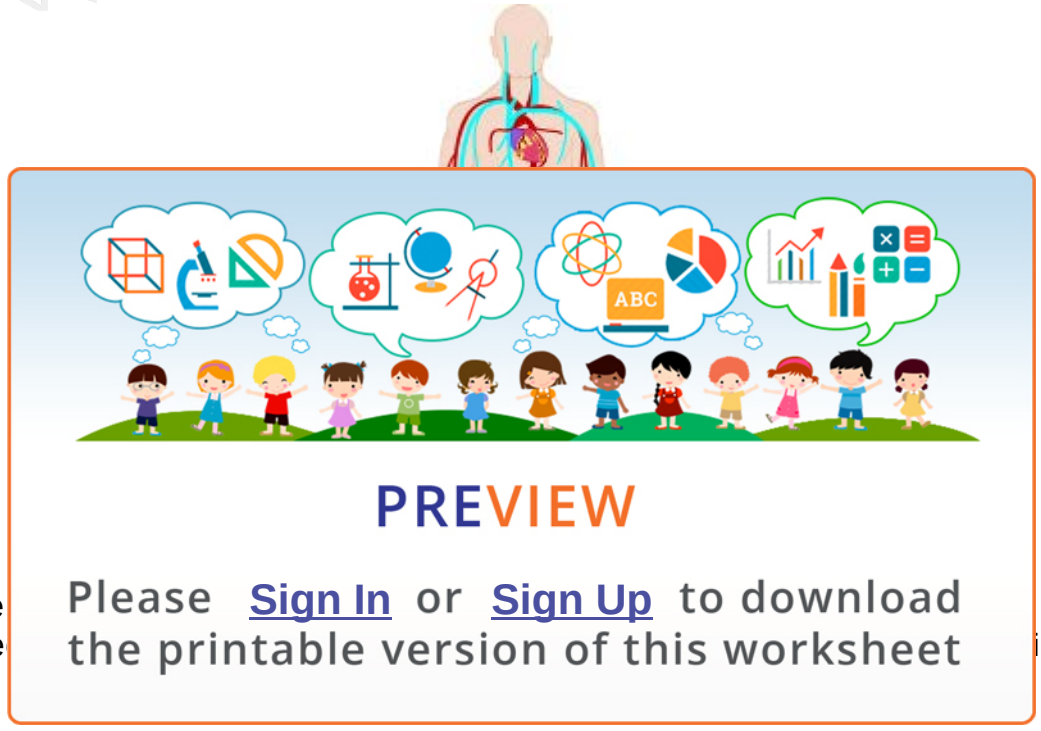
CIRCULATION AND IMMUNITY

The Circulatory System

The circulatory system, otherwise known as the cardiovascular system, consists of the heart, blood vessels, and blood. This important system is a large network of highways delivering blood throughout the body.

The circulatory system brings many different materials to all the cells of the body and picks up waste from the same cells.



The
infe
the

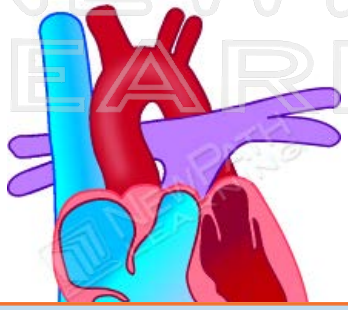
is

The Heart

The **heart** is a hollow muscle made of cardiac muscle that pumps blood to all of the cells in the body. The heart lies underneath the breastbone and is protected by the rib cage. Every time the heart beats, blood is being pushed through all of the different blood vessels of the body.

The structure of the heart keeps the blood flowing in one direction, in a path from body to heart to lungs to heart and back to body. The heart has two separate sides, the right and left, which are separated by the septum. The **septum** prevents oxygen-rich blood from mixing with oxygen-poor blood.

There is an upper and lower chamber on each side of the heart. The upper chambers are known as the atria, and the lower chambers are known as the ventricles. Each atrium receives blood into the heart and each ventricle pumps blood out of the heart. The structure that divides the atria from the ventricles is called a valve. The **valve** prevents blood from flowing backwards in the one-way direction of the circulatory system.



