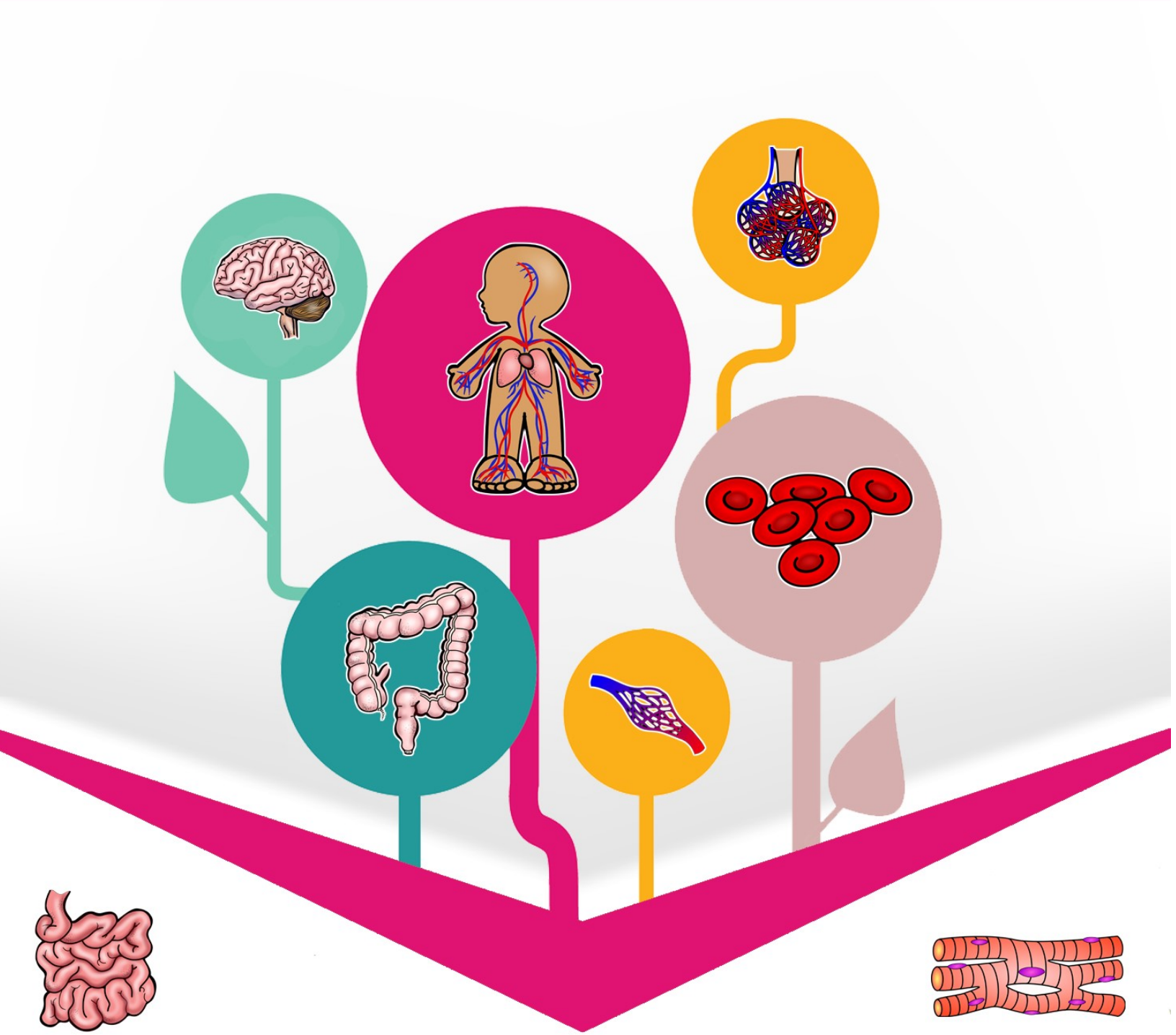
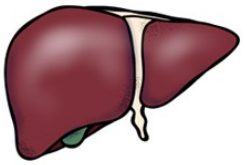
# Life Science
# Level 2







## A Closer Look at Body Systems



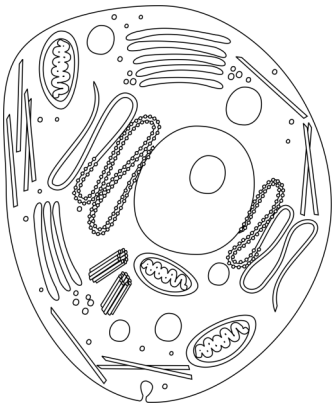
By Bonnie Rose Hudson

Write Bonnie Rose

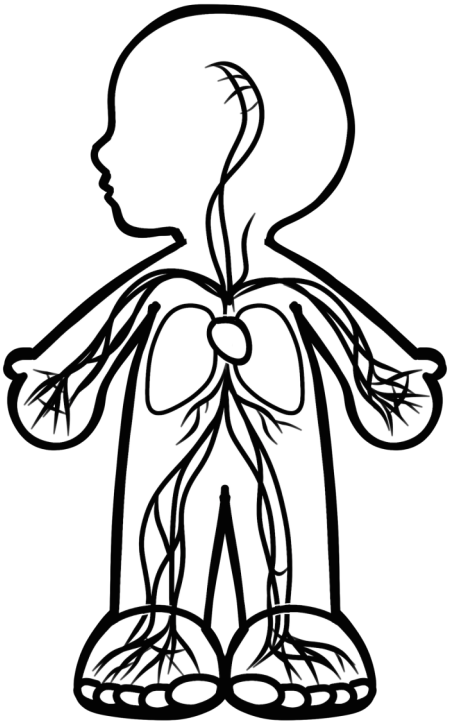
# A Closer Look at Body Systems

Do you know what one trillion is? Think of it this way. Picture one piece of breakfast cereal. Now think of how many pieces it takes to fill one bowl. 100? 200? Let's pretend it takes 250 pieces of cereal to fill your bowl. Now imagine 40 bowls of cereal. Is your table getting full? If each bowl has 250 pieces of cereal in it, now you have 10,000 pieces of cereal. Now here's where it gets amazing. Imagine you had 1,000 bowls of cereal! You would have 250,000 pieces of cereal. We're still a long way from one trillion! How about 1,000,000 (1 million) bowls of cereal? That makes 250,000,000 (250 million) pieces of cereal. What if we had 4,000,000 (4 million) bowls of cereal? Now we're up to 1,000,000,000 (1 billion) pieces of cereal. Hold onto your hats for this next one. If we multiply our 4 million bowls of cereal by 1,000, we would get 4,000,000,000 (4 billion) bowls of cereal. THAT would finally give us 1,000,000,000,000 (1 trillion) pieces of cereal.

