CHAPTER 25
In this unit, you will be looking at how your body works! You will be looking at many of your organs. Organs are parts of your body that have special jobs to do. In the next three chapters, you will be exploring your:

Heart  
Lung  
Stomach  
Intestines  
Kidneys  
Liver  
Gall bladder and **Pancreas** ("pan-kree-as")

But wait a minute! My skin, muscles and bones are not organs, are they?

**You bet they are!**
Let’s take a look at your skin first...

Think of your skin like a sandwich baggie. It keeps everything inside of you safe. It does not let water to leak in or out of your body. It can bend very easily. And, if it gets opened up, it can be resealed (with a little help of course!)

**Not only is your skin your largest organ, it also has a few other cool jobs:**

- It protects you from diseases by keeping them outside of your body (unless you have a cut in your skin!)
- It keeps your muscles and organs from getting hurt by covering you up!
- By covering up your body, it helps you stay warm and to cool off.
- Your skin also allows you to sweat. Sweat is made in sweat glands which are found in your skin. You may think sweating is not a great thing to do, **but it is**! Every time you sweat, your skin is cooling you down. This is pretty important while you are running around on a hot summer day, don’t you think?
- Your skin also contains a large amount of hair. Hair is found all over your body. The main purpose of your hair is to keep you warm.
Like all of your organs, your skin is made of small objects called **cells**. Nearly every part of your body is made up of cells. Think of them like building blocks... all of those blocks can be put together to make all kinds of things, right? Cells are able to grow, reproduce and carry out certain jobs to keep the organism alive!

Well, to make your skin, you have to make lots of sheets of these cells (like pancakes!) and stack them on top of each other!

You are always making new sheets of skin cells inside of your body. These new sheets of cells (called the “dermis”) push towards the outside of your body. So, the skin you can see on your body are the oldest sheets of skin cells you have! This outer layer of cells is known as your **epidermis** (“eh-pih-dur-miss”).

**But if I am always making new layers of cells, why doesn’t my skin get really, really, really thick as I get older?**
Your skin does not get thicker, because you are always losing those oldest sheets of skin cells! That’s right! Every time you rub against something, you are scraping off these cells! In fact, you may lose as many as 30,000 of these cells every minute!

Enough about skin... Let’s take a look at your muscles!

The muscles in your body are just as important to you as your skin.

Your life would end very quickly if you did not have any muscles in your body. You may not look like a weight lifter, but nearly half of your body weight is muscle!

Every single thing that moves on your body uses at least one muscle! Eating, breathing, walking, blinking, everything!
You will be exploring one of three different kinds of muscles today...

**Skeletal muscle** - these are the muscles that you can see and feel. When a weight lifter bends his arms to make his muscles look much bigger, you are looking at skeletal muscle!

You also have smooth muscle and cardiac muscle, which you will learn about these muscles in later chapters!

For now, let’s take a closer look at your skeletal muscles

There are over 600 muscles in your body that work together to help you move. And they do this without pushing!
That’s right, muscles cannot push, they can only pull!

Whenever you move a part of your body, there is always at least one muscle that is pulling. It is never pushing!

For example, when you bend your elbow, one muscle pulls your arm up. When you straighten your arm, muscle pulls your arm back down!

When you bend your elbow to see your muscles in your arm, you are making the muscles in your arm contract, (this means “to shorten”) and slide over each other, just like an opening a sliding glass door!
If you look at a sliding glass door, you really have two doors that are the same size and are standing next to each other. Let’s say that each door is three feet long. When the doors are closed, and standing together, they are taking up six feet of space.

But, when you open a sliding glass door, you are moving one of the doors on top of the other. You are not changing the size of either door...they are still each three feet long. What you are changing is the length of space they take up. Since they are on top of each other, they are only taking up three feet of space. It appears that they have shortened their space, haven’t they? This is what happens to muscles when they contract... the muscles always stay the same size, they only slide on top of each other and appears to shorten.

