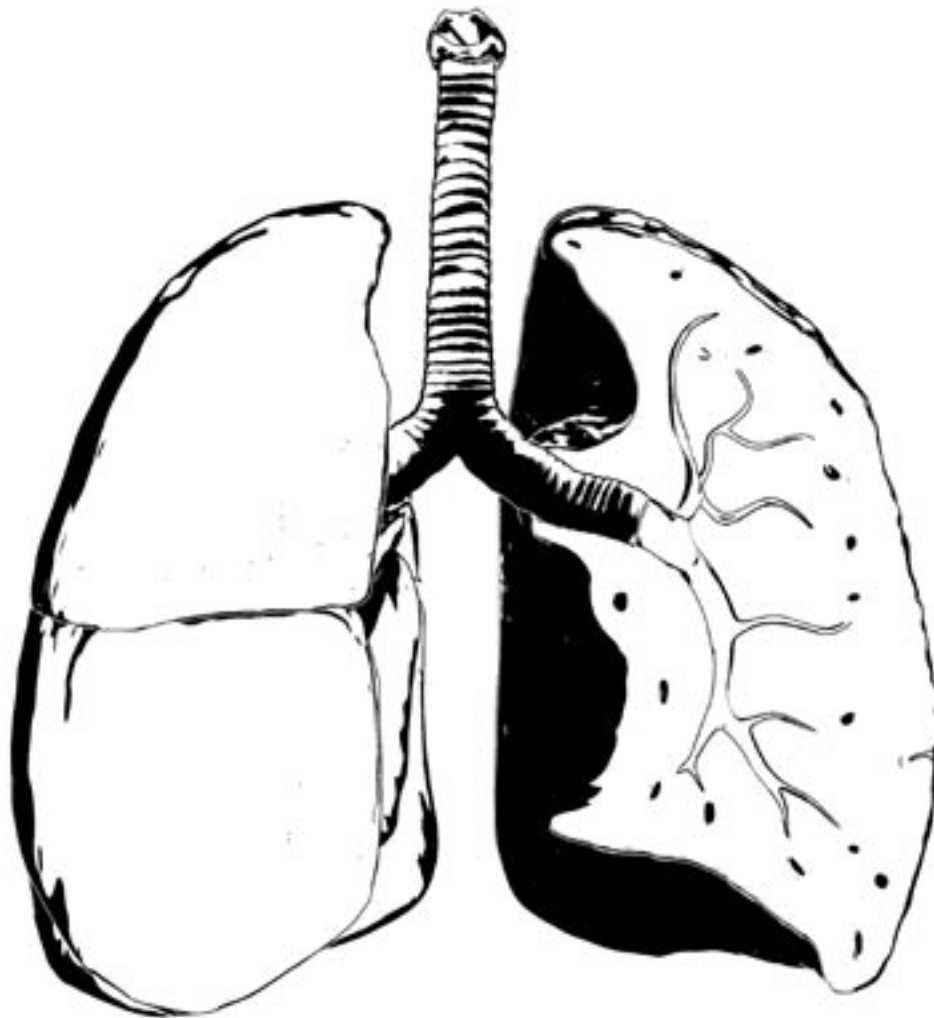


# Respiration

Instructor's  
Manual



**Editors:**

Brian A. Jerome Ph.D.  
Stephanie Zak Jerome

**Graphics:**

Fred Thodal  
Dean Ladago

**Reviewers:**

Stephen Trombulak Ph.D.  
Professor of Biology  
Middlebury College

**Assistant Editors:**

Louise Marrier  
Lyndsey Canfield  
Heidi Berry

**BIOLOGY**

**Visual Learning Company**

1-800-453-8481 [www.visuallearningco.com](http://www.visuallearningco.com)

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# Student Learning Objectives

