LIFEPAC®

SCIENCE

STUDENT BOOK

7th Grade | Unit 9

Alpha Omega
PUBLICATIONS

SCIENCE 709

The Human Anatomy: Part 2

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The Human Anatomy: Part 2

Introduction

God used the apostle Paul to write these words to believers in Rome and to us (Romans 12:1): "I beseech you therefore, brethren, by the mercies of God, that ye present your bodies a living sacrifice, holy, acceptable unto God, which is your reasonable service." Paul wrote also (Romans 12:5): "So we, being many, are one body in Christ, and every one members one of another."

In Science LIFEPAC® 708 you learned that your body is made of cells, billions of cells. You studied your skeletal system, or framework of your body, and your nervous system, or computer-messenger service for your body. In this LIFEPAC you will study two very important systems, your respiratory system and your circulatory system. You will learn how air gets into the lungs and how oxygen is absorbed into the blood. Your heart pumps the oxygen in your blood to all parts of your body. Your physical body needs food and creates waste. Your digestive system and your excretory system are responsible for "feeding" your body and eliminating waste. The other important system is the endocrine system. The major glands of the endocrine system are the pituitary, the thyroid, and the adrenal glands. They help your body processes work, and they help control your growth.

God has given a well-functioning set of systems to support life. You may find your place in heaven because Christ gave His own blood and His human body as a sacrifice for your sins. Trust Christ to guide your life.

Objectives

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAC. When you have finished this LIFEPAC, you should be able to:

1. List three functions of your nose.
2. Explain how the heart and lungs work together.
3. Identify the throat structure not used in breathing.
4. Name the three types of cells in the blood.
5. Diagram the flow of blood in the heart.
6. Explain the difference among arteries, veins, and capillaries.
7. Explain the functions of plasma, red blood cells, white blood cells, and platelets.
8. Explain the function of the circulatory system.
9. Tell why food goes down the esophagus and not down the trachea.
10. List four functions of the digestive system.
11. Label a diagram of a tooth.
12. Explain how the kidneys prevent your body from losing too much water, sugar, or salt.
13. State the main function of the bladder.
14. List the parts of the kidney.
15. Explain the function of the pituitary gland.
16. Explain the function of the thyroid gland.
17. Explain the function of the adrenal glands.

Survey the LIFEPAC. Ask yourself some questions about this study and write your questions here.

1. THE RESPIRATORY SYSTEM

The Bible states in Genesis 2:7, "And the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul." Every minute of your life on earth you breathe air in and breathe it out again.

Breathing in is called **inspiration**. Breathing out is called **expiration**. The organs of your body that are responsible for your breathing make up your respiratory system. The respiratory system is made up of your nose, throat structures, and lungs.

SECTION OBJECTIVES

Review these objectives. When you have completed this section, you should be able to:

1. List three functions of your nose.
2. Explain how the heart and lungs work together.
3. Identify the throat structure not used in breathing.

VOCABULARY

Study these words to enhance your learning success in this section.

alveoli (al vē´ u lī). Air sacs in lungs.

expiration (ek spu ra shun). Breathing out.

inspiration (in spu rā´ shun). Breathing in.

pharynx (far´ ingks). Back of the mouth.

pleura (plür´ u). Thin tissue covering lungs and thorax.

thorax (thôr´ aks). Chest area.

Note: *All vocabulary words in this LIFEPAC appear in* **boldface** *print the first time they are used. If you are not sure of the meaning when you are reading, study the definitions given.*

Pronunciation Key: h**a**t, **ā**ge, c**ă**re, f**ä**r; l**e**t, **ē**qual, t**ė**rm; **i**t, **ī**ce; h**o**t, **ō**pen, **ô**rder; **oi**l; **ou**t; c**u**p, p**u̇**t, r**ü**le; **ch**ild; lo**ng**; **th**in; /*ŦH*/ for **th**en; /*zh*/ for mea**s**ure; /*u*/ represents /*a*/ in **a**bout, /*e*/ in tak**e**n, /*i*/ in penc**i**l, /*o*/ in lem**o**n, and /*u*/ in circ**u**s.