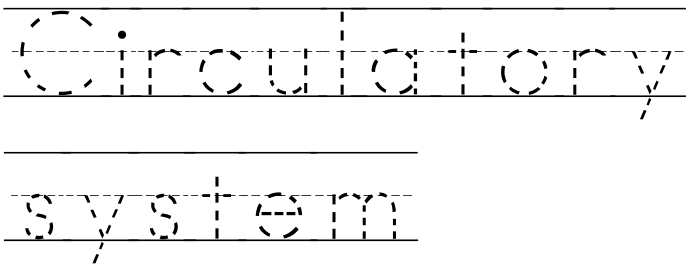
Now that we know what 1 trillion looks like, imagine this. Your body has more than 10 trillion **cells** in it! Thankfully, your cells are a lot smaller than a piece of cereal. As a matter of fact, cells are so tiny you can only see them through a microscope. Every one of those cells is made up of even smaller parts that let the cell "breathe," take in food, and get rid of waste.



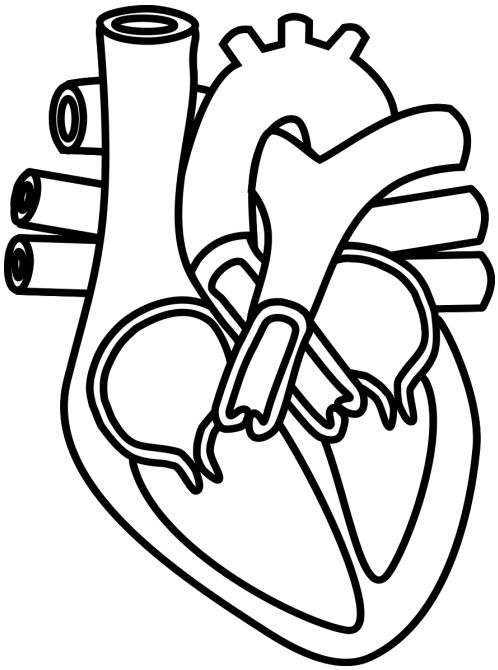
When a group of cells work together to do one type of job, we call them a tissue. When groups of tissues work together, we call it an organ. Your body has many important organs such as your heart, brain, lungs, and kidneys. When a group of organs work together, we call it a system.



Let's look at a few of your body's amazing systems. We'll start with the circulatory system. Your cells need oxygen and nutrients to stay alive and do their jobs. The **circulatory system** is the way your body delivers these things to your cells. It has to reach every single corner of your body, from the top of your head to the bottom of your feet.



Your body uses blood to deliver oxygen and nutrients throughout your body, but something has to keep that blood moving. That's where your **heart** comes in. Your heart is the main organ in your circulatory system. It works like a pump to keep the blood moving in a cycle through your body. Your blood delivers oxygen and nutrients to the cells using a long system of blood vessels. The blood vessels act like a system of roads, transporting the blood everywhere it needs to go. The blood drops off oxygen and nutrients and takes away waste the cells don't need anymore.



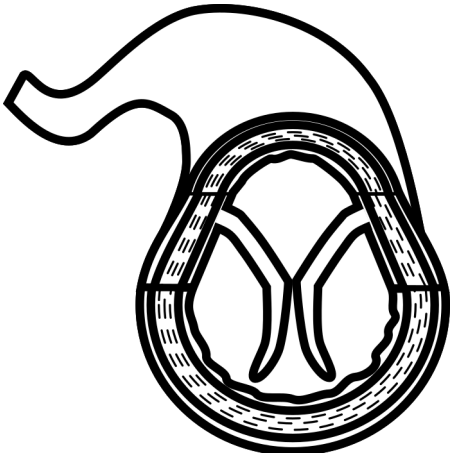
Heart

You have three types of blood vessels in your body, and just like the cells, each type has a different job to do.

Artery

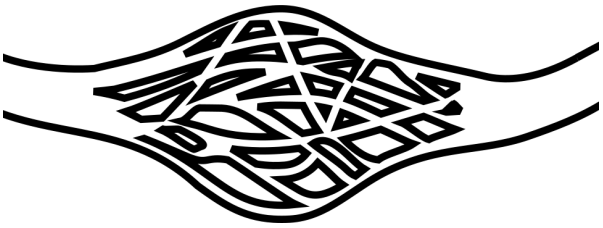
**Arteries** have the job of carrying blood from the heart. The blood they carry is full of oxygen, so it looks very red. **Veins** carry blood back to the heart. The blood our veins carry has already delivered most of its oxygen to the cells, so it appears much darker.

Vein

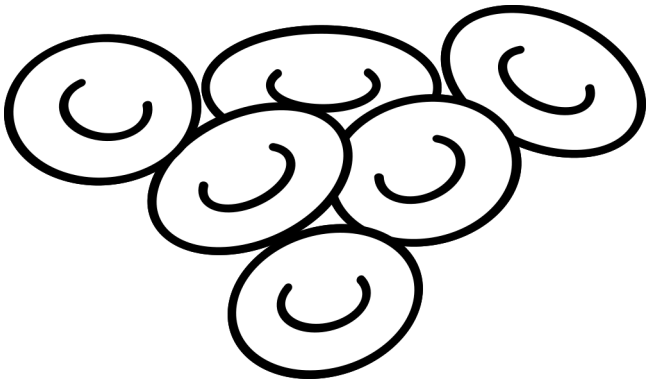


**Capillaries** have the special job of connecting our arteries and veins together.

Capillary



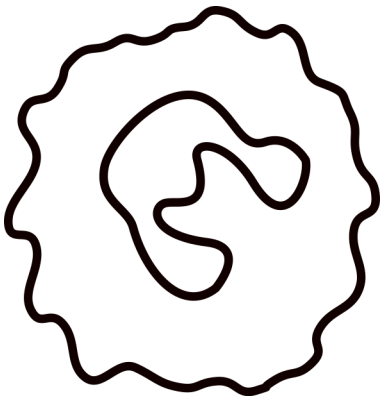
Now that we know how blood travels through the body, let's take a closer look at what makes up your blood. Your blood is made up of a watery-type of liquid called plasma. The plasma carries your blood cells. You have three types of blood cells—**red blood cells**, **white blood cells**, and **platelets**. And just like I'm sure you realize by now, each of those different types of cells has a different job to do.



