

NAME _____

EXERCISE!

BACKGROUND INFORMATION: Body systems do not work alone. It takes all of them working together for the body to function properly.

Because you have a skeleton, you can stand, run, and breathe. The skeleton has five major functions: it gives your body shape and support, protection for internal organs, major muscles are attached to the bone, blood cells are formed in the red marrow of some bones and the skeleton stores calcium and phosphorus compounds. Any place where two or more bones meet is called a *joint*. Joints allow the skeleton to be flexible. A *ligament* is a tough band of tissue that holds bones together.

The skeleton is somewhat like a collection of simple machines. However, they have no power to move on their own. Muscles move body parts. A *muscle* is an organ that contract and gets shorter. Because of this, body parts move. No matter still you are, there is still muscle movement somewhere in your body. Every system in your body has muscle tissue as part of that system.

Voluntary muscles are muscles that you control. Arm and leg muscles are examples. You can choose to move them or not. *Involuntary muscles* are those that you cannot control. Blood is pumped through your body, and food is moved through your digestive system because of these muscles. You don't have to think about using them.

There are three types of muscle tissue in your body: *smooth*, *skeletal* and *cardiac*. There are more skeletal muscles than any other type. Smooth muscles are involuntary. The walls of the stomach, intestine, uterus, bladder, penis, and blood vessels are some of the places where smooth muscle is found. They contract and relax slowly. Smooth muscle is not striated.

Skeletal muscles looked striped or striated. There are attached to bones by *tendons*. Tendons are thick bands that pull on bones as the muscle gets shorter, or *contracts*. Skeletal muscles are voluntary. You can control their use. You choose when to walk or not walk. These muscle contract quickly and tire easily.

Cardiac muscle is the third type of muscle. It is found only in the heart. Cardiac muscle is also involuntary. Cardiac muscle is striated like skeletal muscle. Cardiac muscle contracts about 70 times per minute. You know each contraction is a heartbeat, but it isn't something you can control.

Skeletal muscle movements are the result of pairs of muscle working together. When one muscle of a pair, contracts, the other muscle relaxes, or returns to its original length. Stretch your arm out straight. Bring your hand to your shoulder. The muscle between your shoulder and elbow is your biceps. This muscle contracted and pulled your lower arm and upper arm together so that you could touch your shoulder. When you straighten your arm back out, the biceps relaxes and the muscle on the back side of your arm, the triceps, contracts to pull your arm back down.

Contracting and relaxing muscles takes energy. Muscles use chemical energy in the form of glucose to work. The glucose is delivered to muscle cells through the blood stream. Glucose comes from the breakdown of food in the *digestive system*. Muscles get tired when the glucose is used up.

Glucose isn't the only substance moved through the body in the blood stream. The cardiovascular system moves other nutrients and oxygen to cells and removes carbon dioxide and other wastes. Cardio- means heart and vascular means vessel. Your cardiovascular system is made up of your heart, blood vessels and blood.

Your heart is a muscular organ about the size of a closed fist. It is located behind your sternum and between your lungs. It has four chambers. The two upper chambers are the right and left atria (one is an atrium). The two bottom chambers are the right and left ventricles. During a single heartbeat, both atria contract at the same time. Then both ventricles contract at the same time. A valve separates each atrium from the ventricle below it. This way blood flows only from an atrium to a ventricle.

Pulmonary circulation is the flow of blood through the heart, to the lungs, and back to the heart. Blood from body cells is high in carbon dioxide and comes in to the right atrium of the heart through a large vein called the superior vena cava. When the right atrium contracts, this blood is forced into the right ventricle. The right ventricle contracts, and blood leaves the heart through the pulmonary arteries to go to the lungs. As blood circulates through the lungs, carbon dioxide is exchanged for oxygen. Oxygen rich blood returns to the heart through the pulmonary vein. This blood fills the left atrium. When the atrium is full, it contracts and forces the blood into the left ventricle. The last step of this path through the heart occurs when the left ventricle contracts and forces the blood out of the heart through the largest artery in the body, the aorta. The aorta carries the blood away from the heart to the many branching arteries that carry it to all body parts.

When the blood is pushed out of the heart, it begins a journey through the arteries, capillaries and veins. Arteries are blood vessels that move blood away from the heart. They carry the oxygen rich blood to the rest of the body. Arteries have thick elastic walls that are lined with smooth muscle. Each ventricle of the heart is connected to an artery, so with each contraction, blood is moved from the heart into arteries.

Veins are blood vessels that move blood to the heart. Veins that are near skeletal muscles are squeezed when these muscles contract. This helps move the blood toward the heart. Blood in veins carries waste materials from cells and is low in oxygen.