Wh ***ls?***

Ste

The
Firs
cont
ven ose
and

In the right atrium, there are a group of cells that send out signals that cause the heart to contract called the **pacemaker**. The pacemaker receives information about the body's need for oxygen. Immediately after leaving the heart, the blood travels through the blood vessels.

Blood Vessels

There are three types of blood vessels in the human body: arteries, capillaries, and veins.

- The **arteries** are blood vessels that move blood away from the heart and out to the body.
- The **capillaries** are small blood vessels that connect the arteries to the veins and where substances are exchanged between the blood and body tissues.
- The **veins** are blood vessels that carry blood back to the heart muscle.

Blood Flow

There are two loops in the circulatory system. One has oxygen-rich bloc… and one has oxygen-depleted blood. The blood flows from the hea… flow… secc… loop…

- During the **first loop**, the blood leaves the right atrium and is pumped out to the lungs. This is where blood picks up oxygen and drops off carbon dioxide and other wastes. The blood then returns to the heart.
- During the **second loop**, the blood leaves the left atrium and is pumped out of the left ventricle to all of the cells in the body. The blood drops off oxygen to the cells and picks up carbon dioxide and other wastes.

Lesson Checkpoint:
What is the difference between the two loops of the circulatory system?

Arteries, Capillaries and Veins

Blood leaves the heart through arteries. The right ventricle pumps blood to the lungs through arteries and the left ventricle pumps blood out to the body through an artery called the aorta. The **aorta** is the largest artery in the human body. All of the cells in the body receive materials from blood that travels through the arteries. The heart itself receives materials from blood through structures called the **coronary arteries**.

Structure of an Artery

The walls of arteries are thick and consist of three different layers. The inside layer is made up of epithelial cells that are very smooth, which helps to increase the blood flow. The middle layer is smooth muscle. The outside layer is made up of connective tissue. The artery structure is very flexible and strong allowing the arteries to hold high pres

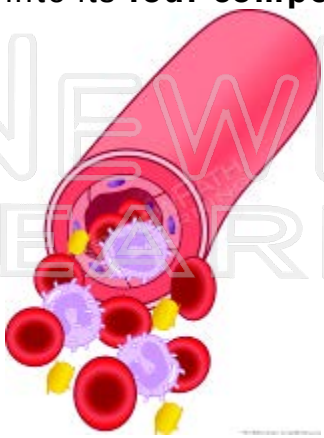
Whe als
are at
surr
allo
oxy
mat on,
whi
allo

The

The **veins** carry the blood that is loaded with waste back to the heart. Veins are made of three layers of tissue with the center tissue being made of muscle. The pressure created by the heart is low by the time that the blood reaches the veins. Blood must flow in one direction, so valves help the blood from flowing backwards.

Components of Blood

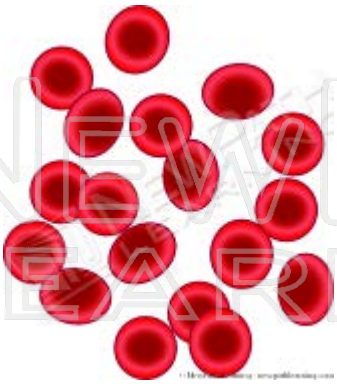
If you were to take blood out of your body and put it into a test tube, the blood would separate into its **four components**.



The top layer would be the liquid part of the blood called **plasma**. The seco ayer wou

Pla wat min is caus na prot dise

Red thes lls. Red od cells ept the center is pinched together. The structure of red blood cells allows them to be flexible so that they can easily travel through the narrow capillaries.



Red blood cells are made of a protein the binds together with oxygen molecules called **hemoglobin**.

White blood cells are also produced in the bone marrow and are the disease fighters of the body. If a white blood cell recognizes a disease, virus, or bacterial cell it will sound the alarm so the body is aware of the invader. There are white blood cells that produce chemicals that kill the invaders and others that actually attack the invader. There are fewer white blood cells than there are red blood cells in the blood and the white blood cells are much bigger.

If yo
prob ut
or s s
calle

Plat ots.
Whe
wou
che

Fibr s
bloc

PREVIEW

Please Sign In or Sign Up to download the printable version of this worksheet

Blood types

If a person were to ever lose a lot of blood from a wound, that person may be given a blood transfusion. A **blood transfusion** is a medical procedure that transfers blood from one person to another.