Red blood cells carry oxygen to all the parts of your body. They are extremely small, as we've already discussed, and they are also very pliable. Pliable means they can bend and stretch a lot, and that comes in very handy when they have to squeeze through tight spaces in blood vessels.

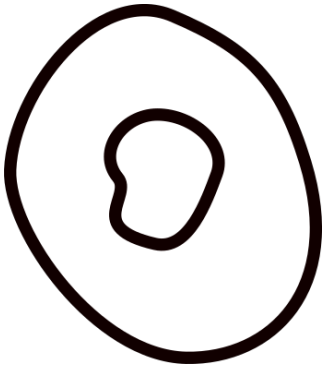
Red blood cells

White blood cells are your body's defenders. Whenever something invades your body that should not be there, like a virus or bacteria for example, the white blood cells go to work. Some of them release chemicals to fight off the attackers, and some of them just swallow the invaders! Your white blood cells multiply and build more of themselves when they have a big job to do, just as if they had called for reinforcements.



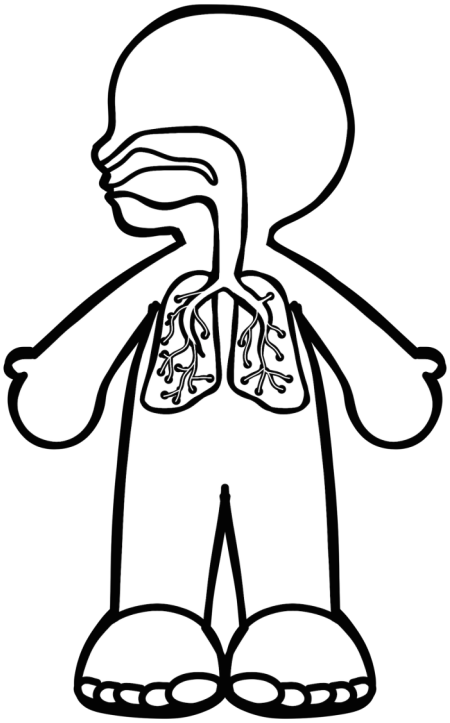
White blood cells

There's one more type of blood cell, and that is called a platelet. Platelets act like a plug to keep your body from losing too much blood when you get hurt. If you get a scrape on your leg, your skin and the blood vessels underneath it are hurt. Blood can leak out. As soon as your body knows there is a problem, it calls for platelets to come stop the bleeding. The platelets clump together with the cells in the broken blood vessels and with other platelets to form a plug to stop the leak. You see the results of platelets doing their job when you get a scab. The scab helps protect your body from bacteria that could enter through your scrape.



Platelet

Once the scrape is covered, your white blood cells come to the scene to make sure nothing came in that could hurt your body.

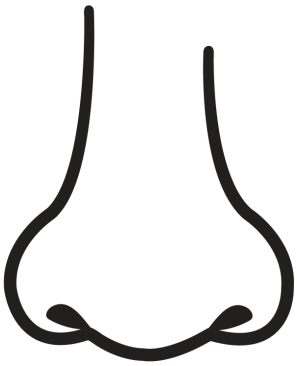


The next system we're going to learn about is the **respiratory system**. We already know that our cells need oxygen and nutrients to do their jobs. It's the job of the respiratory system to bring in the oxygen your body needs.

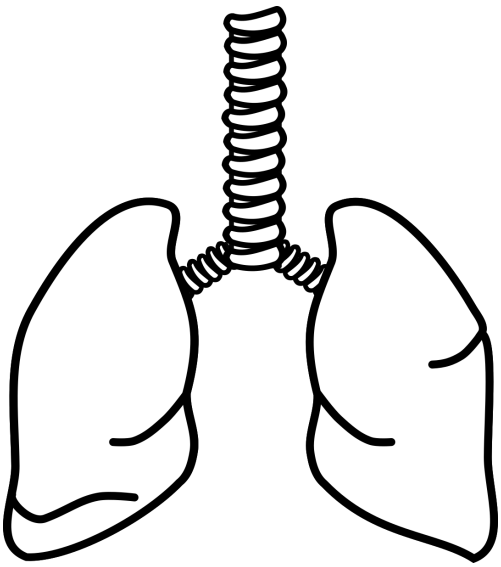
Respiratory system

You bring oxygen into your body through your **nose** and mouth.

Nose



The main organs in your respiratory system are your **lungs**. When you breathe in, called inhalation, you draw air into your lungs. The air travels down your windpipe (called the trachea) and down into two tubes that travel to your lungs. These tubes are called bronchi.



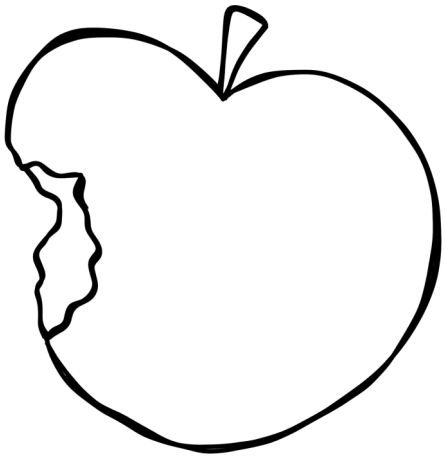
Once inside your lungs, your bronchi split into smaller and smaller branches until they reach extremely tiny **air sacs**. These air sacs have very thin walls and are filled with capillaries. Oxygen leaves the air sacs and travels through the walls into the blood, where it is taken to the heart. The heart can then pump this oxygen-rich blood to all the cells in your body.

Lungs

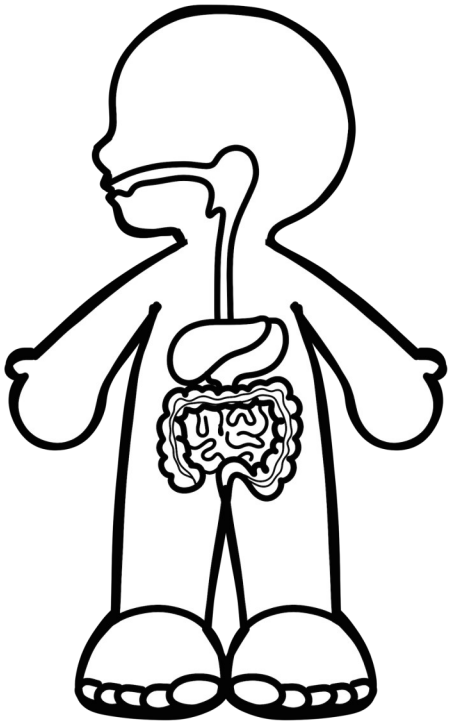
The airs sacs have another job, too. Once they have gotten rid of their oxygen, they pick up waste through the capillaries. Our cells use this type of trash pickup to get rid of gasses like carbon dioxide that they don't need. The capillaries deliver it to the air sacs, and the air sacs push it back out of your nose or mouth when you breathe out, called exhalation.

