

Unit 1 Muscles Move Our Bodies / Unit 2 Amazing Bones

What Do Muscles Do?

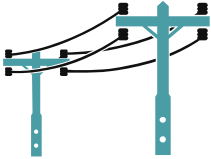






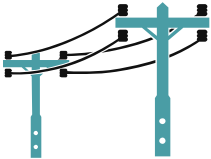




1. **Movement:** The muscular system's main function is to allow movement. When muscles contract, they contribute to gross and fine movement. Gross movement refers to large, coordinated motions and includes walking, running, and swimming. Fine movement involves smaller movements, such as writing, speaking, and facial expressions.
2. **Respiration:** Your diaphragm is the main muscle at work during quiet breathing. Heavier breathing, like what you experience during exercise, may require accessory muscles to help the diaphragm. These can include the abdominal, neck, and back muscles.
3. **Circulation:** The involuntary cardiac and smooth muscles help your heart beat and blood flow through your body. The cardiac muscle (myocardium) is found in the walls of the heart. Your blood vessels are made up of smooth muscles, and also controlled by the autonomic nervous system.

What Do Bones Do?

1. **Support:** Bone provides a rigid framework as well as support for other parts of your body. For example, the larger bones of the legs offer support to your upper body while you're standing up. Without our bones, we'd have no defined shape.
2. **Movement:** Bones also play an important role in the movement of your body, transmitting the force of muscle contractions. Your muscles attach to your bones via tendons. When your muscles contract, your bones act as a lever while your joints form a pivot point. The interaction of bones and muscles contributes to the wide range of movements your body is capable of making.
3. **Protection:** Your bones also protect many of your internal organs. Good examples of this include the way your rib cage surrounds organs such as your heart and lungs or how the bones of your skull surround your brain.

Unit 3 Light Energy / Unit 4 Roller Coaster Cars

Examples of Everyday Conversions

1. Using computers	 electric energy	 light & sound energy
2. Driving cars	 chemical energy	 kinetic energy
3. Rubbing hands together for warmth	 kinetic energy	 thermal energy
4. In hydroelectric dams	 gravitational potential energy	 electric energy
5. Photosynthesis in Plants	 solar energy	 chemical energy
6. Burning of wood	 chemical energy	 heat & light energy

Unit 5 Our Hearts Pump Blood / Unit 6 Blood Moves All Around

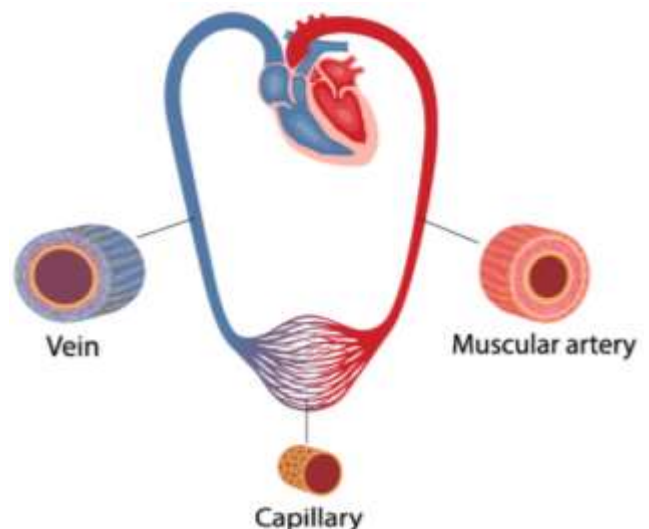
The heart pumps blood around the body. It sits inside the chest, in front of the lungs and slightly to the left side. The heart is actually a double pump made up of four chambers, with the flow of blood going in one direction due to the presence of the heart valves. The contractions of the chambers make the sound of heartbeats.

Blood vessels have a range of different sizes and structures, depending on their role in the body.

1. **Arteries** carry blood high in oxygen content away from the heart to the farthest reaches of the body. Since blood in arteries is usually full of oxygen, the hemoglobin in the red blood cells is oxygenated. The resultant form of hemoglobin is what makes arterial blood look bright red.

2. The arteries eventually divide down into the smallest blood vessels, the **capillaries**. Capillaries are so small that blood cells can only move through them one at a time. Oxygen and food nutrients pass from these capillaries to the cells. Capillaries are also connected to veins, so wastes from the cells can be transferred to the blood.

3. **Veins** have one-way valves instead of muscles, to stop blood from running back the wrong way. Generally, veins carry deoxygenated blood from the body to the heart, where it can be sent to the lungs. The exception is the network of pulmonary veins, which take oxygenated blood from the lungs to the heart.

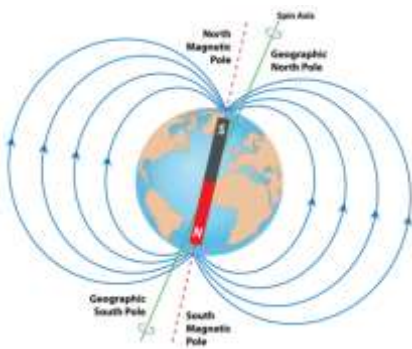


Unit 7 Making Magnetic Fields / Unit 8 Earth Is a Magnet

A compass is a tool for finding direction. A simple compass is a magnetic needle mounted on a pivot, or short pin. The needle, which can spin freely, always points north. The pivot is attached to a compass card. The compass card is marked with the directions. To use a compass, a person lines up the needle with the marking for north. Then the person can figure out all the other directions.