THE NOSE

You learned in Science LIFEPAC 708 that your nose is your sense organ for smell. The nose has a far more important function than that. It is the main entrance for air into the windpipe and lungs. The nose also cleans the air, warms it, and adds moisture to it. Your nose consists of two main nasal cavities and several smaller cavities called *sinuses.*

The nasal cavity. When you look into a mirror you can see the two holes at the bottom of your nose. Your nose is divided into two parts by a piece of cartilage called the *septum.* Just inside the entrance of the nose are several coarse hairs. These hairs trap large bits of dirt that are in the air you breathe. The mucous membrane farther inside the nose also traps dirt. The cells of the mucous membrane secrete

a thick substance called *mucus.* When you have a cold, the mucous membrane swells and blocks the passage of air. This mucous membrane covers the middle and back part of the nasal cavity and passages to the lungs.

Cells farther inside your nose have little hair-like projections called *cilia.* Cilia also clean dirt out of the air. The passages to the lungs all have cilia. One cell may have as many as 270 cilia. Cilia move forward and backward. Dirt is caught in the mucus of the nose. The cilia work together like a broom to sweep the dirt away. The cilia are able to keep most dirt from reaching the lungs.

As air passes through your nasal cavities, it is warmed. By the time air reaches the back of your nose, it is about 86° F. The air is warmed to your body temperature of 98.6° by the time it reaches your lungs. Moisture is also added to the air in your nasal cavities.

Complete these activities.

1.1 Write the difference between *inspiration* and *expiration.*

_____

_____

1.2 List three functions of your nose.

a. _____

b. _____

c. _____

1.3 Explain what happens to the mucous membrane when you have a cold. _____

_____

_____

The sinuses. The sinuses are hollow spaces in the bones above and beside your nasal cavity. Your body has eight sinuses. Each half of your nasal cavity is linked to four of your sinuses. The sinus cavities are filled with air to make your skull lighter. They help you to hold your head up and to balance it on your neck. Your sinuses do not help you to breathe, but they are connected to your nasal cavity. Sinuses are best-known for the trouble they cause. A sinus infection is apt to follow a bad cold or a case of the flu. Mucus collects in the sinus space and cannot drain into the nose because of swelling.

Write true or false.

1.4 _____ You have six sinuses.

1.5 _____ Cilia clean dirt from the air you breathe.

1.6 _____ Air is warmed before it enters the lungs.

1.7 _____ The septum is a bone.

1.8 _____ Your nose is your sense organ for smell.

Match these items.

1.9 _____ smaller cavity near nose

1.10 _____ divides nose into two parts

1.11 _____ hairs that clean dirt out of air you breathe

1.12 _____ thick substance

a. septum

b. mucus

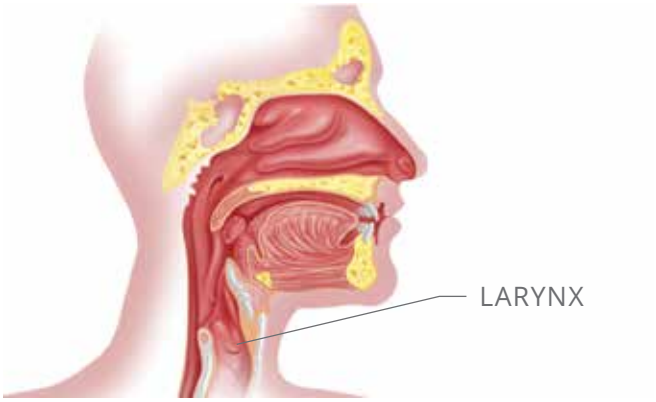
c. mucous membrane

d. sinus

e. cilia

THROAT STRUCTURES

The opening to the lungs is the *trachea,* or windpipe. Air can go in and out of the *trachea* through the nose or the mouth. When you breathe through your mouth, your body has a special way of being sure that air passes into the lungs and food passes into the stomach. The trachea divides into two tubes before entering the lungs. Each tube is called a *bronchus.* The voice box, or *larynx,* which uses air to allow you to talk, is also in your throat.