Air sacs

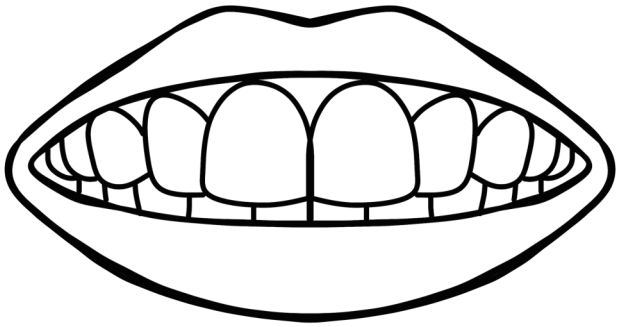
Now it's time to talk about the nutrients our cells need. When you think about eating food, you probably think of taking a bite of something like an apple. But how do tiny little cells, cells that are so small you can't even see them without a microscope, eat? They don't exactly have teeth (and even if they did, can you imagine how long it would take them to take bites of something like an apple?). No, that would never work. In order for our cells to get the food and nutrients they need, our bodies have to break down the food we eat into smaller parts. That's the job of the digestive system.



The **digestive system** is very long and made up of many different parts, so we're going to look at the jobs of just some of those parts for now. We'll start with the part of our body we think about first when we think about food—our mouth!



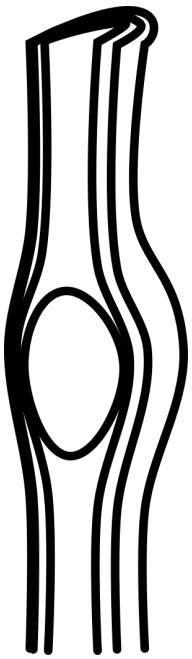
Digestive system



The **mouth** is where the digestive system starts. As soon as you take a bite, you start chewing food up into smaller pieces. Those pieces are mixed with a liquid in your mouth called saliva. Saliva starts the process of breaking down the chemicals in your food.

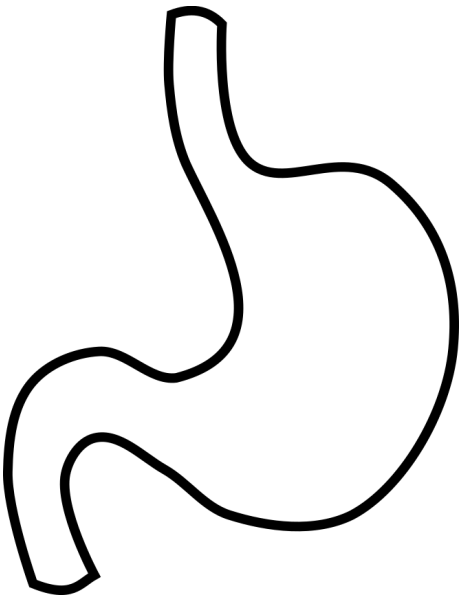
Mouth

When you swallow, the food moves into your esophagus. Your **esophagus** is a long tube that runs from your mouth to your stomach. It's about 10 inches (25 centimeters) long. The walls of the esophagus are lined with muscles that move and contract in a wave-like manner that keeps pushing the food down further and further until it reaches the stomach.



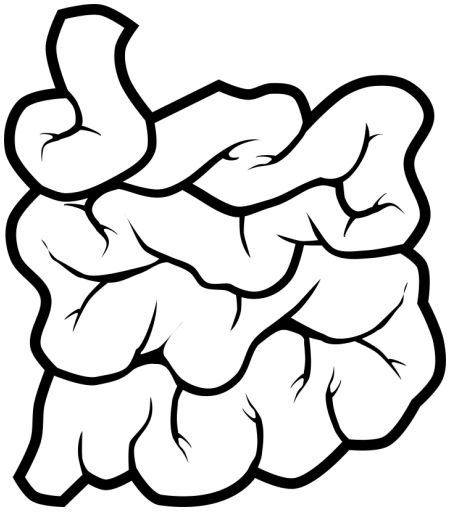
Esophagus

Once your food reaches your **stomach**, it begins to be mixed with other chemicals that can break it down further and also kill some things that could be in your food that could hurt you. Some of these chemicals in your stomach are so strong they could burn your skin if they were outside your body, but inside, they are perfectly safe and do their job.



Once your stomach is done churning your food around and doing its part to break it down into the nutrients your cells need, it moves the food on to its next stop, the small intestine.

Stomach

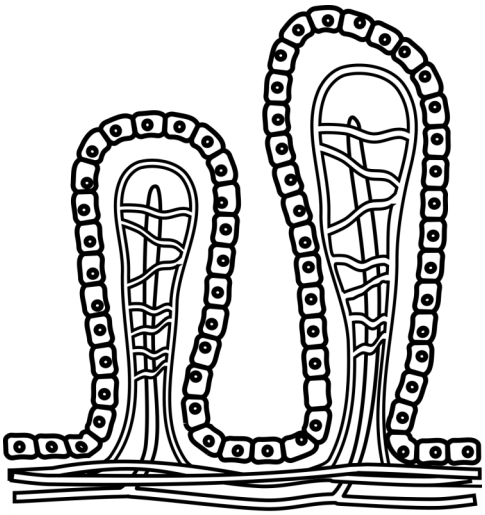


The **small intestine** is something of a confusing name. The small intestine got its name because it is more narrow than the large intestine (which we'll learn about next), but it's certainly not small in any other way! The small intestine is about 22 feet (7 meters) long and is where most of your digestion takes place.

