

## SUGGESTED REFERENCES

- *The Heart: An Online Exploration*  
The Franklin Institute Online  
<http://sln2.fi.edu/biosci/heart.html>
- *How Our Lungs Work*  
American Lung Association  
<http://www.lungusa.org/learn/>
- *Respiratory System*  
The Lung Association  
<http://www.lung.ca/lunghealth/>
- *The Heart and the Circulatory System*  
The National Health Museum  
[http://accessexcellence.org/AE/AEC/CC/heart\\_background.html](http://accessexcellence.org/AE/AEC/CC/heart_background.html)
- *How Blood Works*  
Marshall Brain's HowStuffWorks  
<http://www.howstuffworks.com/blood.htm>
- American Heart Association  
<http://www.americanheart.org/presenter.jhtml?identifier=1200000>
- *Nutrition Science and the Olympics*  
Sports Nutrition  
<http://btc.montana.edu/olympics/nutrition/>
- Tufts Nutrition Navigator  
<http://www.navigator.tufts.edu/>

## NATIONAL SCIENCE EDUCATION STANDARDS

- Science Content Standards: 5 - 8 Structure and Function in Living Systems  
Regulation and Behavior
- 9 - 12 The Cell  
Interdependence of Organisms  
Matter, Energy, and Organization in Living Systems  
Behavior of Organisms

## CREDITS

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# SCIENCE SCREEN REPORT

*Science Brought To Life In The Classroom*

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# SCIENCE SCREEN REPORT

## VOLUME 32 ISSUE 4 ENERGY FOR LIFE



Accreditation Board  
for Engineering  
and  
Technology



Presidential Awards  
for Excellence in  
Mathematics  
and  
Science Teaching



Junior Engineering  
Technical Society  
[www.jets.org](http://www.jets.org)

## SYNOPSIS

Our atmosphere is filled with different gases that evolved over a period of 4.5 billion years. One gas, oxygen, is vital for survival. This colorless, odorless, and tasteless element is found in all living tissue.

This edition of SCIENCE SCREEN REPORT examines how our bodies acquire and process energy through the oxygen we breathe and the glucose we obtain from nutrients. It explores two different physiological systems that work together in order to keep our bodies running efficiently. It demonstrates how the respiratory system processes oxygen that is used within our bodies, and explains the circulatory system and its internal transport of oxygen.

## CURRICULUM UNITS

- ANATOMY
- BIOLOGY
- BIOPHYSICS
- HEALTH
- PHYSICAL EDUCATION
- PHYSIOLOGY

## RUNNING TIME

13:42

## BACKGROUND

Our bodies could not function without the energy we receive from the flow of oxygen and glucose in our bloodstream.

The body receives oxygen from the air breathed in through a process called respiration. This is the physical act where oxygen is inhaled and carbon dioxide, an invisible gas that is a by-product of respiration, is exhaled.

Once oxygen is in the respiratory system, the circulatory system is responsible for transporting it throughout the body. The oxygen first travels to the smallest part of the lungs, the alveoli, that are surrounded by capillaries. Demonstrations illustrate how oxygen diffuses across the alveoli and blood vessel walls where it is picked up by red blood cells.

Glucose also travels in the bloodstream and is transported to every cell in the body. The energy to keep our bodies going is produced by the chemical reaction of the oxygen we breathe from the air and the glucose that comes from the food we eat.

Glucose is the body's main fuel; and eating healthy foods provides our bodies with the energy to carry out tasks and activities.

Different people require different amounts of energy. Throughout the day about 70 percent of our energy is used to keep our body functioning. Energy used to carry out this process is called the basal metabolic rate or BMR. This includes the energy used to keep the heart beating, to maintain body temperature, to keep the blood flowing, and to keep the organs healthy.

As the body uses more energy, the rate of respiration increases; and the body requires more fuel. For example, an athlete will require more calorie intake than an inactive person, and a growing teenager will require more energy than an elderly woman.

A person's individual needs determine the amount, and often the type, of food that is needed. The program explores how scientists measure energy in kilojoules, and how when referring to food, it is measured in calories. Scientists use a calorimeter to compare foods and their energy content, and there are demonstrations of how athletes combine this information along with their own physical characteristics to assure that they will have sufficient energy for specific activities.

However, none of this would be possible without the synergy of the respiratory and circulatory systems, including the flow of the blood that transports oxygen and glucose to all parts of our body.

The organ in charge of keeping our blood flowing is the heart that contains two circulation systems. One system pumps blood to and from the lungs. The other system pumps blood throughout the body. These two systems within the heart work interdependently of each other in order to maximize the efficiency of oxygen exchange.

Our heart is our lifeline, and it is essential that people take care of their hearts with good diets and exercise. As we exercise the body, the heart muscle receives a work out which makes it stronger and better able to be the link to our energy for life.

## ADVANCED ORGANIZERS

Prior to showing the program:

1. Have students keep a journal, writing down what they eat for three days. Discuss food groups and nutrition.
2. After discussing the different food groups and the importance of nutrition, repeat the above activity. Analyze dietary improvements and compare results.
3. Have students measure their pulse. After their resting heart rate is documented, have them exercise and measure their pulse again. How much did it accelerate? Why is your heart pumping so rapidly?
4. Have students analyze their breathing after this exercise. Is there a correlation between accelerated heart rate and rapid breathing?
5. Create a KWHL chart to determine prior knowledge of respiration and circulatory systems.

## CRITICAL THINKING EXERCISES

After showing the video, ask your students the following:

1. Compare and contrast the respiratory and circulatory systems.
2. Illustrate and explain the process of respiration. Include terms such as red blood cells, chemical reaction, glucose, oxygen, and the bloodstream.
3. Using nutritional information create a healthy dinner recipe. Share this with the class.
4. Research different diseases that affect the lungs and heart.
5. Write a persuasive paper convincing others to eat healthier and to exercise regularly.
6. Research how being physically unfit and eating an unhealthy diet can affect a person's body. What are the risks later in life? At what age is it important to start taking care of your body?

## VOCABULARY

Basal Metabolic Rate  
Blood vessels  
Calories  
Calorimeter  
Capillaries  
Carbon dioxide  
Cellular respiration  
Celsius  
Circulatory system

Glucose  
Kilojoules  
Lactic acid  
Oxygen  
Pulmonary  
Red blood cells  
Respiration  
Ventilation

## CAREER POSSIBILITIES

■ CARDIOLOGIST  
■ HEMATOLOGIST  
■ NUTRITIONIST  
■ PHLEBOTOMIST

■ PHYSICAL THERAPIST  
■ RESPIRATORY THERAPIST  
■ SPORT SCIENTIST