The larynx. Air from the nose passes through the larynx before it reaches the trachea. The larynx is commonly called the *voice box.* It is just below the chin and above the breast bone. The larynx is not directly concerned with breathing, but it does use the air that passes through it. The larynx is hollow. It is made of cartilage and has folds of mucous membrane across its opening. These folds are the vocal cords. Air moving across the vocal cords produces sounds. You are able to control the movement of air when you speak.

Complete these sentences.

1.13 The larynx is commonly called the _____ .

1.14 Even though the larynx is not directly related to breathing, it uses _____ .

1.15 The mucous membrane folds in your larynx are the _____ .

1.16 The larynx is made of _____ .

The pharynx and trachea. The back of the throat is called the **pharynx**. The top of the pharynx connects to the passages leading to the nose. The bottom of the pharynx connects to the trachea. The pharynx also connects to the *esophagus,* the tube leading to the stomach. When you swallow, the nose passages are closed so food and liquid cannot enter the trachea. The trachea begins at the bottom of the larynx. It is just behind the breast bone. The trachea is a tube with stiff rings of cartilage. The cartilage does not go completely around the trachea. The gaps that are left allow the trachea to expand when air passes through it. Your trachea is only about four inches long and one inch across. Since it is elastic, it can become wider and longer to let air through. The trachea also has some cilia to clean the air passing through.

Write true or false.

1.17 _____ The trachea connects to the esophagus.

1.18 _____ The trachea has cilia to clean the air.

1.19 _____ The trachea connects to the pharynx.

1.20 _____ The pharynx is the back of the throat.

The bronchi. In the chest the trachea divides into two tubes. One branch goes to the right lung and one to the left lung. Each branch is called a *bronchus.* Together they are called the *bronchi.* Each bronchus divides into smaller, narrower branches. These narrow branches enter the lungs. The bronchi also have rings of cartilage partly around them. The bronchi are elastic and can expand when air is taken in.

Inside the lungs the bronchi divide again. These tubes get so narrow that they are less than 1⁄25th of an inch across. All tubes of the bronchi are lined with mucous membrane and have cilia to catch any dust that travels this far into the lungs.

Match these items.

1.21	_____	branches of the trachea	a. larynx
1.22	_____	cavities near the nose	b. sinuses
1.23	_____	secretes thick substance	c. pharynx
1.24	_____	air passage attached to the back of the throat	d. mucous membrane e. trachea
1.25	_____	voice box	f. nasal cavity
1.26	_____	back of the throat	g. bronchi

Complete these sentences.