Capillaries are very tiny blood vessels that connect arteries and veins. The walls of capillaries are only one cell thick. Food (glucose) and oxygen diffuse to body cells through the small capillary walls. Waste materials move from the body cells into the capillaries to be carried back to the heart.

The heart has its own blood vessels that supply it with nutrients and oxygen and remove wastes. These blood vessels are called the coronary arteries and veins.

For oxygen to get into the blood, it must first get into the body. This is the job of the respiratory system. The respiratory system is made up of body parts that help you breathe by taking oxygen into your body and removing carbon dioxide. Air enters the body through the nostrils. These lead to the nasal cavity, where air gets moistened and warmed. This warm, moist air moves down the pharynx into the trachea. At the end of the trachea are two short branches called bronchi. These carry air into the lungs. Inside the lungs, the bronchi branch into smaller and smaller tubes. These are the bronchioles. At the end of each bronchiole are clusters of thin-walled sacs called alveoli. Capillaries surround the alveoli. The exchange of oxygen and carbon dioxide takes place between the alveoli and the capillaries. This is easy because the walls of the alveoli and

capillaries are only one cell thick. Oxygen diffuses through the walls of the alveoli and then through the walls of the capillaries into the blood. It is carried back to the heart and pumped out to the rest of the body. At the same time, carbon dioxide diffuses through the walls of the capillaries and through the walls of the alveoli. It leaves the body when you exhale.

QUESTION: What is happening in your body systems during exercise?

MATERIALS: Watch or clock with a second hand
Large / heavy book or small barbells from the gym
Map pencils

PROCEDURE:

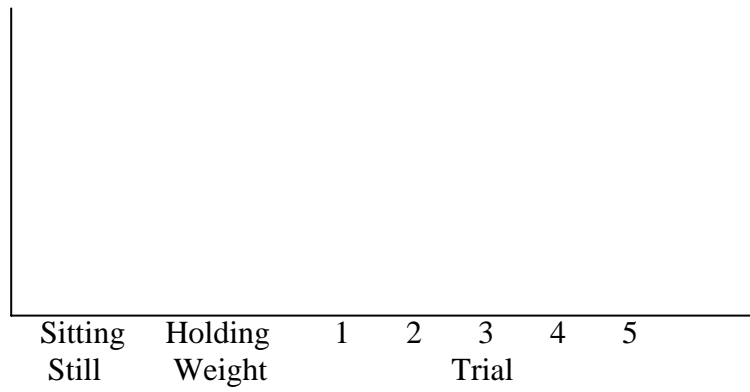
1. Work with a partner.
2. Sit very still and quiet for 1 minute.
3. At the end of the minute, have your partner keep time for 1 minute while you count the number of breaths you take. Record.
4. Repeat to find your pulse rate for 1 minute. Record. (Sometimes, your partner can count your breaths by watching you inhale & exhale while you count your pulse. This will save time if you can do this.)
5. While still seated, hold a heavy weight in your dominant hand. Bend your elbow so that your arm is forming a right angle to your body.
6. Hold the weight (don't move your arm) for 1 minute, then take your breath and pulse rate. Record.
7. Extend your arm all the way down and bend it back to the right angle again (biceps curls) as many times as you can in 1 minute. Record the number of times you were able to complete this action.
8. Take and record your breath and pulse rate.
9. Repeat steps 7 & 8 four more times for a total of 5 times.

DATA:

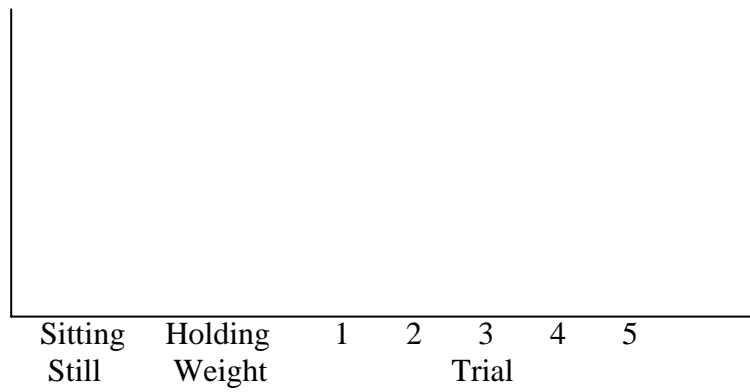
Action	Breath Rate	Pulse Rate	# of Curls
Sitting Still			XXXXXXXXXXXXXXXXXX
Holding Book			XXXXXXXXXXXXXXXXXX
Curls – trial 1			
Curls – trial 2			
Curls – trial 3			
Curls – trial 4			
Curls – trial 5			

Graph your data. Make three graphs: 1 to show pulse rate, 1 to show breath rate, and 1 to number of curls completed.

Pulse Rate



Breath Rate



of Curls

