OUR BODY

THE UNIVERSE WITHIN

TEACHER'S GUIDE
Grades 6 – 8

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Welcome to OUR BODY: THE UNIVERSE WITHIN!

Have you ever wondered where your liver was located? Or what smoker's lung looks like? Or how your muscles perform when you run? These and more questions are answered at OUR BODY: THE UNIVERSE WITHIN. This scientific and educational exhibit is comprised of over 200 specimens that have been preserved using a method known as "polymer impregnation".

OUR BODY: THE UNIVERSE WITHIN goes "under the skin," literally as well as figuratively, revealing the complexity of the human body and allowing students an up-close, three-dimensional look at their inner make-up. Rather than use models of the human body, OUR BODY uses actual human bodies to provide students a look at what normally only doctors and scientists are allowed to see first-hand, making this a once in a lifetime experience.

The goal of OUR BODY is for students to leave with a deeper understanding of the body's form and function and a stronger appreciation for the uniqueness of each of our individual bodies. OUR BODY also highlights why we need to keep our bodies fit and healthy. The specimens serve as an engaging resource that vibrantly illustrates how far mankind has come since Galen drew anatomical sketches in the 2nd century A.D.

Students at OUR BODY: THE UNIVERSE WITHIN begin their visit with a time line displaying the history of anatomy. The exhibition continues with the frame that holds a person together—the musculoskeletal system—and full body specimens that demonstrate how bones and muscle groups work together to keep a body in motion.

From there, you and your students will see the central nervous system with the brain as the "control room" from which all motor impulses flow. Exhibits at OUR BODY: THE UNIVERSE WITHIN on the digestive and respiratory systems show how we eat and breathe, while the cardiovascular displays show the intricate system that carries blood to and from the heart. Students will learn how the urinary system gets rid of waste materials and how the reproductive system ensures the survival of our species.

This Educators Guide provides you with background information on the polymer impregnation process plus important questions and answers about the exhibition followed by student activities for before, during, and after your field trip to OUR BODY: THE UNIVERSE WITHIN. At the end, you will find correlations to your state academic curriculum standards, recommended resources, and an anatomical glossary.

Polymer Impregnation

This educational and scholarly exhibition is made possible by the unique method of preserving the specimens with "polymer impregnation." Polymer impregnation is a relatively new method of preservation whereby bodily fluids are replaced by liquid plastic, which then hardens to create a solid, durable anatomic specimen that will last indefinitely.

Most importantly, the process leaves even the finest, most delicate tissue structures virtually intact, making the process invaluable for medical study. The organs are actually identical to their pre-preservation state. The plastic is initially pliable, enabling the bodies to be placed in many different life-like positions, and then hardens. The specimens are completely dry and odorless.

Polymer impregnation results in specimens that are not only versatile and easy to handle, but are truly authentic. Because the specimens are dry, odorless and durable, they are an excellent teaching and research tool. Although the technique is still fairly new, it is being used in more than 150 departments of anatomy, pathology, forensic science, and biology all over the world.

Polymer Impregnation Process

Water and lipid tissues are replaced by curable polymers, including silicone, epoxy and polyester-copolymer in a four-step process.

1. The first step of polymer impregnation is fixation. This simply means that the body is embalmed in order to halt decomposition.
2. After any necessary dissections take place, the specimen is placed in a bath of acetone. Under freezing conditions, the acetone draws out all the fluids and replaces them inside the cells.
3. The specimen can then be placed in a bath of liquid polymer, such as silicone rubber, polyester, or epoxy resin. By creating a vacuum, the acetone is boils and vaporizes. As it leaves the cells, it draws the liquid polymer in behind it, leaving a cell filled with liquid plastic.
4. The plastic must then be cured—either with gas, heat, or UV light—in order to harden it. A specimen can be anything from a full human body to a small piece of an organ.

Frequently Asked Questions

What is highlighted in OUR BODY: THE UNIVERSE WITHIN?

The exhibit educationally and artfully displays approximately 200 organs, human bodies and other anatomical specimens. OUR BODY: THE UNIVERSE WITHIN allows your students to learn about their own bodies and, ultimately, teaches them how to take better care of themselves and make positive lifestyle choices. This exhibition enables them to see and understand the medical conditions their friends and family members face in a whole new way.

What part of the anatomy is the hardest to preserve?

The brain is the most difficult organ to preserve because it is composed primarily of lipids (fat) and water. During the process of polymer impregnation, the brain can shrink significantly during dehydration. To manage this problem, the brain is dehydrated in a cold acetone thus better maintaining its original size and shape.

Why use real human specimens instead of constructed models?

Unlike models that idealize the body through the eyes of an artist, the specimens in this exhibition show the body and its parts as they really exist. Idealized models do not allow for any variation in structure or pathologies–which are key in noting how unique our bodies are.

What do the polymer-impregnated bodies feel like?

The specimens feel dry to the touch and can be either rigid or flexible, depending on the mix of chemicals used. While students will be able to get very close to the specimens, as a rule, visitors are not allowed to touch them.

From where do the specimens originate?

The scientific, educational exhibition, *OUR BODY: THE UNIVERSE WITHIN* was developed and provided by the Anatomical Sciences & Technologies Foundation in Hong Kong. The specimens in the exhibition were provided by various accredited Chinese universities, medical schools, medical institutions, research centers and laboratories to further the goals of the Anatomical Sciences & Technologies Foundation, most notably to promote educational and medical research of the human body.