A compass works because Earth is a huge magnet. A magnet has two main centers of force, called poles—one at each end. Lines of magnetic force connect these poles. Bits of metal near a magnet always arrange themselves along these lines. A compass needle acts like these bits of metal. It points north because it lines up with Earth's lines of magnetic force.



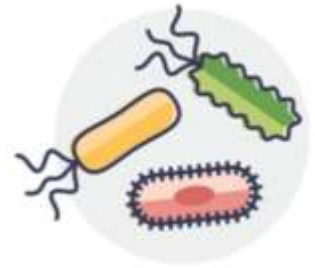
Earth's magnetic poles are not the same as the geographic North and South poles. The geographic poles are located at the very top and bottom of a globe. The magnetic poles are nearby but not at exactly the same places. A compass points to the magnetic North Pole, not the geographic North Pole. Therefore, a compass user has to make adjustments to find true north.

People in China and Europe first learned how to make magnetic compasses during the 1100s. They discovered that when a magnetized bit of iron floated in water, it pointed north. Sailors soon began to use compasses to navigate, or find their way, at sea.

Unit 9 Bacteria vs. Fungi / Unit 10 Strange Smells

Bacteria

Bacteria are bigger and more complex than viruses, though they can still spread through the air. A bacterium is a single cell, and it can live and reproduce almost anywhere on its own: in soil, in water and in our bodies.



For the most part, we live peacefully with bacteria—the colonies in our guts are helpful to us and strengthen our immune system. But they can also harm us by replicating quickly in our bodies, killing cells. Some bacteria also produce toxins which can kill cells and cause an outsized, damaging immune reaction.

Fungi

Fungi are more complicated organisms than viruses and bacteria—they are "eukaryotes," which means they have cells. Of the three pathogens, fungi are most similar to animals in their structure.



There are two main types of fungi: environmental, which are yeast and mold that often live in soil and don't generally cause infection in most healthy people; and commensals, which live on and in us and generally don't hurt us. Commensal fungus may play a beneficial role in our overall health.

Certain environmental fungi reproduce "spores," particles that can enter our body through the lungs or on the skin. These fungi can be especially damaging for people with weakened immune systems, as the fungi can spread quickly and damage many organs. Other fungal infections can be caused by an overgrowth of commensal fungus.

Unit 11 62 Degrees in the Morning? / Unit 12 Different Temperatures

The Fahrenheit Scale

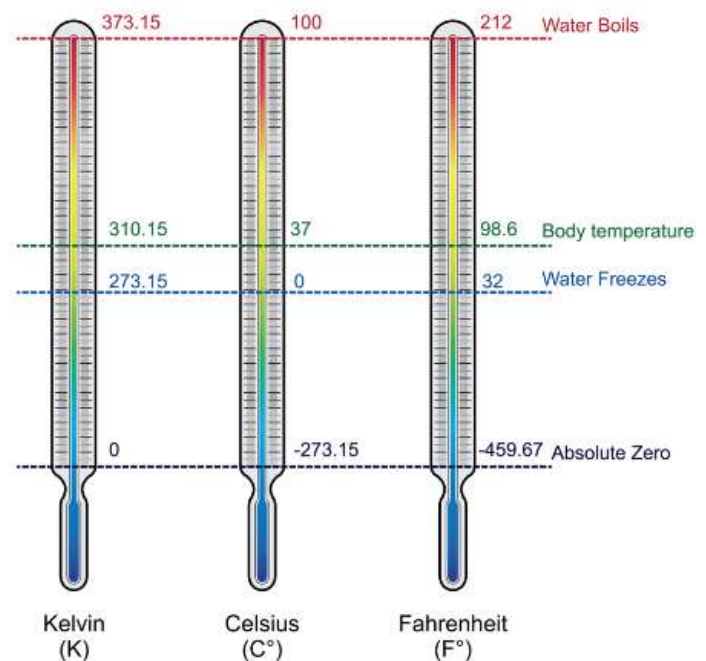
The Fahrenheit temperature scale was developed in 1717 by the German physicist Gabriel Fahrenheit. 0° was established as the freezing temperature of a solution of brine made from a mixture of water, ice, and ammonium chloride (a salt). The upper point is based on the boiling point of water, designated as 212° to maintain the original magnitude of a Fahrenheit degree, whereas the melting point of ice is designated as 32° .

The Celsius Scale

The Celsius scale was developed in 1742 by the Swedish astronomer Anders Celsius. It is based on the melting and boiling points of water under normal atmospheric conditions. Initially, the Celsius scale used 0° in order to denote the boiling point of water and 100° in order to denote freezing point of water. These values were later inverted to 0° for the freezing point of water and 100° for the boiling point of water. Because of 100 divisions, it is also called the centigrade scale.