Skeletal muscles are what make your bones move! They can do this because they are attached to your bones by groups of cells called tendons. However, the job of your bones is not only to help you move. They have two more very important jobs:

**Your bones protect many of your organs.**

and

**Your bones give you your shape.**

(without bones, you would be a sack of skin and blood...yuck!)
Your skull, rib cage and spine all protect very, very important organs in your body! Your skull acts like a helmet, protecting your brain. Your rib cage surrounds some very important organs like your heart and lungs. And inside your spine you will find your spinal cord which controls your senses!

**How many bones do you have?**

When you were born, you had over 300 bones in your body. As you get older, many of these bones start to grow together. By the time you are an adult, you will probably have about 200 bones in your body!

That’s right...bones can grow! They are very much alive!

Your bones are connected to each other with strong bands of cells called **ligaments**. (don’t confuse ligaments with tendons!)

Your bones do not rub against each other (that would be painful), so they have a cushion between them called **cartilage**.
Your skin, muscles and bones are organs that all work together to protect you from dangers in your environment. In the next chapter, you are going to learn how two more of your organs work together to keep you alive...
Place the answers to the following clues in the boxes below. Each box should contain one letter.

Across

1. type of muscle which stretches to allow your bones to move
3. the largest organ of the human body that protects the body
6. parts of the body that have special jobs to do
7. the outer layer of skin cells that can be seen outside of your body
8. a "cushion" of cells between your bones to keep them from rubbing together

Down

2. groups of cells that attach your skeletal muscles to your bones
4. bands of cells that connect your bones together
5. an organ that helps you to move everything in your body
8. "to shorten"
Match the words in the first column to the best available answer in the second column.

| _____ Organs | 1) the largest organ of the human body that protects the body |
| _____ Skin | 2) bands of cells that connect your bones together |
| _____ Epidermis | 3) groups of cells that attach your skeletal muscles to your bones |
| _____ Muscle | 4) a "cushion" of cells between your bones to keep them from rubbing together |
| _____ Skeletal muscles | 5) an organ that helps you to move everything in your body |
| _____ Tendons | 6) the outer layer of skin cells that can be seen outside of your body |
| _____ Ligaments | 7) type of muscle which stretches to allow your bones to move |
| _____ Cartilage | 8) "to shorten" |
| _____ Contract | 9) parts of the body that have special jobs to do |
Which one is right? Circle the correct answer.

1. Your skin is made from a collection of __________.
   a. cells
   b. muscles
   c. cartilage

2. New skin is always being formed __________.
   a. outside your body
   b. inside your body
   c. inside and outside your body

3. What body part keeps your bones from grinding into each other?
   a. cartilage
   b. tendons
   c. ligaments

4. The number of bones in your body __________.
   a. increases as you get older
   b. decreases as you get older
   c. stays the same your whole life

5. Your muscles can __________.
   a. only push
   b. only pull
   c. push and pull

6. Which of the following are true?
   a. your muscles allow you to sweat
   b. sweating helps to keep you warm
   c. your skin protects your organs
In the last chapter, you learned that your skin, muscles and bones are very important organs that help you survive. In this chapter, you will learn about how your muscles and bones work together with two different organs.

Let's start with your heart!

Think of your heart as a pump that is busy moving blood all the time! Do you remember learning about muscles in the last chapter? Well, your heart is made of a different kind of muscle known as cardiac muscle ("car-dee-ack"). Cardiac is a scientific word that means “heart.”

This muscle is not attached to any bones, which is different from what you learned about skeletal muscle.
Your heart **contracts** around 70 times a minute when you are resting. It speeds up when you are running, jumping or exercising!

Every time the cardiac muscle in your heart contracts, it gets very tense for a very short period of time. If you have ever felt your heart beating before, you are feeling your cardiac muscle contract!

The heart’s main job is to pump blood that has nutrients and a very important gas known as **oxygen** ("ox-e-gen") to all of the muscles and organs in your body. It is these nutrients and oxygen that your body needs to stay alive!

In order to pump this blood, your heart needs some kind of plumbing to move this fluid. So, the “pipes” that are used to move blood out of your heart are known as **arteries**. Arteries are very good at moving your blood around, but they are too big to reach every part of your body. Therefore, your arteries get smaller and smaller until they become the smallest possible “pipe” that can be used to carry blood. These tiny “pipes” are known as **capillaries** ("cap-ill-air-eez").
All of the blood moving around your body must return to the heart to be pumped out again. The large “pipes” that carry blood back into the heart are known as veins (try to say “vanes”).