Have the persons whose bodies have been donated consented to their use?

Acceptance of corpses (via donation by will or donation by relatives) by the Chinese medical schools is the principle source of obtaining materials for medical anatomy and educational purposes. In China, all donors (or their immediate family members) are clearly told that the donated bodies will be used for medical research and educational purpose. They are also guaranteed that all of their personal information will be treated as confidential.

What is the appropriate age level for viewing OUR BODY: THE UNIVERSE WITHIN?

The teaching of basic human anatomy and physiology are hallmarks in any child's education. We recommend that children attend the exhibition with a teacher or parent as an adult guide. We feel strongly that the exhibition offers a rare experience. It is a golden opportunity to open a child's eyes in a way no textbook ever could. OUR BODY: THE UNIVERSE WITHIN teaches the complexities of the human body, the necessity of proper nutrition and regular activity, and the importance of healthy lifestyle choices like avoiding smoking and alcohol.

Before Your Field Trip: Introduction to the Human Body

OUR BODY: THE UNIVERSE WITHIN is a fascinating tour of the human body as a whole, taking your students through each of the body systems to see firsthand how they function and how they relate to all of the other systems. You will see actual full human bodies and individual specimens of bones, blood vessels, nerves, muscles, hearts, livers....everything we have under our skin.

See and learn about your body and how each system supports the other. Use the anatomy information below and the activity that follows to introduce these systems to your students before your field trip to OUR BODY: THE UNIVERSE WITHIN.

MUSCULAR SYSTEM

The human body contains more than 650 individual muscles attached to the skeleton, which provides the pulling power for us to actually move. The muscular system consists of three different types of muscle tissues: skeletal, cardiac, and smooth. Each of these different tissues has the ability to contract, which allows for body movements and functions. There are two types of muscles in the system: involuntary, which we cannot control, and voluntary, which we can control.

The fastest muscle in the human body is in the eye. It allows us to blink.

SKELETAL SYSTEM

The skeletal system works with the muscular system. The skeletal system includes all your bones, ligaments, and tendons. It determines the shape and symmetry of the body, protects your organs, and acts as a firm base for the attachments of all your muscles. The skeletons of men and women are similar; however, the female skeleton is a bit lighter and smaller and has a wider pelvis for birthing.

Over half your body's bones are in your hands and feet.

CIRCULATORY SYSTEM

The circulatory system has three distinct parts: pulmonary circulation (lungs), coronary circulation (heart), and systemic circulation (veins and arteries). Each of these parts must be working independently in order for them all to work together. On average, your body has approximately five liters of blood continually traveling through it by way of the circulatory system. Your heart pumps to keep the blood moving on its journey throughout your body.

A red blood cell only lives for four months.

NERVOUS SYSTEM

There are no pain-detecting nerves inside your brain.

The nervous system is responsible for sending, receiving, and processing nerve impulses throughout your body. It is the master control unit of our body. The brain and the spinal cord make up the central nervous system. Sense organs provide the nervous system with information about the environment by means of the five senses. Nerves carry the information throughout the body in the form of electrochemical signals called impulses travelling from the brain and spinal cord to the nerves. The brain is largely made up of specialized cells called neurons.

It takes the cooperation of three systems to carry out the nervous system's mission.

- The central nervous system issues nerve impulses, analyzes sensory data, and includes the brain and spinal cord.
- The peripheral nervous system carries the impulses to and from the nerves branching off the brain and spinal cord.
- The autonomic nervous system, which is the sympathetic and parasympathetic systems, regulates and coordinates vital functions.

DIGESTIVE SYSTEM

The digestive system processes food and breaks it down into usable proteins, fats minerals, carbohydrates, and other substances. The digestion process begins in your mouth when salivary glands produce saliva, secretions that mix with food and break it down. The food then goes down your esophagus in peristaltic waves to the stomach. The stomach contains chemicals like hydrochloric acid and enzymes. The stomach gradually releases materials into the small intestine, where digestion is completed. All the nutrients are absorbed into the bloodstream, leaving the rest as unusable residue which passes through the large intestine to the rectum

If you ate while standing on your head (which you shouldn't!), the food would still go through your esophagus to your stomach.

Lungs with digestive tract

RESPIRATORY SYSTEM

The respiratory system provides the blood with oxygen to deliver to all over the body. Oxygen enters the respiratory system through the mouth and the nose. It then passes through the trachea. In the chest cavity, the trachea splits into two bronchi which divide again to form the bronchial tubes. In the lungs, the bronchial tubes divide into many smaller tubes and connect to tiny sacs called alveoli. The inhaled oxygen passes into the alveoli and through the capillaries into the arteries. At the same time, the veins release carbon dioxide to follow the same path back out of the lungs. The diaphragm is a sheet of muscles that lies across the bottom of your chest cavity. When it contracts, oxygen is pulled into your lungs; when it relaxes, carbon dioxide is pumped out of your lungs.

Your left lung is smaller than your right lung. It has to make room for your heart.

REPRODUCTIVE SYSTEM

The primary function of the reproductive system is to ensure survival of the species. Within the context of producing offspring, the reproductive system has four functions:

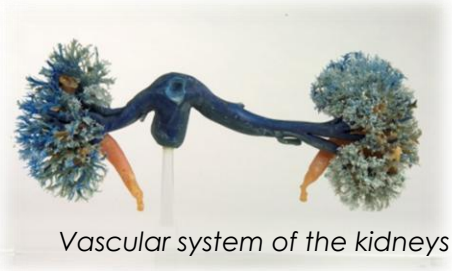
- To produce egg and sperm cells
- To transport and sustain these cells
- To nurture the developing offspring
- To produce hormones

A woman is born with all the eggs she will ever have.