**Upon viewing the video and completing the enclosed activities, students will be able to do the following:**

- Explain that breathing involves the exchange of gases between the body and the external environment.
- Understand that in the complex process of aerobic cellular respiration, oxygen gas and other materials are used to produce energy. Carbon dioxide is a by-product that is produced as a waste gas.
- Describe the process of air entering the body through the nose or mouth, flowing through the pharynx, into the larynx, to the trachea, through the bronchi, and into the lungs.
- Given a diagram of the respiratory system, identify the following structures: nasal cavity, pharynx, epiglottis, larynx, trachea, bronchi, and lungs.
- Explain that alveoli are tiny sacs consisting of thin membranes lined with a dense network of capillaries across which gas exchange occurs with blood cells.
- Understand that breathing is initiated by a pressure difference that causes air to rush into the lungs.
- Describe the role of the intercostal muscles and diaphragm in the process of breathing.
- Understand that breathing is largely an involuntary process controlled in the part of the brain generally referred to as the respiratory center. Also understand that feedback is continually given to the brain to adjust the rate of breathing.
- Explain the possible causes and symptoms of the following respiratory problems: common cold, pneumonia, bronchitis, asthma, lung cancer, and emphysema.
- List several things that people can do to care for their respiratory system such as not smoking, eating a well-balanced diet, exercising regularly, and having an annual physical medical examination.

# Assessment

**Preliminary Assessment (p. 14-15):**

The Preliminary Assessment is an assessment tool designed to gain an understanding of students' preexisting knowledge. It can also be used as a benchmark upon which to assess student progress based on the objectives stated on the previous pages.

**Post Assessment (p. 16-17):**

The Post Assessment can be utilized as an assessment tool following student completion of the program and student activities. The results of the Post Assessment can be compared against the results of the Preliminary Assessment to assess student progress.

**Video Review (p. 18):**

The Video Review can be used as an assessment tool or as a student activity. There are two sections. The first part contains questions displayed during the program. The second part consists of a ten-question video assessment to be answered at the end of the video.

# Introducing the Program

Before watching the video instruct students to take a deep breath then hold their breath for 15 seconds. At the end of 15 seconds ask them how they felt. Next, ask them why they had to gasp for air. Discuss why the body needs air. Ask students the following question: What body processes depend on breathing? Write their suggestions on the board.

Next, ask students to describe where air enters the body. Then ask them where air goes once it enters the body. List some of the internal structures involved in breathing. Discuss the role each of the structures plays in the process of respiration.

Tell students to pay close attention to the video to learn about the role and function of the different respiratory organs. Instruct students to pay attention to the program to learn why air moves into and out of the lungs. Also tell students that the video describes some problems that may occur with the respiratory system, and it offers suggestions that students may follow to help maintain a healthy respiratory system.

## Program Viewing Suggestions

The student master “Video Review” (p. 19) is provided for distribution to students. You may choose to have your students complete this master while viewing the program or do so upon its conclusion.

The program is approximately 20 minutes in length and includes a ten-question video assessment. Answers are not provided to the Video Assessment in the video, but are included in this manual on page 13. You may choose to grade student assessments as an assessment tool or to review the answers in class.

The video is content-rich with numerous vocabulary words. For this reason you may want to periodically stop the video to review and discuss new terminology and concepts.