So why does my heart beat faster when I am exercising?

Your body needs more oxygen and nutrients when you are exercising. So, when you are running and jumping, your heart must pump the blood faster for your body to get the extra oxygen and nutrients it needs.

At rest, your body does not need as many resources. During this time, your heart does not contract as fast!

Your blood is just as important as the heart that pumps it!
All of the blood in your body is made up of a clear liquid that is called **plasma**. The plasma helps everything that is in your blood to flow easily through your arteries, capillaries and veins. It is the large amount of **red blood cells** in your plasma that gives your blood a red color!

These red blood cells are responsible for carrying oxygen to all of the muscles and organs of your body.

Your blood also has **white blood cells**. Think of these cells as an army in your body. Their job is to attack anything that should not be in you (like a bacteria!) It is the white blood cells that work very hard to keep you healthy!

**But how does the oxygen from the air get into my blood?**

Every cell in your body needs oxygen in order to survive. No oxygen...no life!

When you breathe in air, it travels into your body and goes into your **lungs**. A fancy word for “breathing in” is called **inhale**. But if the oxygen goes into your lungs, how does the rest of your body use this resource.
The oxygen has to reach every one of your cells in order for you to survive!

Your heart pumps blood out of its arteries and into the smaller capillaries that surround your muscles and organs, this includes your lungs!

The oxygen gets picked up by the red blood cells in your blood as they pass over the lungs. Think of your red blood cells like a taxi. They show up at your lungs when you bring air to them, and then carry this gas away to all of the cells in your body!

After your red blood cells are done picking up all of the oxygen in your lungs, they begin to deliver it to the rest of your body. At this time, you have to **exhale**. This means that your body breathes out all of the gas in your lungs that you do not need to survive! Pretty cool, huh?

This “taxi service” happens every time you breathe...which is about 20 times a minute.
You need to thank your muscles for keeping you breathing! Your lungs are like two spongy balloons that can be filled up with air... but you don’t see a balloon fill up with air on its own, do you? (If you do... stay away from it!)

**Nope!** You have to use some of your energy to force air into that balloon! Your lungs work the same way...

You don’t have to think about breathing do you? You just do it naturally, without thinking. This is because a large skeletal muscle in your body (called the *diaphragm*... “die-a-fram”) is contracting every time you breathe!

Your diaphragm is found under your lungs. It is shaped like a dome with your lungs resting on top of it!!! When your diaphragm contracts, it flattens out and gives your lungs more room to fill up with air. (inhaling!) This is when your red blood cells come in and pick up the oxygen.

Once your diaphragm relaxes, it goes back to its dome shape. This action squeezes the lungs and forces the leftover gas out through your nose and mouth! (exhaling!)
It is true that your heart and lungs rely on muscles to keep you alive. But there are many other organs that are working together, right now, to do the very same thing!

Next week, you will be taking a look at three of these organs:

Stomach, Kidneys and Intestines
Unscramble the words below:

1. boclddrollees  ______________________
2. cisaualcedrcm  ______________________
3. treseiar  ______________________
4. slapma  ______________________
5. ipcrisaella  ______________________
6. cacradi  ______________________
7. evnsi  ______________________
8. ldswcheilbeootl  ______________________

Write the definitions for each word:

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________
8. ______________________
Match the words in the first column to the best available answer in the second column.

_____ Cardiac 1) the liquid part of your blood

Cardiac muscle 2) part of the blood that carries oxygen to all of the muscles and organs of your body

_____ Arteries 3) a kind of muscle that is only found in the heart

_____ Capillaries 4) “pipes” that are used to move blood out of your heart

_____ Veins 5) large “pipes” that carry blood back into the heart

_____ Plasma 6) the smallest possible “pipe” that can be used to carry blood

Red blood cells 7) parts of the blood that attack anything that should not be in you

_____ White blood cells 8) anything related to the heart
Imagine you are a red blood cell that is inside a human body. Describe your journey as you are pumped throughout the body.
CHAPTER 27
In the past two chapters, you have explored the importance of your bones, skin and muscles. It is your muscles that seem to keep working with all of your organs, doesn’t it? Muscles keep your heart and lungs working every day!