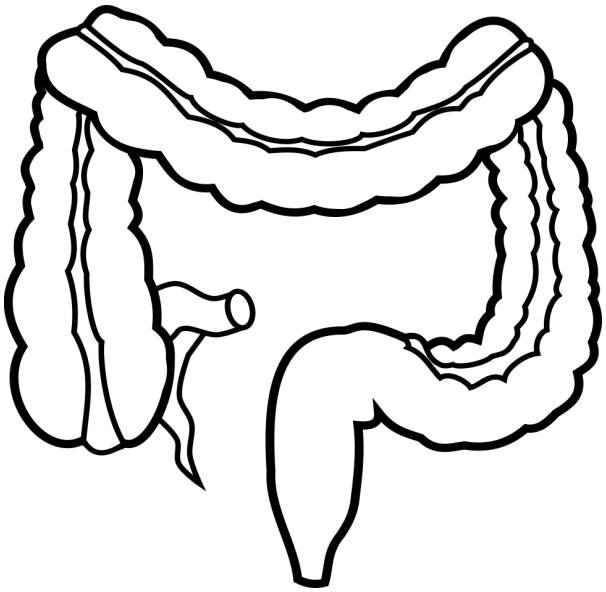
Small intestine

Your small intestine is lined with **villi**, tiny fingerlike groups of cells that reach out and absorb nutrients from the digested food. The nutrients then pass from the villi to the blood so the nutrients can reach your cells.

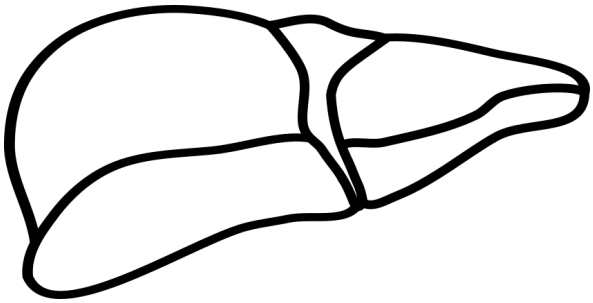
Villi



Once your small intestine has finished its job of digesting the food, it passes what is left to the large intestine. The **large intestine** wraps around the outside of the small intestine and is about 5 feet (1.5 meters) long. The large intestine takes any water and salts that your body needs that are still left in the food and then moves the rest on to the rectum, where waste can be passed out of your body.



Large intestine



There is one more part of the digestive system we should talk about before we move on to the next system, and that is an organ called the **liver**. The liver sends a greenish-yellow liquid called bile to the small intestine to help it break down the fats in your food.

Liver

The liver also works like a big power plant. It collects the nutrients and determines how to best use them. Some, it stores to use as energy later when your body needs it. Some, it turns into chemicals your body can use.

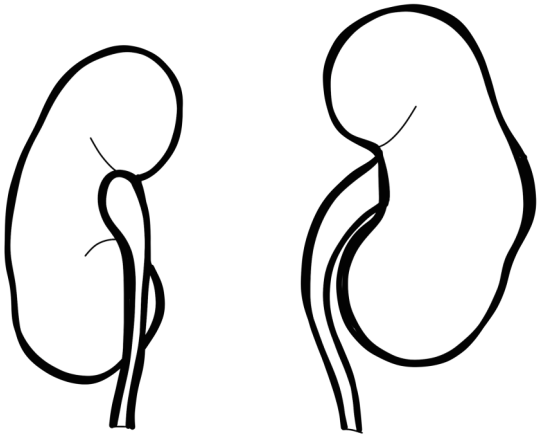
The liver also filters poisons and other harmful substances from your body.

Now we know how your body gets rid of the waste from what is leftover after you absorb all the nutrients you need from your food, but that isn't the only kind of waste your body needs to get rid of. As your cells do their jobs, they create a different kind of waste. This waste mixes with water and is then passed out of your body through the **urinary system**. There are two main organs in the urinary system, the kidneys and the bladder.

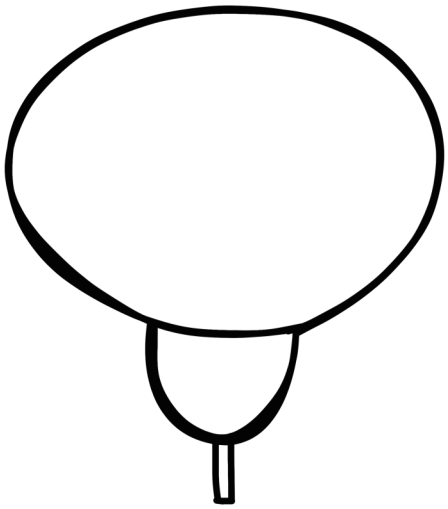
Urinary system

Your **kidneys** have an important job to do. They come in a pair, and one sits to the right of your spine and one sits to the left of your spine, below the middle of your back. Each one is about the size of your fist.

Your kidneys have millions of tiny filters in them that send some water and important chemicals back to your body and send the rest out as waste to your bladder. If your kidneys didn't do this important filtering job, your body would slowly fill up with poisons that could hurt you.



Kidneys

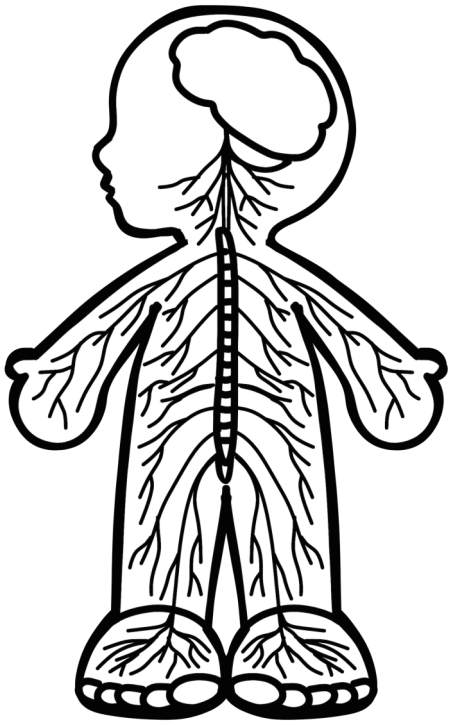


The kidneys pass their waste on to the **bladder** as a liquid called urine. When your bladder gets full enough of urine, you empty it by going to the bathroom.

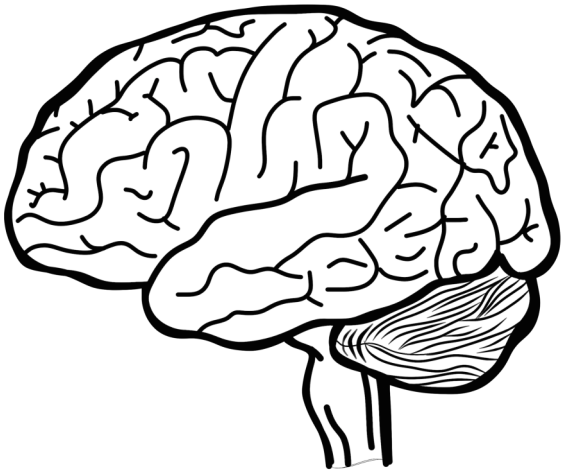
Bladder

The next system we're going to explore is the **nervous system**. Your nervous system is responsible for just about everything you can imagine. It's your body's communication network, sending and delivering messages to every part of your body.