# Video Script: Respiration

1. At this very moment you are either breathing air in or breathing air out.
2. When we breathe air in and out, our body is exchanging gases with the environment in a process called respiration.
3. Why do our bodies need to carry out this process?
4. What gases are needed and produced in respiration?
5. What structures are involved in the process of respiration?
6. How can we take care of these structures?
7. And, what are some of the problems that occur with these structures?
8. During the next few minutes we are going to explore these questions and others...
9. ...as we investigate respiration.
- 10. Graphic Transition – Gas Exchange**
11. Chances are, as hard as you try; you can't hold your breath for much longer than 40 to 60 seconds.
12. This is because you need to breathe. Breathing involves the exchange of gases between the body and the external environment.
13. All animals need to breathe. You can see the chilled breath of these elk as they exhale on a crisp, autumn morning.
14. Even fish have the ability to breathe in water through special structures called gills.
15. Why do animals, including humans, need to breathe?
16. It has to do with the process of cellular respiration that many different types of organisms carry out.
17. In the complex process of cellular respiration, oxygen gas and other materials are used to produce energy. Carbon dioxide is a by-product and is expelled into the environment as a waste gas.
18. This rather complex process is also referred to as aerobic cellular respiration.
19. In order for this process to occur, gases must be exchanged or transferred between the organism and the environment.
20. The gas exchange process takes place in the respiratory systems of animals. Let's take a closer look at the human respiratory system.
- 21. Graphic Transition – The Respiratory System**
22. Take a deep breath.
- 23. You Observe!** Where did you feel air enter your body?
24. Air enters the body through the nose or mouth.
25. The air you breathe is cleaned, filtered, warmed, and moistened as it leads to your lungs.
26. The nasal cavity and upper part of the respiratory system is lined with mucus membranes and small hairs that help accomplish these tasks.
27. From the nasal cavity or mouth, air enters the pharynx, or throat.
28. After leaving the pharynx, air passes into the larynx, also called the voice box.
29. The voice box, consisting mostly of cartilage, also contains vocal cords that consist of thin membranes stretched across the larynx.

# Video Script: Respiration

30. Exhaled air vibrates the vocal cords. We use these vibrations to speak and sing.
31. To prevent choking while the swallowing food and water, the larynx is blocked by a flap called the epiglottis.
32. Choking is the result of food or other material mistakenly getting past the epiglottis into the larynx and blocking air from entering the passage.
33. The larynx leads directly into the windpipe, also called the trachea.
34. The trachea is about 12 centimeters long and only about 2.5 centimeters wide.
35. The trachea divides into two branches called the bronchi.
36. Each bronchi leads to a lung.
37. The lungs are the sites of gas exchange in the human body; it's a very important job. Let's take a closer look at the lungs.
- 38. Graphic Transition – Lungs and Gas Exchange**
39. Under the ribs in your chest are two very important structures called lungs.
40. Lungs are the sites of gas exchange.
41. In the lungs, bronchi branch out into smaller and smaller tubes called bronchioles.
42. Small bronchioles end in tiny air sacs call alveoli, arranged kind of like grapes on a stem.
43. Alveoli consist of thin membranes lined with a dense network of capillaries across which gas exchange occurs with blood cells.
44. Here, oxygen is picked up and carbon dioxide is given off by the blood.
45. There are over 300 million alveoli in the lungs.
46. Their total surface area would cover a good part of this soccer field!
47. Smoking makes it difficult for oxygen to be exchanged through alveoli.
48. It is estimated that at least one-third of the smoke inhaled from smoking coats alveoli with particles.
49. Too many particles from smoking or other forms of pollution damage the walls of the alveoli causing inelastic scar tissue to form.
- 50. Graphic Transition – The Breathing Process**
51. Playing a musical instrument takes a lot of air.
52. So does playing a sport.
53. Maybe you've noticed that when breathing hard your chest rises and falls quickly. You feel the air rushing in and out of your nose and mouth.
54. Breathing is the process of moving air into and out of the lungs.
55. There are two main phases of breathing – inhalation and exhalation.
56. Inhalation is the process of air going into the lungs.
- 57. You Observe!** What happens to your chest when you inhale?
58. Your chest and/or your stomach move out.
59. In fact, try to breathe in without moving your chest or stomach. It's impossible to inhale without them moving. Why?
60. This is because the work of breathing is actually done by the diaphragm, and the intercostal muscles – those are the muscles located between the ribs.

