Grade 11 PE: Active Living
Your Body's Response to Exercise

Name: _____ Date: _____

Any type of exercise you do uses muscles. Running, swimming, weightlifting, or any sport you can imagine uses different muscles or muscle groups to generate force that allows you to move. For example, in running and swimming, your muscles are creating force against the ground or water to accelerate your body and keep it moving.

How do your muscles work during exercise?

As you begin to use your muscles, you simultaneously increase the demands on the rest of the body. During strenuous exercise, just about every system in your body focuses its efforts on helping the muscles do their work either by speeding up or slowing down their work. For example, during strenuous exercise your heart beats faster so that it can pump more blood to the muscles, and your stomach slows down (stops digesting food) so that it does not waste energy that the muscles can use.

During exercise, your muscles act something like electric motors. The muscles contract and relax to produce a desired movement. They take in a source of energy and they use it to generate force. An electric motor uses electricity as its source of energy. Your muscles are biochemical motors so they use a substance called adenosine triphosphate (ATP) for their energy source. Without ATP your muscles would not be able to contract or relax, making it one of the most important molecules in the body.

The muscles do not store a significant quantity of ATP and therefore it must be continuously produced. The ATP is produced by breaking down the body's stored sugar (glycogen) and fat.

As the body begins to exercise if progresses through three energy systems that use and produce ATP.

The first stage uses the (phosphagen system) where any stored ATP is used up within 10 seconds.

The second stage of ATP production (anaerobic system) begins at this point using the sugar (glucose) in the muscle. The stored sugar is used up within two to three minutes.

The third stage of ATP production (aerobic system) then begins as the body uses oxygen, stored body sugar (glycogen) and fat to produce the ATP needed to continue exercising.

If the intensity of the exercise is too great the body will not be able to meet the ATP needs of the muscles. The longer a person exercises the more they will need to slow down so that ATP production can keep up with ATP usage.

During exercise ATP is used in the muscles to:

- help them contract
- help them relax
- help create more ATP

In order to continue exercising, your muscles must continuously make ATP. To make this happen, your body must supply oxygen, sugar in the form of glucose (broken down from glycogen), and fat to the muscles.

ASSIGNMENT: Energy Systems

Name: _____ Date: _____

Identify the energy system (A) phosphagen; B) anaerobic; or C) aerobic) that is the prime contributor of ATP in the given activity. Then justify your answers.

	A – Phosphagen B – Anaerobic, or C – Aerobic	Justify your answer in a brief sentence.
1. Marathon running		
2. Weightlifting		
3. Dancing		
4. Spring up one flight of stairs		
5. Baseball		
6. Walking to school		
7. Cross-country skiing		
8. Tennis		
9. Jumping over a puddle		
10. Mowing the lawn		

Exercise Intensities

Exercise intensity refers to how hard your body is working during physical activity. For maximum health benefits, the goal is to work hard but not too hard. There are a variety of ways to measure your exercise intensity so that you get the most out of every workout.

Your body's response to moderate intensity exercise (65 to 80 percent of maximum heart rate) normally includes:

- an increase in heart rate
- an increased breathing rate (this increased respiratory response allows for the body to take in more much needed oxygen)
- an increase in body temperature
- mild to moderate perspiration

Nervous System

The Nervous System is the body's information gatherer, storage centre, and control system. Its overall function is to collect information about the external environment to relation to the body's internal environment, to analyze this information, and to initiate appropriate responses to satisfy certain needs.

The body's nerves form several systems that are interrelated. The brain and spinal cord for example make up the Central Nervous System (CNS). The Peripheral Nervous System (PNS) is made up of the Somatic and Autonomic Nervous Systems. The Somatic Nervous System controls voluntary or conscious movements such as walking or throwing. The Autonomic Nervous System is responsible for the body functions that are involuntary or not under conscious control - like the heartbeat or the digestive system.

The smooth operation of the Autonomic Nervous System is achieved by dividing it into the Sympathetic and Parasympathetic Systems. These systems cause opposing actions and check on each other to provide balance.