EXCRETORY SYSTEM

The excretory system finds and removes waste produced by the body. The organs of excretion are the lungs, kidneys, and skin. Blood carries carbon dioxide through the veins to the lungs for respiration. Dead cells and sweat are removed from the body through the skin, which is also part of the integument system. Liquid waste is removed from the body through the kidneys. During circulation, blood passes through the kidneys where it is filtered. Urine is formed in the kidneys and funneled into the bladder which stores it until muscles contractions force the urine out through the urethra.

You can survive with only one kidney.



Vascular system of the kidneys

INTEGUMENTARY SYSTEM

The body's integument system helps the excretory system with removing waste. Skin, hair, fingernails and toenails make up the system by which surface wastes are removed. The skin protects the body and also provides for the removal of dead cells and sweat. Hair, fingernails, and toenails are actually accumulations of dead epidermal cells. As more cells die and need to be removed, the hair and nails grow.

Which organ is part of both your integumentary and your excretory systems? Your skin!

Name Class Date

Introduction to the Human Body Activity

Match the body systems with their primary functions.

System	Function
_____ **1. Musculoskeletal**	A. Responsible for transport of materials around the body.
_____ **2. Central nervous**	B. Responsible for gas exchange or bringing oxygen into the body and releasing carbon dioxide.
_____ **3. Peripheral nervous**	C. Responsible for filtering waste from the blood
_____ **4. Digestive**	D. Responsible for processing information from nerves & senses; the control center for the body.
_____ **5. Respiratory**	E. Responsible for movement & support of the human body.
_____ **6. Circulatory**	F. Responsible for transmitting information from nerves throughout the body to the brain.
_____ **7. Excretory/Urinary**	G. Responsible for breaking larger molecules into smaller ones to obtain nutrients.

Name _____ Class _____ Date _____

During Your Field Trip: Gallery Activities

Complete the following activities at your field trip to OUR BODY: THE UNIVERSE WITHIN.

Activity 1: Musculoskeletal System

Unscramble the terms.

1. oentnd _____
2. sbneo _____
3. ulcsme _____
4. tngmilea _____
5. otenkesl _____

Activity 2: Brain and Central Nervous System

Name the senses and the parts of the body responsible for transmitting the messages to the brain. Can you trace the message routes to the brain on a specimen?

The 5 Senses	Body part or parts responsible

Name Class Date

Activity 3: Peripheral Nervous System

Find these words in the puzzle:

BRAIN	NERVE	SPINAL CORD
FIBER	PERIPHERAL	CYTON
IMPULSE	REFLEX	RADIAL

D	U	E	C	M	E	R	A	D	I	A	L	P	U	X
W	R	S	X	V	Q	E	G	G	C	T	X	M	I	E
R	V	O	R	A	V	V	N	O	T	Y	C	V	Y	L
N	T	E	C	I	H	Y	H	R	S	Q	W	L	F	F
Z	N	N	M	L	B	U	F	G	H	P	J	D	D	E
C	K	G	C	O	A	E	T	P	C	E	E	T	R	R
B	Z	O	R	F	I	N	H	M	Y	R	G	N	H	O
T	E	B	N	I	H	R	I	B	Z	I	H	L	H	V
I	M	P	U	L	S	E	Y	P	W	P	A	K	U	H
N	Q	G	W	A	O	H	P	U	S	H	D	M	H	F
J	N	Z	T	B	H	V	H	N	I	E	P	L	B	L
C	O	E	R	A	R	F	I	B	E	R	H	V	T	Z
D	F	V	Z	M	L	A	O	W	Z	A	O	D	P	W
S	U	O	N	H	O	Y	I	L	N	L	G	F	G	E
G	P	D	N	E	Z	U	H	N	B	H	I	R	K	A