Nervous system

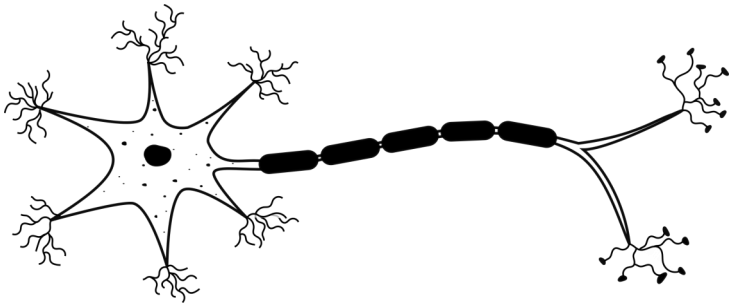


The main organ of your nervous system is your **brain**. It's the headquarters of everything for your body. It tells your muscles when to move, it lets you know if you are hot or cold, it enables you to keep your balance, recognize smells and tastes, and read the words on this page. It coordinates all the information your body receives every single day and keeps all of your vital organs working together.



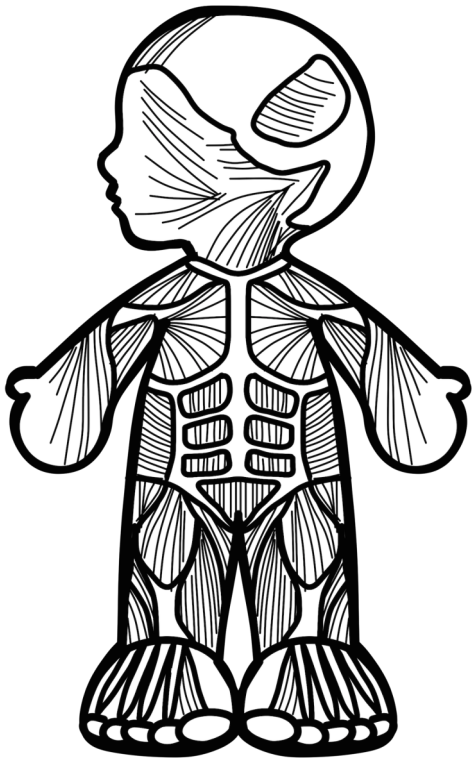
Your brain connects to your spinal cord, which is a bundle of nerves. **Nerve cells**, called neurons, carry messages from your brain to every part of your body.

Brain



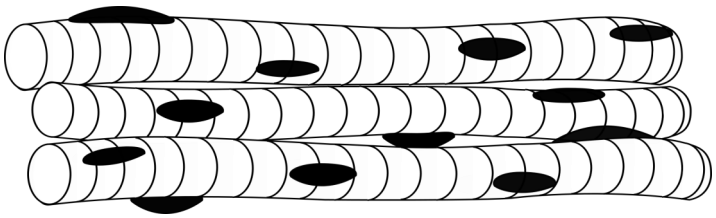
Nerve cell

Your nervous system tells your body when to move, but your **muscular system** is in charge of moving it! Muscles are bundles of muscle tissue that are bound and working together. As the muscle tissue contracts, it pulls any tissues attached with it. You have more than 600 skeletal muscles in your body that work together to do just about anything you can think of. There are three different types of muscle tissue, and just like we've learned with the other parts of the body, each type has a special job to do.



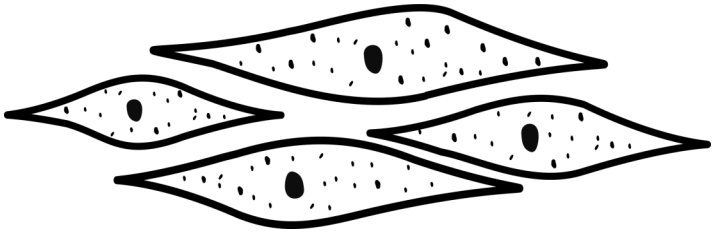
Muscular system

**Skeletal muscles** are the muscles that you probably think of first when you think about a muscle's job. These are the muscles that let you lift your arm, take a step, or move your mouth to talk. They are attached to your bones with strong tissues called tendons. Skeletal muscles are voluntary muscles, which means you can move them—or not—whenever you want. You can take a step or stand still. You can pick up a pencil or put it back down. You can talk or not talk. It's up to you!



Skeletal

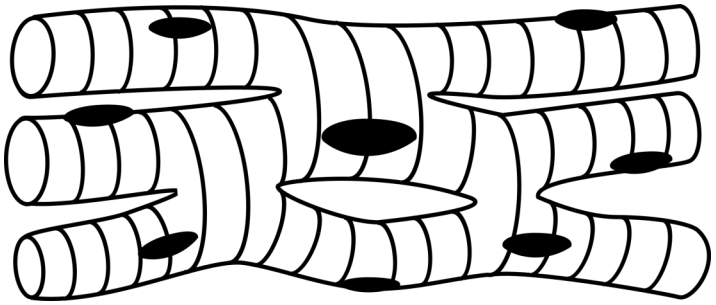
muscle cell



**Smooth muscles** are the muscles in most of our internal organs. They are the ones that push the food through your esophagus and other parts of your digestive system.

Smooth muscle cell

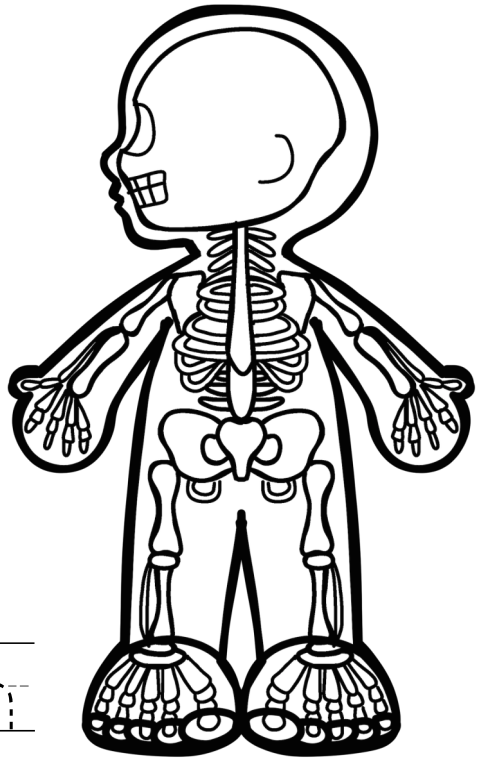
**Cardiac muscles** are the ones that make up the walls of your heart. These are special muscles that can work constantly without ever getting tired. They keep your heart pumping and everything else in your body working.