This week, you will learn that your muscles keep three more organs working for you...

Let’s start by looking at your stomach (“stum-uk“)! After you chew up a piece of pizza, the muscles in the back of your throat moves this food down a long tube (known as your esophagus (“ee-soft-ah-gus“)) to your stomach.
How does it do this? The muscles of your esophagus push your food down until it reaches the stomach. If you have ever rolled up a tube of toothpaste from the bottom up, you have a good idea of how your food gets moved down your esophagus! The muscles of your esophagus are not skeletal muscles or cardiac muscles, they are known as smooth muscle. You are going to hear a lot about Smooth muscle today!

Now back to that slice of pizza you just ate...

Most people think that the stomach is where all of your food is broken down...but this is not true!

The most important job of the stomach is to hold onto your food until your body needs it! That’s it! Your stomach is made up of smooth muscle, just like your esophagus!

Your stomach does a great job at storing your food, and it is filled with a special liquid...
The inside of your stomach is filled with a liquid called **acid**. The acid in your stomach is a chemical that kills any bacteria that may be on the food you just ate! However, this acid is very dangerous and could burn a hole right through your stomach!

**Why doesn’t it do that?**

Well, the inside walls of your stomach are covered in a thick layer of mucus (much like the goo that you find in the back of your throat and nose!) This mucus protects the walls of your stomach from the acid. Sometimes, people lose some of this mucus and the acid burns a hole through their stomach...ouch! This is called an **ulcer** (“uh-l-sir”) and they are very painful!

About four hours after you eat, the food that is stored in your stomach starts to look like a creamy slime. Some of this slime is then moved into your **small intestine** (“in-tess-tin”)

Your small intestine looks like a big sausage. Of course, this sausage would be around 20 feet long! Inside your small intestine, your food is broken down into small pieces that your blood can carry throughout the body.
If you look on the inside of your small intestine, you would find millions of little, finger-like bumps all over the place! These little bumps are called villi (“vee-lie”). For the next three hours, your villi will move the small, broken down pieces of food from your small intestine into your blood.

**What happens to all of the water I drink?**

**Another good question!** After the villi move the broken down food into your blood, the slimy goo that is left over moves into the large intestine!

Your large intestine is also shaped like a sausage...but it is much larger and much shorter than your small intestine. It is also pretty dry inside your large intestine.

The inside of your large intestine is dry because the most important job of this organ is to take all of the water out of your food.
What does it do with all of this water?

Think again...how is the large intestine going to move all of this water to every cell in your body? You got it!

It will be using the blood!

Getting the water out of your food can take a long time. Some of this leftover goo may stay in your large intestine for up to two days!

Once it is done, however, you are normally left with a stinky mess that is usually flushed down the toilet!

After your body uses all of the food and water inside your blood, there is a lot of “leftovers” hanging around in your blood. These “leftovers” are called waste products. Your body does not need waste products, so they must be taken out of your body.
That is where you use another organ, called your **kidneys**!

Your kidneys *(you have two of them!)* are small organs that are shaped like beans. Their job is very important too! It is their job to clean out the waste products from your blood.

**How does it do this?**

Imagine a strainer that your parents use in the kitchen. A strainer lets water pass through the little holes, but it traps the spaghetti and keeps it from going down the drain! The spaghetti is too big and cannot pass through the little holes in the strainer.

Your kidneys act just like the strainer! When blood passes through the kidneys, they let the good things through (like your nutrients and water) and trap all of the bad chemicals that are floating around in your blood.

Lots of things in nature have the same shape. For example, the picture on top shows a tree with several branches. The bottom picture shows how your arteries and veins run through your kidneys. Cool, huh?
Your kidneys get rid of all these bad chemicals, and even some of the extra water you do not need, by sending them out of your body.