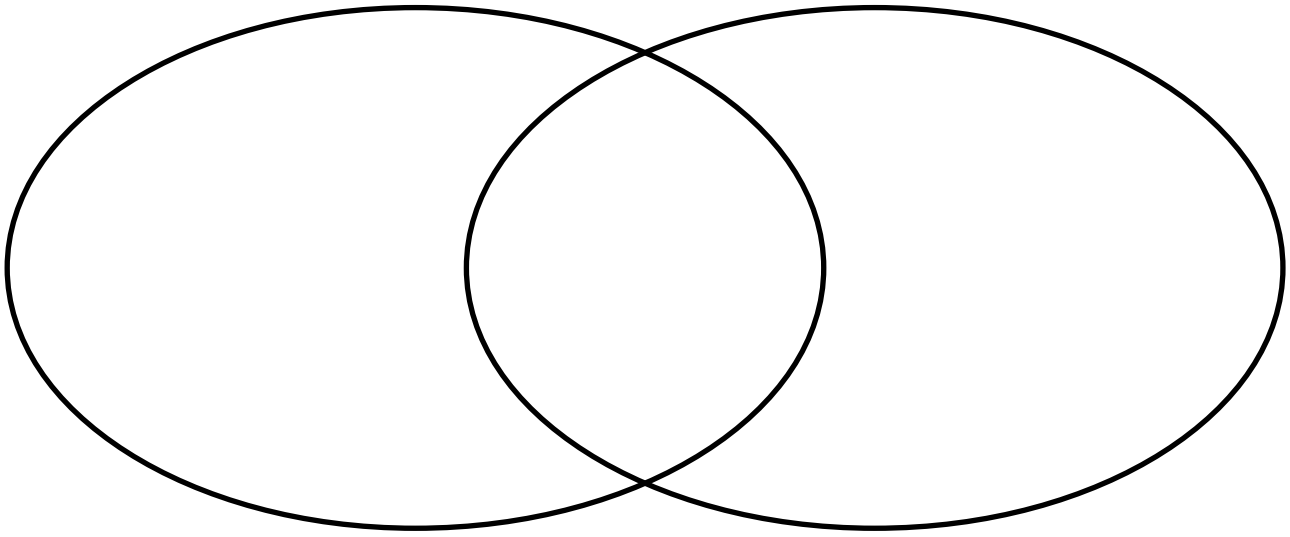
Name Class Date

Activity 4: Digestive System

In the space below, diagram the path your food takes through the digestion process. Include the mouth, esophagus, stomach, small intestine, and large intestine.

Activity 5: Respiratory System

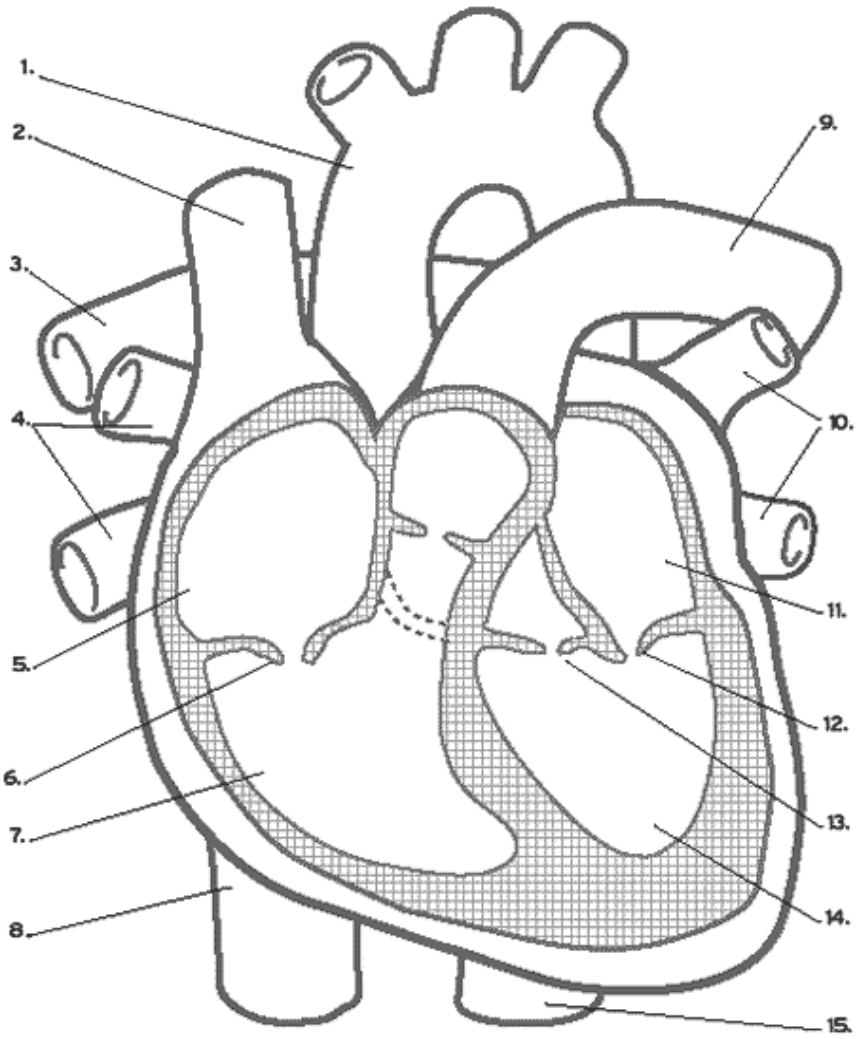
Use this Venn diagram to compare the healthy and unhealthy lungs on display at OUR BODY: THE UNIVERSE WITHIN.



Name Class Date

Activity 6: Circulatory System

Label as many parts of the heart as you can.



Name Class Date

Activity 7: Urinary System

Draw a kidney in its actual size.

Name Class Date

After Your Visit: Classroom Extensions

Continue your learning from OUR BODY: THE UNIVERSE WITHIN in your classroom with these follow-up activities.

Activity 1: Body Scramble

The table below contains 15 body parts, separated in two pieces. Find the segments that fit together and write them in the spaces below.

~~ne~~	fa	ye	rm	~~ck~~	ce	uth	mo	ad	no
eg	fo	ch	nd	he	l	e	ha	ck	lder
kn	a	shou	e	ba	ee	ot	est	ar	se

1. *neck*	6.	11.
2.	7.	12.
3.	8.	13.
4.	9.	14.
5.	10.	15.

Name Class Date

Activity 2: To Tell the Truth

Take this true/false quiz to see if you can tell the difference between anatomical fact and science fiction. Write a "T" on the line if the statement is true and "F" if it is false.

1. ___The liver is mostly made up of cells called neurons.

2. ___The circulatory system consists of the heart, lungs, veins, and arteries.

3.____ The largest human cell is the male sperm.