Resting and exercise heart rates are controlled by the sympathetic and parasympathetic nervous system. The sympathetic division of the autonomic nervous system prepares the body for physical activity by increasing heart rate, blood pressure, and respiration. The sympathetic division also stimulates the release of glucose from the liver for energy. Once exercise begins, the sympathetic nervous system is activated and the heart rate rises quickly. The parasympathetic division helps slow down the heart rate and respiration. At rest, the heart is controlled by the parasympathetic division, which is why the average resting heart rate is about 60 beats per minute. An example of an increased parasympathetic response is the low-resting heart rates in endurance athletes.

Endocrine System

The Endocrine system comprises a number of glands that produce hormones needed for a wide array of vital functions. Hormones are chemical substances that are secreted by endocrine glands and are carried by the bloodstream to other target organs or tissues where they control or regulate the development or function of those structures. Endocrine hormones may be either proteins or steroids.

Hormones cause a specific effect on the activities of target organs. This affect may require minutes or hours to occur. For example, the hormone epinephrine acts quickly on the heart to increase its rate and force of contraction when a person begins to run. It acts on the blood vessels to increase blood flow to the muscles and decreases blood flow to the gastrointestinal tract. Hormones also help control the type and rate of body growth and metabolism which are long-term effects, and they help the body maintain a consistent internal environment. The endocrine system has a large influence on the way we feel and act. In turn, our energy and other needs in any given situation set the activity of the endocrine system.

ASSIGNMENT: Body System and Response

Name: _____ Date: _____

In this activity, you will match the correct "Body's Response to Exercise" to the "Body System." To do that, write A, B, C, or D next to the correct sentence under "Body's Responses to Exercise."

Body System

A. Nervous system
B. Endocrine system
C. Circulatory system (includes cardiovascular)
D. Respiratory system

Body's Response to Exercise

1. Increased rate of breathing in order to increase amount of oxygen coming into the body. _____

2. Controls heart rate so that it increase during exercise and decreases at rest. _____

3. Increases secretion of hormones such as insulin and glucagons, thereby adapting to the need for extra fuel during exercise. _____

4. Increase volume of blood pumped, thereby supply and increased amount of oxygen. _____

Long-term Effects of Exercise on the Body

Regular exercise makes the heart stronger and the lungs fitter, enabling the cardiovascular system to deliver more oxygen to the body with every heartbeat and increasing the maximum amount of oxygen that the body can take in and use. Exercise also lowers resting blood pressure and reduces the levels of low density lipoprotein (LDL) cholesterol (the bad cholesterol), which in turn reduces the risk of heart attack, stroke, and coronary artery disease. Other conditions that are less likely to occur with regular exercise include colon cancer and some forms of diabetes.

Exercise makes muscles stronger, allowing people to perform tasks that they otherwise might not be able to do. Most everyday tasks require muscle strength and good range of motion in joints, and regular exercise can improve both.

Exercising stretches muscles and joints, which in turn can increase flexibility and help prevent injuries. Weight-bearing exercise strengthens bones and helps prevent osteoporosis.

Exercise increases the body's level of endorphins. Endorphins are chemicals in the brain that reduce pain and induce a sense of well-being. Thus, exercise appears to help improve mood and energy levels and may even help alleviate depression. Exercise also helps boost self-esteem by improving a person's overall health and appearance.

Besides the ways in which exercise benefits people of any age, regular exercise helps older people remain independent by improving functional ability and by preventing falls and fractures. It can strengthen the muscles of even the frailest older person living in a nursing home. Exercise also tends to increase appetite, reduce constipation, and promote sleep.

The beneficial effects of exercise cannot be stored. Heart strength, muscular strength and endurance, and the level of high-density lipoprotein (HDL cholesterol: the good cholesterol) decrease, whereas blood pressure and body fat increase. Even former athletes who stop exercising do not retain measurable long-term benefits. They have no greater capacity to perform physical activities and no fewer risk factors for heart attacks than those who have never exercised, nor do they regain fitness any faster.