**That’s right...** every time you pee, you are getting rid of all the bad chemicals that have been floating in your blood. It’s a good thing they do this, too. Because without your kidneys, you would be pretty sick!
The table below contains words and phrases that have been chopped in half. Find the pieces that fit together and write them in the answer area below.

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**Answers:**

1) __________________  6) __________________

2) __________________  7) __________________

3) __________________  8) __________________

4) __________________  9) __________________

5) __________________
Match the words in the first column to the best available answer in the second column.

| ______ Stomach | 1) a dangerous chemical inside your stomach that kills any bacteria that may be on the food you eat |
| ______ Esophagus | 2) the study of the human body |
| ______ Acid | 3) small bumps inside your small intestine that pulls out all of the nutrients from the food you eat |
| ______ Ulcer | 4) two small organs in your body that clean out your blood |
| Small intestine | 5) a 20-foot long organ that is filled with villi and is the place where you digest your food |
| ______ Villi | 6) a painful hole in a person's stomach |
| Large intestine | 7) a long tube that moves food from your throat into your stomach |
| ______ Kidneys | 8) a long organ in your body that is attached to the small intestine which absorbs all of the water out of your food |
| ______ Human anatomy | 9) an acid-filled sack that stores your food before digestion |
Last week you were a red blood cell. Today, imagine you are a jelly donut! Describe your journey through the body from the mouth to the intestines.
CHAPTER 28
Welcome back! You are almost finished with your study of the parts of the human body (which is also known as **human anatomy**...“a-nat-o-mee”). In this last chapter, you will be looking at three more organs. Like all of your organs, these guys work together to keep you alive!

**THIS WEEK YOU WILL BE LEARNING ABOUT YOUR...**

Pancreas, Liver and Gallbladder

Let’s start by looking at your... **Pancreas** ("pan-kre-az")

The #1 job of your pancreas is to help **digest** (break down) the food that comes into your small intestine!

If you remember from Chapter 27, by the time that pizza you ate for lunch moves from your stomach into your small intestine, your food looks like a pile of creamy slime!
Your pancreas squirts chemicals into your small intestines called enzymes ("ends-imes"). Enzymes are chemicals that your body makes that helps your body do all kinds of things. Enzymes are used to help you breathe, walk and digest your food.

Once your pancreas squirts its enzymes into your small intestines, these chemicals mix into the creamy slime you once called your lunch. These enzymes help to break down a lot of the fats, sugars and proteins in your food. Foods like meat, eggs, milk and vegetables are filled with proteins! Proteins are the most important part of the food that you eat because your body must have protein to survive! Some parts of your body are even made up of proteins...like your muscles!

Ok...back to your pancreas!

The enzymes from your pancreas help to digest most of the food that makes it into your small intestine.
This is not the only job for your pancreas!

In addition to digesting your food, your pancreas also makes certain that your blood has the right amount of sugar in it! Too much or too little sugar in your blood can make you very sick!

As your blood flows through your pancreas, it can tell when you have too much or too little sugar in your blood. When this happens, your pancreas sends out messengers into your blood, which are called hormones (“hoar-moans”). If you have too little sugar in your blood, your pancreas sends out a hormone (a messenger) called glucagon (“glue-ca-gone”). This messenger tells another organ in your body (your liver) to release more sugar into your blood!

When you have too much sugar in your blood, your pancreas sends out a different hormone, called insulin, into your blood. Insulin tells your liver to take sugar out of your blood and to store it for future use!
A common disease that involves your pancreas is diabetes ("di-a-beet-ez"). Diabetes happens in people when their pancreas does not release enough insulin in their blood. Without insulin, they cannot lower the amount of sugar in their blood. If this problem is not taken care of, a person can become very sick.

Now let’s take a look at your... **Liver**

The enzymes from your pancreas do a very good job at breaking down your food; however, the “creamy goo” that was once your lunch still needs to be cleaned before it can be used by your body. This is where your liver comes in!