4. ___Girls' brains count for 2% of their body weight. Boy's brains account for 2.5%.

5. ___The autonomic nervous system is made up of the sympathetic and parasympathetic systems.

6. ___The brain requires 100% of the body's total blood supply.

7. ___On average, one pack of cigarettes can shorten your life by almost three hours.

8. ___In women's skeletons, the pelvic bone is wider than in men's.

9. ___Babies have 206 bones; adults have 300 bones.

10. ___Along with your kidneys, your skin and lungs are part of the excretory system.

Name Class Date

Activity 3: Up in the Air

This activity challenges your coordination and your anatomy skills. Facing a friend, try to keep a balloon in the air. Start by using your hands to bat it back and forth. Then one at a time, each of you calls out the name of a different part of your body. For example, if someone calls out "elbow", you may only use your elbow to keep the balloon in the air.

Activity 4: A Vacation to Remember

You have been asked to design a TV commercial to advertise a cruise through one of the body's system. Select a system. Describe and illustrate the trendy spots, exciting activities, imports, exports, and even the dangerous parts of the tour. Act out your ad as a skit in front of your class or film it and show the video.

Activity 5: Taste with Your Nose

This experiment demonstrates how your sense of smell affects your taste buds.

Materials: pieces of apple, pieces of onion, blindfold, partner

Instructions:

1. Eat a piece of apple. Chew it thoroughly and swallow.
2. Describe how the apple tastes.
3. Put on the blindfold.
4. Have your partner put the pieces of onion under your nose.
5. Continue to smell the onion while eating another piece of apple.

How did the apple taste the second time?_____

Name Class Date

Activity 6: Strong Heart

Your heart squeezes between 70 and 100 times in one minute to keep the blood moving through your veins and arteries. This exercise demonstrates how strong the muscles of your heart must be to maintain that rate. You will see if the strength in your hand would be enough to accomplish the same task.

Materials: partner, timer or watch with second hand, tennis ball or small rubber ball

Instructions:

1. Hold the ball in one hand.
2. Count how many times you can squeeze and release the ball in 10 seconds while your partner times you.
3. Multiply the number of squeezes from Step 2 by six. This is your hand's "heart rate."
4. Repeat the exercise but keep squeezing and releasing the ball for a whole minute. Can you do it between 70 and 100 times?

What was your hand's "heart rate"?_____

How did your hand feel after Step 4?_____

_____

Answer Key

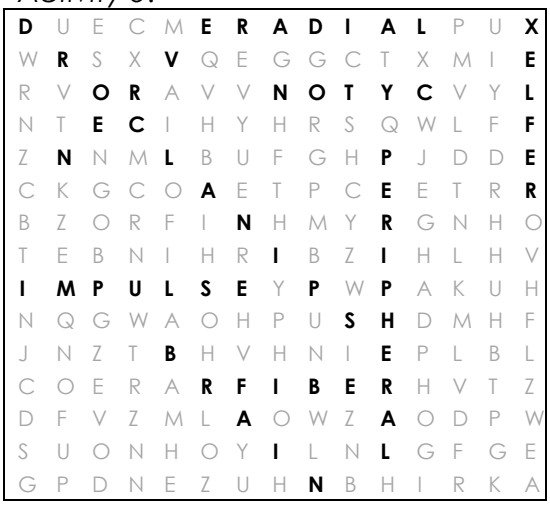
Before Your Field Trip: 1E 2D 3F 4G 5B 6A 7C

During Your Field Trip

Activity 1: 1.tendon 2.bones 3.muscle 4.ligament 5.skeleton

Activity 2: sight/eyes, touch/skin, taste/tongue, hearing/ears, smell/nose

Activity 3:



Activity 6: 1.aorta 2.superior vena cava 3.right pulmonary artery 4. pulmonary veins 5.right atrium 6.tricuspid valve 7.right ventricle 8.inferior vena cava 9.left pulmonary artery 10.pulmonary veins 11.left atrium 12.mitral valve 13.aortic valve 14.left ventricle 15.descending artery

After Your Field Trip

Activity 1: neck foot shoulder back leg head arm knee mouth nose eye hand ear face chest

Activity 2: 1.F (The brain has neurons.) 2.T 3.F (The male sperm is the smallest cell in the body.) 4.F (Girls' brains account for 2.5%; most brains weigh about 3.0 pounds, but females generally weigh less than males). 5.T 6.F (But relative to other parts of the body, it does use a lot—20%.) 7.T 8.T 9.F (Babies have 300 bones when they are born; as we grow, they fuse into 206 bones.) 10.T

Additional Resources

Websites

- Neuroscience for Kids: http://faculty.washington.edu/chudler/neurok.html
- InnerBody: http://www.innerbody.com
- Body Quest: http://library.thinkquest.org/10348
- KidsHealth: http://kidshealth.org
- Your Gross & Cool Body: http://yucky.discovery.com/noflash/body

Books

- *Children's Human Body Encyclopedia: Discovering How Our Amazing Bodies Work.* Steve Parker. Parragon Inc, 2008.
- *Encyclopedia of the Human Body*. Richard Walker. DK Publishing, 2002.
- *Human Body Revealed*. Sue Davidson & Ben Morgan. DK Publishing, 2002.
- *The Pathfinders: Human Body*. Laurie Beckelmen. Readers Digest, 2004.
- *The Way We Work*. David Macauley. Houghton Mifflin Co., 2008.
- *Usborne Complete Book of Human Anatomy*. Anna Claybourne. Usborne Pub Ltd, 2006.