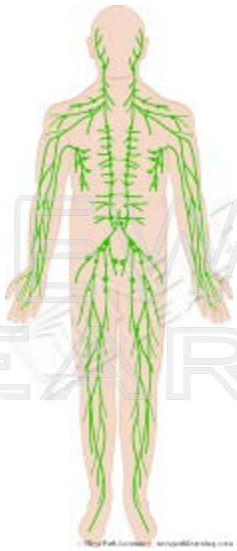
In the early 1900's, this procedure often failed, and doctors did not understand why at the time. It wasn't until a physician tried mixing the blood of several different patients in a glass jar that the problem was revealed. The blood would clump together when some patients' blood was mixed and mix together smoothly when other patients' blood was mixed. The clumping after a blood transfusion caused certain patients to die because the clumped blood was clogging the blood vessels. This led to the discovery of the four types of blood.

The
dete
an
A m
mar
en
you
ve
bloc

The
type
to
the

The

Bloc
ls.
The liquid is brought back to the bloodstream by a network of vein-like vessels called the **lymphatic system.**



Once the fluid is within the lymphatic system it is called **lymph**.
Lym
liqui
lym

Lym
lym

Infe

Man ll to
see
dise

An **i**
orga he
major groups of pathogens that cause disease in humans are **protists, fungi, bacteria, and viruses**. The only way to stop an infectious disease is by killing the organism that is causing the disease. Pathogens are spread in many different ways, including from another person, a contaminated object, and the environment around you. Infectious disease can be spread from one person to another directly through physical contact such as hugging and shaking hands, and indirectly by inhaling materials in the air from another person's sneeze.

Objects can become contaminated if an infected person touches the object; then that disease can be spread if another person were to touch that object. Many pathogens live in our environment. They live in soil, food, and water.

Noninfectious Disease

Noninfectious diseases are diseases that are not spread from one person to another. These include diabetes, allergies, and cancer.

Diabetes: The pancreas is an organ that produces the chemical insulin. **Insulin** allows the body to take in glucose from the blood and use the glucose for energy. **Diabetes** is a noninfectious disease that occurs when the body is unable to use insulin or the pancreas does not produce insulin. When a person has diabetes, they have high levels of glucose in their blood, and the glucose is excreted in the urine rather than used by the body. This drastically reduces the glucose that is available for the cells to produce energy. A person with diabetes must monitor the amount of glucose that is in their blood on a strict schedule to keep his or her body systems in balance.

Alle is
sens
cert

Can
mul
mul **mor**
is a

Bod
Our
The s
that
with **of**
defense against disease.

- The **skin** produces oils and sweat that will kill most of the pathogens that try to enter. Washing your skin will get rid of pathogens.
- The **mouth** and **stomach** both produce chemicals that will destroy pathogens.
- Mucus that is produced in the **breathing passages** will trap pathogens and cilia slowly remove the trapped pathogens.

However, even with these defenses against invading pathogens, sometimes disease invades the body.

The **second line of defense** is a response to damaged tissue called the inflammatory response. The **inflammatory response** causes the body to release chemicals and white blood cells into the tissue near the damaged tissue so that the chemicals and white blood cells can fight the invading pathogens. The response is the same no matter what the invader is. The white blood cells involved with the inflammatory response are called **phagocytes**.

Function of a phagocyte

A **phagocyte** is a white blood cell that surrounds the invading pathogen and breaks it down. The area that is affected by an inflammatory response becomes red and swollen because the blood vessels widen to allow the fluids and blood to get to the area damaged. The area affected by the inflammatory response is normally warmer than the surrounding tissue because of the repairing that is occu

The
imm
kno
diffe
spe
imm

Two

The
lym

- dy.
  actually recognize is something called an antigen that is on the pathogen. An **antigen** is a molecule that responds to a particular immune response.
- **B cells** produce chemicals, called **antibodies**, which help to destroy the different types of pathogens.

Antigens and antibodies attack pathogens together. The antigen will attach to the pathogen and the antibody attaches to the antigen. This will mark the invading pathogen to be destroyed.