**Every drop of blood that carries your digested food from your small intestines goes through your liver first!**

Your liver does a lot of things to keep your body alive!
Your liver:

- Gets rid of wastes and poisons in your blood
- Stores sugar and releases it into your blood
- Produces a chemical called bile

Your liver is the warehouse for sugar in your body. When your pancreas senses that there is too much or too little sugar in your blood, it sends a hormone to the liver. Once your liver picks up this hormone, it can either start storing sugar from your blood or start releasing it into your blood.

Every drop of creamy goo that enters your small intestine and is digested by the enzymes from your pancreas must pass through your liver!

Your liver filters out all of the waste and poisons that are in this creamy goo and prepares to send it through your blood to your body.

Your liver also makes a special liquid called bile!

Bile is a liquid that is made by your liver and is used to digest any fat that still can be found in your food.
After your liver makes bile, it gets stored in an organ called the **gallbladder**!

Your gallbladder squirts out its bile into the creamy goo once it reaches the small intestines! Just like your pancreas squirts out enzymes to digest your fats, sugars and proteins in your food. That’s right! It takes more than one chemical to break down all of the fats in your food!

**Before you go, let’s have a quick reminder about what happens to that pizza once you start eating your lunch...**

1. You use the skeletal muscles and bones in your arms to reach for the last slice of pizza and place it into your mouth.
2. The skeletal muscles in your mouth move your jaw to chew your food.
3. Your esophagus forces your food down into your stomach.
4. The smooth muscles in your stomach store your food until it gets moved into your small intestines. At this point, it looks like a creamy goo.
5. Your pancreas squirts enzymes and your gallbladder squirts bile into the goo.
6. The goo gets digested into smaller, softer pieces and gets placed into your blood.
7. Your blood is passed through the liver.
8. The liver removes the poisons and wastes from the blood.
9. Your blood leaves your liver and goes to your body.
Fill in the blanks with the correct letters. The words in the list on the right provide a clue to the answer.

1) b _ le  
   a liquid that is made by your liver and is used to digest any fat that is in your food

2) dig _ s _ _ ng  
   to break down your food into smaller and more usable pieces

3) pro _ ei _ s  
   the building blocks for many parts of the body

4) ho _ m _ nes  
   chemical messengers made by your body

5) g _ uc _ go _  
   a hormone made by your pancreas which informs the liver to send more sugar into your blood

6) ins _ _ i _  
   a hormone made by your pancreas which informs the liver to stop sending sugar into your blood

7) _ ia _ ete _  
   a common disease that occurs when your pancreas stops making insulin

8) pa _ c _ eas  
   makes enzymes to help break down the food that comes into your small intestine

9) _ al _ bladde _  
   a storage area for bile

10) l _ _ er  
    an organ of the body that filters your blood and stores sugar and makes bile
Match the words in the first column to the best available answer in the second column.

_____ Pancreas  1) the building blocks for many parts of the body
_____ Digesting  2) a liquid that is made by your liver and is used to digest any fat that is in your food
_____ Proteins  3) an organ of the body that filters your blood
_____ Hormones  4) to break down your food into smaller pieces
_____ Glucagon  5) a storage area for bile
_____ Insulin  6) a common disease that occurs when your pancreas stops making insulin
_____ Diabetes  7) chemical messengers made by your body
_____ Liver  8) a hormone made by your pancreas which informs the liver to stop sending sugar into your blood
_____ Bile  9) makes enzymes to help break down the food that comes into your small intestine
_____ Gallbladder  10) a hormone made by your pancreas which informs the liver to send more sugar into your blood
Unit Seven review

Fill in the blanks in the story below with the following words:

skeletal  smooth  liver
esophagus  small intestines  lungs
stomach  pancreas

You use the __________ muscles and bones in your arms to reach for the last slice of pizza and place it into your mouth. After chewing up the pizza, your __________ forces your food down into your __________. The __________ muscles in your stomach store your food until it gets moved into your __________. At this point, it looks like creamy goo. Your __________ squirts enzymes and your gallbladder squirts bile into the goo. The goo gets digested into smaller, softer pieces and gets placed into your blood. Your blood is passed through the __________. This organ removes the poisons and wastes from the blood. Your blood leaves your liver and ends up in your __________ where it can pick up oxygen.

Be certain to go over your definitions for the test!