WORDS TO KNOW

Abdomen	*the belly, the part of the trunk between the diaphragm and the pelvis*
Accessory organs	*organs that assist with the functioning of other organs within a system*
Active transport	*movement of substance across cell membranes against concentration gradient, requiring the expenditure of energy (ATP)*
Adipose	*fatty tissue*
Allergen	*any substance that produces an allergic response in a person*
Alveolus	*an individual air capsule in the lung, the basic functional units of respiration; a small cavity or pit, like a socket for a tooth*
Amino acid	*one of a group of twenty different substances that are the building blocks of proteins*
Anatomical pathology	*study of the gross and microscopic appearances of diseased organs, also called morbid anatomy or histopathology*
Anatomy	*structure or study of structure of the body and the relation of its parts to each other*
Anterior	*toward the front, opposite of posterior*

WORDS TO KNOW

Aorta	*major vessel of the arterial system of the body, emerging from the left ventricle of the heart*
Appendicular skeleton	*part of the skeletal system with the bones of the paired appendages, including the pelvic and pectoral girdles*
Appendix	*small, finger-like projection attached to the first part of the large intestine but plays no role in digestion*
Artery	*blood vessel carrying blood away from the heart to deliver oxygen to the rest of the body*
ATP	*adenosine triphosphate; a substance found inside cells that stores and transports energy and releases it where required*
Atrium	*cavity or passage, especially in the heart*
Atrophy	*gradual wasting away of a muscle or organ*
Autonomic nervous system	*sympathetic and parasympathetic parts of the nervous system, controls the organs and skin*
Axial skeleton	*part of the skeletal system forming the central column, which includes the skull, vertebral column, and rib cage*
Bile	*greenish-yellow liquid produced by liver cells and released into the small intestine to aid in the digestion of fat*

WORDS TO KNOW

Birth canal	*channel formed by the cervix, vagina, and vulva, through which the fetus arrives during birth*
Bone	*the hard, rigid form of connective tissue constituting most of the skeleton*
Brain	*enlarged superior portion of the central nervous system located in the skull*
Brain stem	*part of the brain that connects to the spinal cord and controls vital functions like breathing*
Bronchiole	*a minute, thin-walled branch of a bronchus*
Bronchus	*a branch of the trachea that leads to a lung*
Capillary	*very thin blood vessel*
Cardiac	*related to the heart*
Cardiac muscle	*striated muscle tissue in the muscles of the heart*
Cardiovascular system	*heart, arteries, veins and capillaries*
Carotid artery	*artery that carries blood to the brain*
Cartilage	*type of connective tissue, usually translucent, with a solid elastic matrix*

WORDS TO KNOW

Cauda equina — *lower end of the spinal cord where the roots of spinal nerves have a tail-like appearance*

Cecum — *pouch-like part of the large intestine, where the ileum of the small intestine attaches*

Central nervous system — *part of the nervous system consisting of the brain and the spinal cord, to which sensory impulses are transmitted and from which motor impulses pass, and which supervises and coordinates the activity of the entire nervous system; CNS*

Cerebellum — *the part of the brain that keeps the body balanced and coordinated*

Cerebrum — *largest part of the brain; it controls sensations, conscious thoughts, and movement*

Cervix — *narrow neck-like portion of an organ, like the inferior end of the uterus*

Chyme — *liquid of semi-digested food that passed from the stomach into the small intestine*

Circulatory system — *pumps and channels blood to and from the body and lungs; includes heart, blood, and vessels*

Cochlea — *organ of hearing in the inner ear, nerve impulses are generated in response to sound waves*

Colon — *part of the large intestine from the cecum to the rectum*

WORDS TO KNOW

Compact bone — *dense, outer portion of bones, with parallel osteons and their nerves and blood vessels*

Compounds — *substance that can be broken down into two or more of the substances by chemical means*

Connective tissue — *most abundant of the four basic tissue types in the body, performing the functions of binding and supporting; consists of relatively few cells in a great deal of intercellular substances*

Contraction — *shortening and thickening of a functioning muscle or muscle fiber*

Cytology — *study of cells*

Decomposition — *one reactant forming two or more products*

Dendrite — *nerve cell that transmits impulses toward a neuron cell body*

Dermis — *thick layer of mostly connective tissue, that underlies, nourishes, and supports the epidermis*

Diaphragm — *sheet of muscle and connective tissue that separates the thoracic and abdominal cavities and aids in respiration*

Diffusion — *a passive process in which there is a net or greater movement of molecules or ions from a region of high concentration to a region of low concentration until equilibrium is reached*

WORDS TO KNOW

Digestive system	*processes food with salivary glands, esophagus, stomach, liver, gallbladder, pancreas, intestines, rectum, and anus*
Duodenum	*first part of the small intestine that leads from the pylorus of the stomach to the jejunum*
Embryo	*term used to identify a developing baby between the time of its implantation in the uterus and the end of the eight week after fertilization*
Endocrine system	*composed of specialized glands that secrete chemicals known as hormones, made by endocrine glands such as the hypothalamus, pituitary or pituitary gland, pineal body or pineal gland, thyroid, parathyroid, and adrenals or adrenal glands, directly into the blood*
Endometrium	*lining of the uterus*
Energy	*capacity to do work*
Enzyme	*a substance that affects the speed of chemical changes: an organic catalyst, usually a protein*
Epidermis	*outermost layer of the skin*
Epithelial tissue	*covers the body and its parts; lines various parts of the body, forms continuous sheets that contain no blood vessels; classified according to shape and arrangement*