Cardiac muscle cell

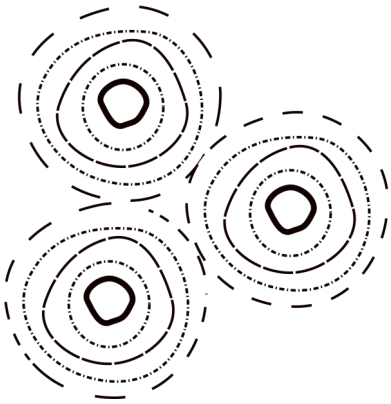
Smooth muscles and cardiac muscles are involuntary muscles. This means you don't control when they work and when they don't. It's a VERY good thing that these muscles are involuntary. If they weren't, you'd have to remember to tell them to work day in and day out. You wouldn't get much of anything else done, including sleep! Thankfully, these muscles keep working whether you are awake or asleep and whether you remember they are even there or not. Only the skeletal muscles are part of the muscular system, but it's important to know that not all muscle tissues are the same.

The last system we're going to talk about is the **skeletal system**. We usually only think about our bones when we break one, but your bones are busy every day doing their own amazing jobs. One of their most important jobs is giving your body its shape. They hold you up. They also protect some of your most important organs. Your skull protects your brain, and your rib cage protects your heart and lungs.



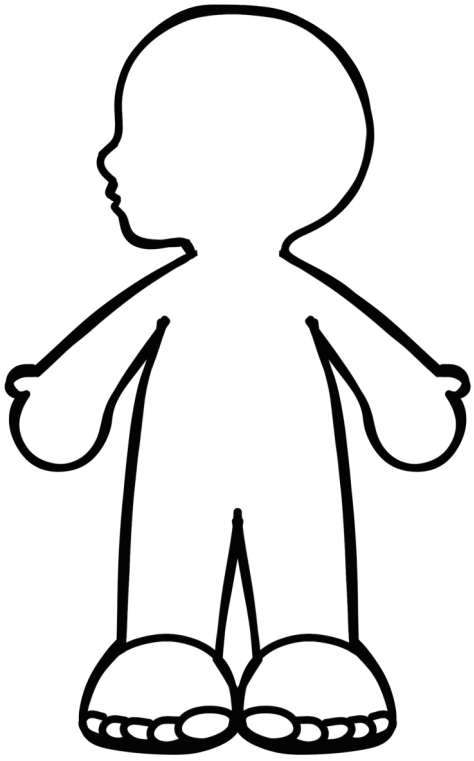
Your skeleton also includes a smooth tissue called cartilage that keeps bones from rubbing together, and a strong, stretchy material called ligaments that hold your bones in place.

Skeletal system



Bone cells

**Bones** may seem hard and dead, but they are actually quite alive! Most bones are hard on the outside and have softer bone on the inside. They are also home to two types of bone marrow, which is sort of a jellylike material. Yellow bone marrow is mostly fat, but red bone marrow has a terribly important job to do. It manufactures blood cells. Our red blood cells, for example, only live about 30 days, so without a way to make more of them, we'd quickly run out. Thanks to red bone marrow, we have a never-ending supply of them. Red blood cells are a critical part of the very first system we learned about, the circulatory system. Now you can see we've come all the way back to the beginning!

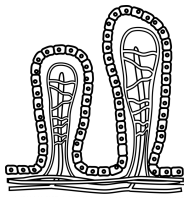


More than 10 trillion cells, 600 muscles, and 200 bones are all working together to make the one and only YOU!

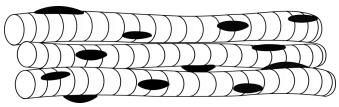
You

# Review

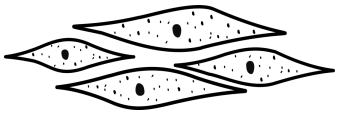
This is not a type of muscle tissue. Draw an X through it.



Villi



Cardiac

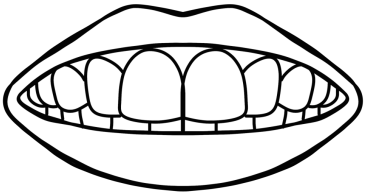


Smooth

This is where the digestive system starts.  Draw a circle around it.

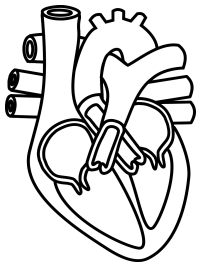
Artery

Air sacs

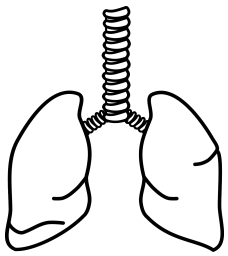


Mouth

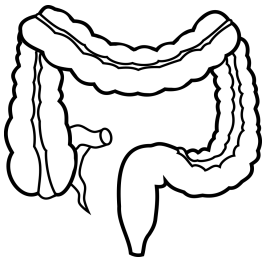
This is the main organ of the respiratory system. Draw a circle around it.



Heart

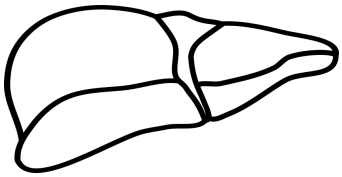


Lungs

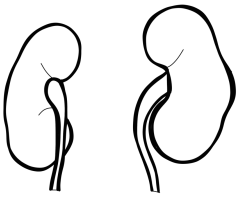


Large intestine

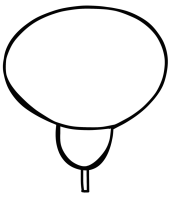
This organ is not a part of the urinary system. Draw an X through it.



Liver



Kidneys

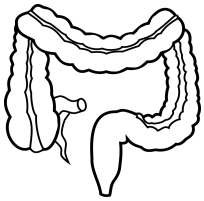


Bladder

This organ is more than 22 feet (7 meters) long. Draw a circle around it.

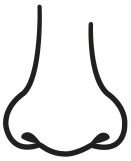
Esophagus

Small intestine



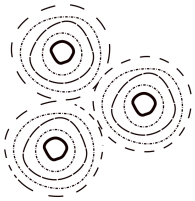
Large intestine

This is not part of the respiratory system. Draw an X through it.