1.27 Bronchi tubes are lined with _____ .

1.28 Narrow branches of the bronchi enter the _____ .

1.29 Bronchi can become wider because they are _____ .

1.30 Air in the bronchi is cleaned by the _____ .

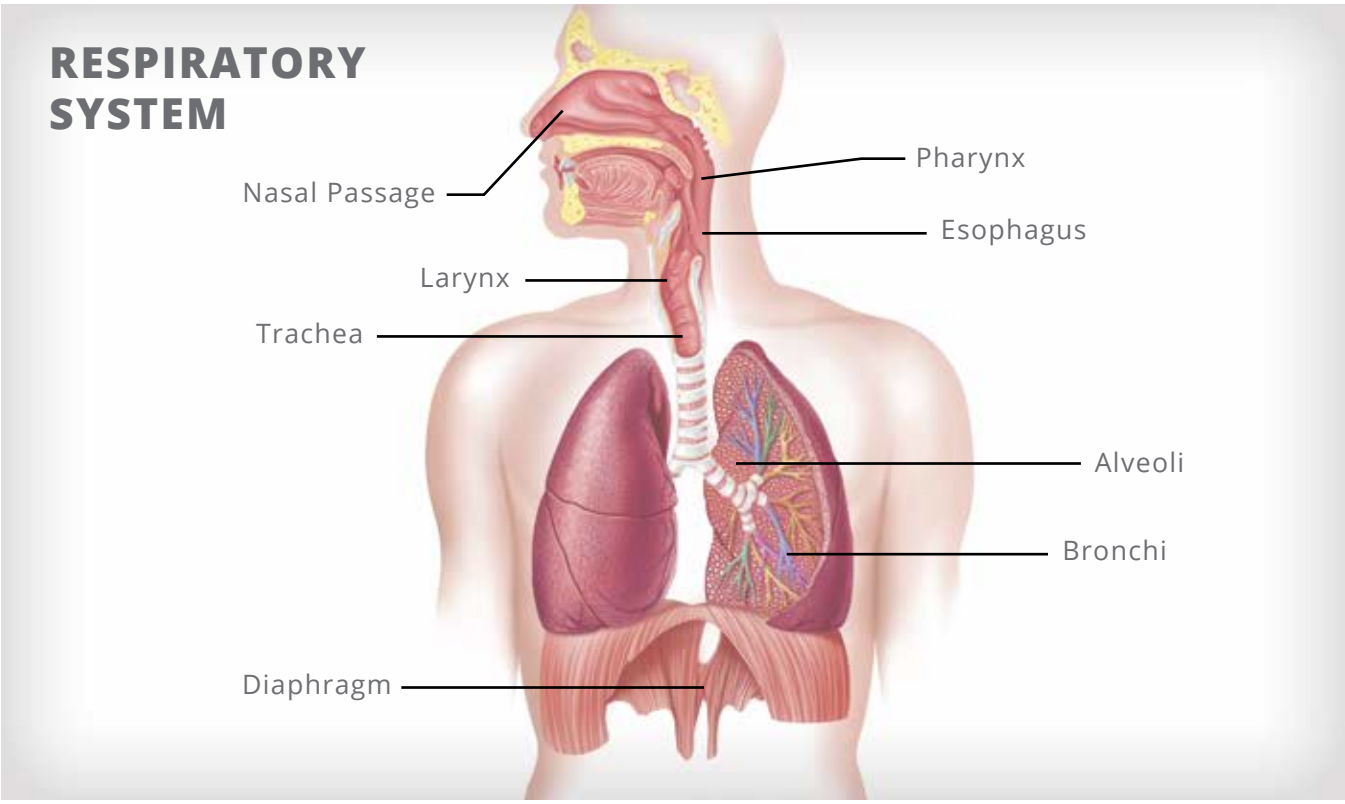
THE LUNGS

Your lungs are the main organs of your respiratory system. Your lungs take in enough air every day to fill a room ten feet long and ten feet high. The real work of your respiratory system takes place in your lungs. The air you breathe is put to use in your lungs.

Structure. Your lungs and heart fill up your **thorax**, or chest area. Your thorax is enclosed by your breast bone, rib cage, and diaphragm. Your *diaphragm* is a thick muscle at the lower part of your chest area. Your lungs are also protected by your spine. The thorax is airtight. Air can get into the lungs only through the trachea.

You have two lungs. Your lungs overlap your heart. Your right lung is divided into three parts, and your left lung is divided into two parts. Each part of the lungs is called a *lobe.* Your lungs work closely with your heart. The pulmonary artery carries blood from the heart to the lungs. The pulmonary vein carries blood from the lungs to the heart. Your lungs are made up of millions of little air sacs called **alveoli**. Your lungs look very much like a sponge, which also has many air spaces. The lungs are elastic so that they can expand. A very thin tissue, the **pleura**, covers the outside of your lungs. Pleura also covers the inside of the thorax. A thin layer of liquid keeps the two layers of pleura from touching. This liquid also holds the two layers together.

| The Thorax



| The Respiratory System

View 709 The Pleura, from the Grade 7 SCIENCE EXPERIMENTS Video

Try this investigation to see how the two layers of pleura are held together.

These supplies are needed:

- 2 slides
- water

Follow these directions and answer the questions. Put a check in the box when each step is completed.

- ☐ 1. Put a drop of water on one slide and place the second slide on top of the water.
- ☐ 2. Move one slide back and forth across the other slide.
- ☐ 3. Try to separate the two slides.

1.31 What is the easiest way to separate the two slides? _____

_____

1.32 How are the two layers of pleura like the two slides and water?

_____

_____

Pleura Experiment

Complete these sentences.

1.33 Each part of your lungs is called a _____ .

1.34 The thin tissue that covers the outside of the lungs and the inside of the thorax is called _____ .

1.35 The little air sacs that make up the lungs are called _____ .

1.36 Your lungs work closely with your _____ .

1.37 Your chest area is called the _____ .

Write true or false.