WORDS TO KNOW

Erythrocytes	*red blood cells*
Exocytosis	*a process of discharging cellular products too big to go through the membrane*
Facilitated diffusion	*diffusion in which a substance not soluble by itself in lipids in transported across a selectively permeable membrane by combining with a transporter (carrier)*
Fallopian tube	*either of the two tubes that carry the eggs from the ovaries to the uterus, also called the uterine tube*
Fetus	*term used to identify a developing baby from the ninth week after fertilization until birth*
Gland	*an organ that produces a certain substance or secretion*
Gonad	*reproductive organ*
Gray matter	*neural tissue of the brain and spinal cord that contains cell bodies as well as nerve fibers, has a brownish gray color, and forms most of the cortex and nuclei of the brain, the columns of the spinal cord, and the bodies of ganglia*
Gross anatomy	*also topographical anatomy, regional anatomy, or anthropotomy; the study of anatomical structures that can be seen by unaided vision*

WORDS TO KNOW

Heart — *four-chambered, muscular, pumping organ positioned in the thoracic cavity, slightly to the left of midline*

Hemoglobin — *pigment of red blood cells, accounting for about 33% of the cell volume, that carries oxygen and carbon dioxide*

Histology — *microscopic study of the structure of tissues*

Homeostasis — *condition in which the body's internal environment remains relatively constant, within physiological limits*

Hormone — *chemical substance produced in an endocrine gland and secreted into the blood to affect a specific organ*

Hydrogen bond — *weak attractive force existing between a hydrogen atom and a partial positive charge and an electronegative atom*

Ileum — *last part of the small intestine, between the jejunum and cecum*

Immune system — *body's defense system against disease, protects by identifying and killing pathogens and tumor cells*

Incus — *the middle of three auditory ossicles within the middle-ear chamber; commonly called the anvil*

WORDS TO KNOW

Integumentary system	*skin and its related structures (hair & nails)*
Internal respiration	*exchange of gases between the cells of the body and the blood*
Jejunum	*middle part of the small intestine, between the duodenum and the ileum*
Keratin	*the flexible, water-resistant protein in the outer layers of skin that makes up hair and fingernails*
Larynx	*the voice box, located between the pharynx and trachea, housing the vocal cords*
Ligament	*tough cord or fibrous band of connective tissue that connects bones to each other to strengthen and provide flexibility to a joint*
Liver	*largest internal organ, secretes bile and causes important changes in many of the substances contained in the blood which passes through it; detoxifies the blood and modifies the blood plasma concentration of glucose, triglycerides, ketone bodies, and proteins*
Lymphatic system	*supplements the circulatory system; delivers fluid involved in the transfer of lymph between tissues and the blood stream, the lymph and the nodes and vessels that transport it including*
Marrow	*soft, highly vascular connective tissue inside certain bones that produces red blood cells or stores fats*

WORDS TO KNOW

Meiosis	*a type of cell division restricted to sex-cell production involving two successive nuclear divisions that result in daughter cell with the haploid (n) number of chromosomes*
Melanin	*dark colored pigment found in skin and hair*
Meninges	*the three fibrous membranes covering the central nervous system: the dura mater, arachnoid mater, and pia mater*
Microscopic anatomy	*study of minute anatomical structures requiring microscopes, including histology and cytology*
Mitosis	*orderly division of a cell that ensures each daughter nucleus has the same number and kind of chromosomes as the original nucleus*
MRI	*magnetic resonance imaging; noninvasive diagnostic technique that produces computerized images of internal body tissues*
Muscles	*over 600 contractile organs made of fibers, allowing the body to move and maintain its posture*
Muscular Tissue	*tissue specialized to produce motion in response to action potentials by its qualities of contractility, extensibility, elasticity and excitability*
Nasal cavity	*the first chamber of the respiratory system, mucous-lined space above the oral cavity, separated by the nasal septum*

WORDS TO KNOW

Nervous System — *collects, transfers, and processes information with the brain, spinal cord, peripheral nerves, and nerves*

Neuroglia — *supporting tissue that is intermingled with the essential elements of nervous tissue especially in the brain, spinal cord, and ganglia*

Neuron — *a nerve cell, the structural and functional unit of the nervous system made up of a cell body, dendrites, and an axon*

Organelle — *a permanent structure within a cell with characteristic morphology that is specialized to serve a specific function in cellular activities*

Osmosis — *net movement of water molecules through a selective permeable membrane from an area of high water concentration to an area of lower water concentration until an equilibrium is reached*

Ossicles — *the three bones of the middle ear*

Osteoblast — *immature bone cell*

Ovary — *essential female reproductive organ, or gonad, in which ova and certain sexual hormones are produced*

Palate — *roof of the oral cavity*

WORDS TO KNOW

Pancreas	*organ in the abdominal cavity, behind the stomach and attached to the duodenum, that secretes pancreatic juices into the digestive tract and insulin and glucagon into the blood*
Pathogen	*a disease-producing microorganism or substance*
Pectoral girdle	*part of the skeleton that supports the upper extremities*
Perilymph	*inner ear fluid that conducts the vibrations involved in hearing and the maintenance of equilibrium*
Peripheral nervous system	*nerves and ganglia of the nervous system that lie outside of the brain and spinal cord*
Peristalsis	*contractions of smooth muscle in the walls of various tubular organs by which the contents are forced onward*
Pharynx	*throat, the organ of the digestive and respiratory systems at the back of the oral and nasal cavities extending to the larynx and esophagus*
Physiology	*science that deals with the functions of an organism or its parts*
Placenta	*vascular organ of metabolic exchange between the mother and the fetus, that connects the fetus to the uterus*