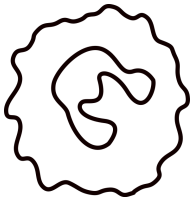
Nose

Air sacs

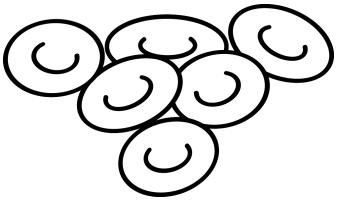


Bone cells

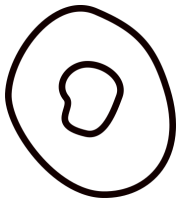
This is an important part of our body's defenses. Draw a circle around it.



White blood cell

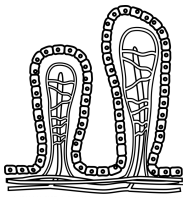


Red blood cells

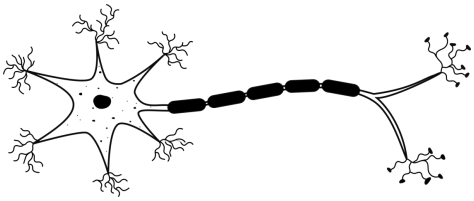


Platelet

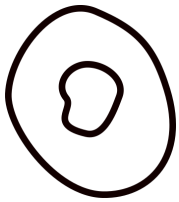
This helps our small intestine digest food. Draw a circle around it.



Villi



Nerve cells

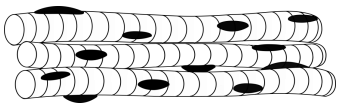


Platelet

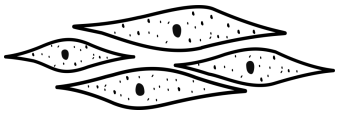
# Review Answer Key

This is not a type of muscle tissue. Draw an X through it.

Villi



Cardiac

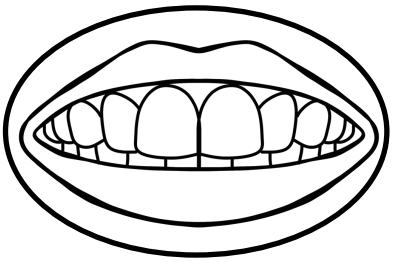


Smooth

This is where the digestive system starts.  Draw a circle around it.

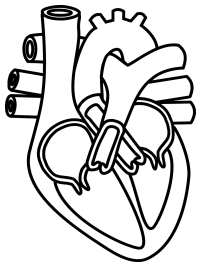
Artery

Air sacs

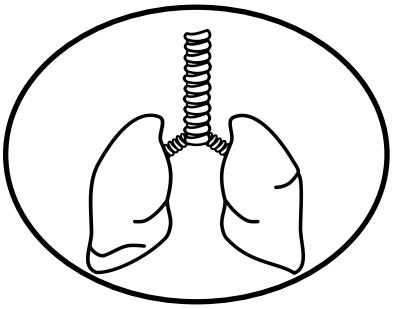


Mouth

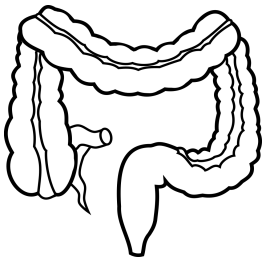
This is the main organ of the respiratory system. Draw a circle around it.



Heart

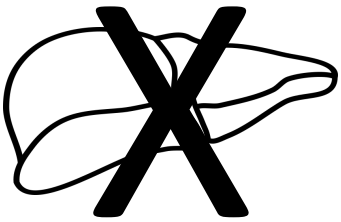


Lungs

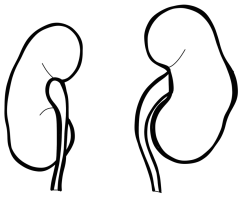


Large intestine

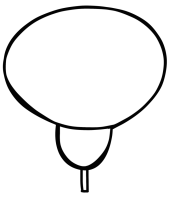
This organ is not a part of the urinary system. Draw an X through it.



Liver



Kidneys



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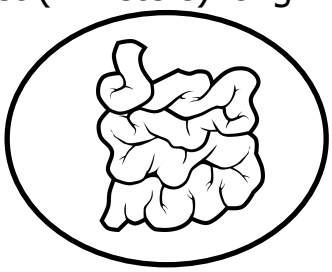
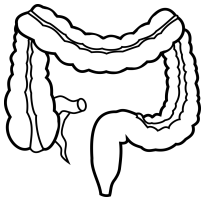
Esophagus

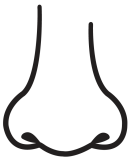


Small intestine



Large intestine

This is not part of the respiratory system. Draw an X through it.



Nose

Air sacs

Bone cells

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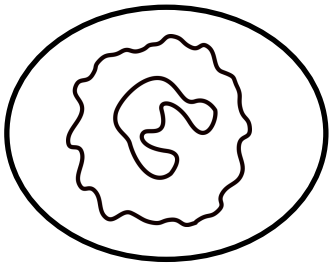
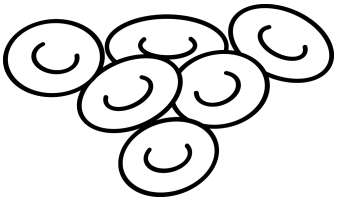
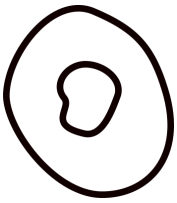


White blood cell

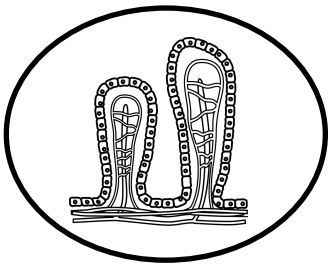


Red blood cells

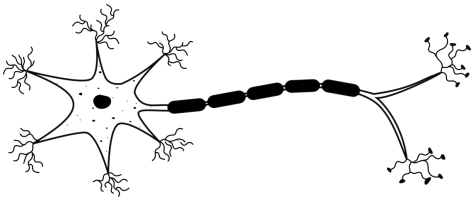


Platelet

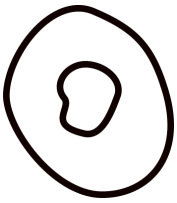
This helps our small intestine digest food. Draw a circle around it.



Villi



Nerve cells



Platelet

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