1.38 _____ The diaphragm is a thin muscle in the middle of your chest.

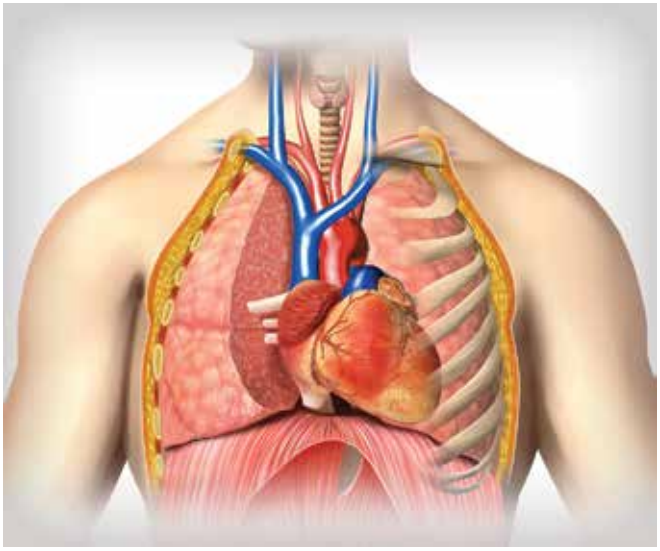
1.39 _____ Your lungs are protected by your spine.

1.40 _____ You have two lungs.

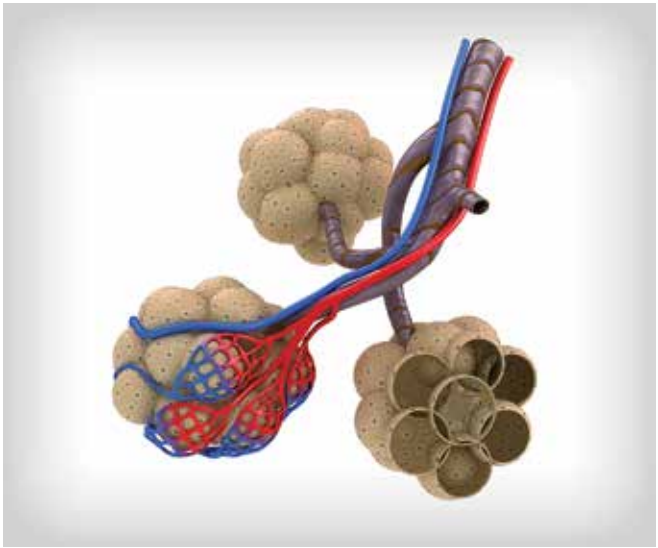
1.41 _____ Each lung has three lobes.

Function. Some force is needed to get air both into and out of your lungs. Your lungs are never completely flat. Some air is always inside your lungs. When you breathe, air is drawn in and out by muscles. Muscles attached to your ribs contract and pull the ribs outward. Muscles in your neck and shoulders contract. This contraction expands the upper part of the thorax. The diaphragm contracts and moves downward. This movement of the diaphragm expands the chest downward and forward. The pleura of the thorax pulls on the pleura of the lungs. The lungs expand. Now the lungs have more room, and air is pulled in. Air pressure outside your body helps push air into the lungs. When all the muscles around the lungs relax, the space in the thorax becomes smaller. The air no longer has enough space and is forced out of the lungs. You can see your chest become larger and smaller when you breathe in and out. An adult takes in about a pint of air into the lungs with each breath. You take about fourteen breaths a minute.

Breathing is necessary to supply oxygen to all the cells of your body. All your cells need oxygen to stay alive. Breathing also removes carbon dioxide, which is a waste product. Every cell in your body is like a manufacturing plant. It uses oxygen to produce useful things. It also produces carbon dioxide and needs to get rid of this waste product. Your circulatory system and your respiratory system work together very closely. Oxygen is carried to your cells by your arteries. Carbon dioxide is carried away from your cells by your veins. Your blood gets the oxygen from the air in your lungs. Your blood



| The lungs and the heart work together.



| An Alveolus

gets rid of carbon dioxide by giving it up to the air in the lungs.