WORDS TO KNOW

Plasma — *fluid portion of blood, consisting mostly of water but also containing proteins and other molecules*

Platelets — *thrombocytes, or fragments of specific bone marrow cells that function in blood coagulation*

Plexus — *network of interlaced nerves or vessels*

Polymer — *large molecule formed by combining monomers, or smaller subunits*

Posterior — *toward the back, dorsal*

Postnatal — *after birth*

Prenatal — *before birth, during pregnancy*

Prostate — *a muscular, glandular body surrounding the male urethra above the bladder that secretes an alkaline additive to seminal fluid during ejaculation*

Prosthesis — *artificial device to replace or assist a missing or impaired part of the body*

Puberty — *period of development in which the reproductive organs become functional*

Pulimonary circulation — *part of the circulatory system that moves blood between the heart and lungs, bringing oxygen in taking carbon dioxide away from the body*

WORDS TO KNOW

Pulmonary	*pertaining to the lungs*
Reflex	*quick, involuntary response to a stimulus*
Renal	*Pertaining to the kidneys*
Reproductive system	*responsible for either the formation of new cells for growth, repair or replacement or the production of a new individual*
Respiratory system	*organs used for breathing: nose, pharynx, larynx, trachea, bronchi, diaphragm, and lungs*
Rugae	*folds or wrinkles, usually of the stomach*
Sagittal plane	*vertical; runs parallel to the midsagittal plane and divides the body into unequal right and left sides*
Scrotum	*pouch of skin that contains the testes and their accessory organs*
Sebaceous gland	*gland in the skin that produces sebum to lubricate the hair shaft and inhibit bacterial growth in the surrounding area of the skin*
Sebum	*waxy, oily secretion of the sebaceous glands*
Seminal vesicle	*a pair of glandular pouches on either side of the male reproductive tract, that secrete a sugar- and protein-containing fluid into the ejaculatory duct*

WORDS TO KNOW

Sensory neuron — *a nerve cell that conducts an impulse from a receptor organ to the central nervous system*

Skeletal system — *bones, cartilage, and ligaments that provide the body with a rigid framework for support and protection*

Skeleton — *all the articulated bones of varying sizes and shapes that form the frame of the body, support muscles, and protect vital organs*

Small intestine — *portion of the digestive track between the stomach and large intestine, responsible for absorbing the nutrients form digested food*

Smooth muscle — *muscle that is not under voluntary control, responsible for contractions of the uterus, digestive tract, blood vessels, and passageways of the lungs*

Spleen — *large, blood-filled, glandular organ located in the upper left portion of the abdomen*

Spongy bone — *porous bone found in the ends of long bones, less dense than compact bone*

Stapes — *innermost auditory ossicle; also called the stirrup*

Striated muscle — *skeletal muscle; muscle attached to bone, is under conscious control, and has a striped or "striated" appearance because of its long, fibrous units*

Superficial — *toward or near the surface*

WORDS TO KNOW

Surfactant — *detergent-like substance found in the lungs that decreases surface tension in alveoli*

Synapse — *place at which a nervous impulse passes from one neuron to another*

Synergist muscle — *a muscle that acts in concert with another to enhance its effect*

Synovial joint — *freely movable joint with the bone ends covered by cartilage and separated by a fluid*

Systemic circulation — *part of the circulatory system that moves blood between the heart and the rest of the body*

Tendon — *band of dense connective tissue that attaches muscles to bones*

Testes — *male gonads, or reproductive glands, that produce sperm and testosterone*

Thorax — *chest*

Thyroid cartilage — *the largest cartilage in the larynx that supports and protects the vocal cords; commonly called the Adam's apple*

Trachea — *windpipe; airway leading from the larynx to the bronchi*

WORDS TO KNOW

Transcription	*synthesis of RNA using one strand of DNA as the template*
Translation	*synthesis of a protein*
Turbinate	*one of the three thin, bony plates on the lateral wall of the nasal cavity on each side, with or without a mucous membrane covering; also called a concha*
Urethra	*canal that carries off the urine from the bladder*
Urinary system	*kidneys, ureters, bladder and urethra involved in fluid balance, electrolyte balance, and excretion of urine*
Uterus	*the organ in females that carries and nourishes the young prior to birth; also called the womb*
Vas deferens	*tube that carries sperm from the epididymis to the ejaculatory duct; also seminal duct*
Vein	*blood vessel carrying dark colored, de-oxygenated blood to the heart, with thinner walls than arteries and with valves at intervals to prevent blood from flowing backwards*
Vena cava	*one of two large vessels that return deoxygenated blood to the heart*

WORDS TO KNOW

Ventricle — *cavity within an organ; especially those in the brain and heart*

Vestibular window — *oval opening in the bony wall between the middle and inner ear, into which the stapes fits; also called the oval window*

White blood cell — *central cell of the immune system; includes T cells, B cells, neutrophils, eosinophils, and macrophages*

White matter — *neural tissue that consists largely of myelinated nerve fibers, has a whitish color, and lies under the gray matter of the brain and spinal cord or is gathered into bundles*