The Kelvin Scale

Lord Kelvin, working in Scotland, developed the Kelvin scale in 1848. His scale uses molecular energy to define the extremes of hot and cold. Absolute zero, or 0 K, corresponds to the point at which molecular energy is at a minimum. The Kelvin scale is preferred in scientific work, although the Celsius scale is also commonly used. Temperatures measured on the Kelvin scale are reported simply as K, not $^{\circ}\text{K}$.

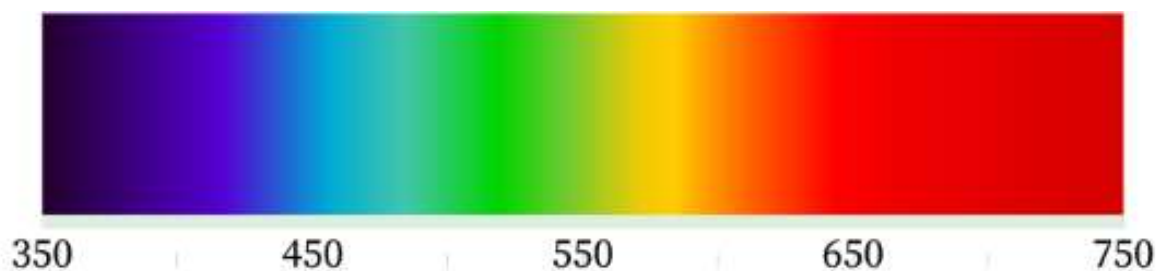


Unit 13 The Wonder of Rainbows / Unit 14 All the Colors of the Rainbow

A rainbow is an arc of color in the sky that can be seen when the sun shines through falling rain. The pattern of colors start with red on the outside and changes through orange, yellow, green, blue, indigo, and violet on the inside. A rainbow is created when white light is refracted while entering a droplet of water, split into separate colors, and reflected back. A rainbow is actually round like a circle. On the ground, the bottom part is hidden, but in the sky, it can be seen as a circle around the point opposite the Sun.

While sunlight is white, all white light is actually a blend of many different colors. Water and other materials bend the different colors at different angles, some more strongly than others. This is called dispersion. By splitting up white light into its separate colors, rainbows appear colorful even though the source of light hitting them is white. An unnatural rainbow effect can also be made by spraying drops of water into the air on a sunny day.

The range of wavelengths of light that the human eye can see is called "the visible spectrum". Wavelengths from approximately 400 to 700 nm are visible by human eyes. This includes the colors of the rainbow. Each color can be explained as a ray of light that is transmitted at a particular level of energy (with a particular wavelength).



Unit 15 Creating Organs and Limbs

Innovations in Artificial Organs

The first real breakthrough in artificial organ design came in 1982, with Jarvik-7, the first fully functioning artificial heart to be successfully implanted in a human. Robert Jarvik and inventor Willem Kolff are credited with the design of Jarvik-7. Kolff has several other innovations to his credit, including the first artificial kidney and the heart-lung machine. For these innovations, he is regarded as the father of artificial organs.



Today, despite remarkable advances in transplantation, the importance of artificial organs has not diminished. If anything, the long waiting list and the wait duration necessitate effective and immediate alternatives to organ transplant. The average prospective kidney recipient has a 3.6-year wait, and at least 20 people waiting for an organ die each day.

Foremost among the medical advances, and one that while controversial has continued to demonstrate potential, is the use of stem cells. Still, the studies that have been done with stem cells have proven that it is possible to grow organs in a lab, which could then be implanted.

Science has also made it possible to produce artificial organs using another technological marvel, 3D printing. When applied to medicine, the technique is referred to as 3D bioprinting — and the achievements in the emerging technique have already been quite remarkable. Thus far, scientists have successfully 3D-bioprinted several organs, including a thyroid gland, a tibia replacement, as well as a patch of heart cells that actually beat.

Unit 16 Online Doctors

Advantages of Telemedicine

Healthcare systems, physician practices, and skilled nursing facilities are using telemedicine to provide care more efficiently. Technologies that come integrated with telemedicine software like AI diagnosis and medical streaming devices can better assist providers in diagnosis and treatment. Providers can also benefit from increased revenue. By utilizing telemedicine, physicians can see more patients without the need to hire more staff or increase office space.

Because of telemedicine, patients who previously had limited access to health care services can now see a physician without leaving their home. Seniors can now do so with the use of medical streaming devices. The spread of disease is reduced as individuals with contagious diseases don't have to expose it to others in crowded waiting rooms. In addition, individuals can schedule a consultation during a work break or even after work hours.

Disadvantages of Telemedicine

Although telemedicine brings with it many benefits, there are some downsides to it as well. First, since technology is growing at such a fast pace, it's been difficult for policymakers to keep up with the industry. There is great uncertainty regarding matters like reimbursement policies, privacy protection, and healthcare laws.

Furthermore, several physicians and patients are finding it difficult to adapt to telemedicine, especially older adults. Physicians are very concerned about patient mismanagement. While advances in medicine have made it more efficient to use technology, there are times when system outages occur. There is also the potential for error as technology cannot always capture what the human touch can.