The alveoli, or air sacs of the lung, are connected to the air passages. The walls of the alveoli are quite thin. These thin walls are in close contact with the capillaries in the lungs. *Capillaries* are the smallest blood vessels in your body. The capillaries in your lungs are so tiny that they are just wide enough for one red blood cell to pass through at a time.

Each red blood cell takes in oxygen and gives up carbon dioxide in the lungs. Both actions happen at the same time. Both actions take less than a second. After the blood passes through the lungs it goes back to the heart in the *pulmonary vein.* The oxygen is then pumped around the body to supply all your cells with oxygen.

Even when you rest, about five quarts of blood flow through your lung capillaries every minute. Up to seventeen quarts per minute may go through your lungs when you exercise and your heart beats faster.

Breathing is controlled by your brain. If your blood contains too much carbon dioxide, the brain receives the message. The brain then sends messages to the muscles that control breathing. The messages tell the respiratory muscles to speed up, making you breathe faster. This faster breathing supplies your body with more oxygen and rids your body of the extra carbon dioxide. Sometimes the message from the brain is so strong that your respiratory muscles work even if you do not want them to. If you try to hold your breath for too long, your muscles force air from your lungs to get rid of carbon dioxide.

Just as you need physical breathing for your physical life, spiritual breathing helps you experience God's love and forgiveness. Spiritual breathing is an exercise in faith. When you exhale **(expiration)**, confess your sins and thank God for His forgiveness. When you inhale **(inspiration)**, surrender the control of your life to Christ. Trust that God directs your life and that He loves you.

Match these items.

1.42 _____ needed to get air in and out of the lungs

1.43 _____ waste product

1.44 _____ expands chest downward and forward

1.45 _____ necessary for life

1.46 _____ carry blood to and from lungs

1.47 _____ air sacs

a. pulmonary artery and vein

b. diaphragm

c. lobe

d. carbon dioxide

e. alveoli

f. force

g. oxygen

Write true or false.

1.48 _____ Breathing is controlled by the brain.

1.49 _____ You can hold your breath for too long and you could die.

1.50 _____ Walls of the alveoli are quite thin.

1.51 _____ Red blood cells in the lungs take in oxygen and give up carbon dioxide.

1.52 _____ An adult takes in about one quart of air with each breath.

Review the material in this section in preparation for the Self Test. The Self Test will check your mastery of this particular section. The items missed on this Self Test will indicate specific areas where restudy is needed for mastery.

SELF TEST 1

Match these items (each answer, 2 points).

1.01	_____	thick, sticky substance	a. bronchus
1.02	_____	chest area	b. septum
1.03	_____	air sacs	c. vocal cords
1.04	_____	cartilage dividing nose in two parts	d. alveoli e. sinus
1.05	_____	mucous folds in voice box	f. diaphragm
1.06	_____	windpipe	g. trachea
1.07	_____	branch of the windpipe	h. thorax
1.08	_____	smaller cavity above or near nasal cavity	i. mucus

Write the letter of the correct choice (each answer, 2 points).

1.09 Hairs that clean dirt out of the air in your nasal passages are called _____ .
a. sinus b. trachea c. cilia d. mucus

1.010 A throat structure not used for breathing is the _____ .
a. trachea b. larynx c. pharynx d. bronchus

1.011 Many parts of the respiratory system can expand because they are _____ .
a. small b. cartilage c. mucus d. elastic

1.012 The thick muscle in the lower part of your chest is your _____ .
a. diaphragm b. thorax c. larynx d. lungs

1.013 The thin tissue on the outside of the lungs is _____ .
a. bronchi b. pleura c. alveoli d. esophagus

1.014 Each part of your lungs is called a(an) _____ .
a. alveoli b. bronchi c. lobe d. capillary

1.015 Your cells need _____ to live.
a. carbon dioxide b. carbon c. air d. oxygen

Complete these activities (each answer, 5 points).

1.016 Explain the difference between expiration and inspiration.

_____

_____

1.017 List two functions of your nose.

a. _____

b. _____

1.018 Explain how the heart and the lungs work together.

_____

_____

_____

_____

40/50 **SCORE** _____ **TEACHER** _____ _____
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