# Video Script: Respiration

61. The diaphragm is a sheet of muscle below the lungs separating the chest cavity from the abdomen.
62. When the diaphragm and intercostal muscles contract, the size of the chest cavity increases.
63. The enlarged chest cavity creates a situation in which the air pressure is lower in the chest than outside the body.
64. Air then rushes from an area of higher pressure outside the body to an area of lower pressure inside the lungs.
65. So as you can see, when you breathe you aren't really sucking air in, but instead a pressure difference causes air to rush into the lungs.
- 66. Graphic Transition – Control of Breathing**
67. It's possible to consciously control your breathing.
68. But, for the most part, breathing is an involuntary process.
69. Breathing continues even though you don't consciously control it. This occurs even while you sleep.
70. Breathing is controlled in a part of the brain generally referred to as the respiratory center.
71. Feedback is continually given to this part of the brain to adjust the rate of breathing.
72. Receptors in the aorta and other arteries sense pH levels and gas levels, such as carbon dioxide, in the bloodstream.
73. As carbon dioxide levels increase, the brain sends a message to the diaphragm and intercostal muscles to increase the rate and depth of breathing.
74. This lowers the amount of carbon dioxide and raises the amount of oxygen in the blood.
75. Your resting respiration rate varies between 12 to 25 breaths per minute.
76. But it is easily and quickly altered by changes in activity,...
77. ...as well as fear, or stress.
- 78. Graphic Transition – Respiratory Problems**
79. Every day your respiratory system is exposed to harmful substances and organisms in the air.
80. Most of the time these things do not create respiratory problems. But, occasionally they do, as is the case with the common cold.
81. Chances are at some point you have had a cold.
82. Colds are most often caused by viruses that often attack the respiratory system.
83. Symptoms often include swollen respiratory tissues that make breathing difficult, as well as irritated eyes and nasal passages.
84. Medications can relieve cold symptoms, but they rarely destroy viruses that cause colds.
85. Pneumonia, another respiratory ailment, is more severe than a cold.
86. Pneumonia can be caused by viruses, fungi, or bacteria.
87. The body responds to these agents by accumulating fluid and debris in the alveoli.
88. This inhibits the ability of the lungs to exchange oxygen.
89. Another relatively common respiratory problem is bronchitis.
- 90. You Decide!** What part of the respiratory system is affected by bronchitis?

# Video Script: Respiration

91. Bronchitis involves an inflammation of the membranes of the bronchial tubes.
92. Bronchitis may develop from bacteria or viruses that cause colds or influenza.
93. You may know someone who has a respiratory affliction called asthma.
94. “Asthma” is an allergic and an inflammatory response in which airways constrict, making it difficult to breathe.
95. Pollen, dust, smoke, strenuous exercise, and even cold air can trigger an asthma attack.
96. Lung cancer, a very serious ailment of the respiratory system, is a disease in which tumors form in the lungs. Cancerous tumors form as the result of irregular and uncontrolled cell growth.
97. Smoking is the number one cause of lung cancer. Lung cancer is a leading cause of death, particularly in smokers. Smoking is also a major cause of another respiratory problem called emphysema.
98. “Emphysema” is a severe lung disease caused by smoking, dirty air, or long-term exposure to smoke. These harmful substances destroy tissues in the lungs making it very difficult for air to pass in and out of the lungs.
- 99. Graphic Transition – Taking Care of Your Respiratory System**
100. Maintaining a healthy respiratory systems is important to leading an active, exciting, healthy, and long life.
101. There are several things you can do to help maintain this system.
102. First, if you smoke, quit now. As soon as people stop smoking the risk of various types of cancer, as well as heart disease, and high blood pressure drops dramatically.
103. Eat a healthy, well-balanced diet with lots of fruits and vegetables.
104. It is also important to exercise regularly.
105. You should never expose your lungs to harmful substances such as toxic chemicals, dirty air, or tobacco smoke.
106. To help prevent respiratory infections and other illnesses it is important to wash your hands throughout the day, and to maintain good overall hygiene.
107. Finally, it is very important to have a physical examination from a doctor at least once a year.
108. While doing all these things does not guarantee you will have a healthy respiratory system, it greatly increases your odds.
- 109. Graphic Transition – Video Review**
110. During the past few minutes we have explored some of the fascinating characteristics and processes of respiration.
111. We began by discussing the process of cellular respiration,...
112. ...and the organs and structures involved in human respiration.
113. More specifically, the nature of gas exchange within the lungs was investigated.
114. The mechanics of inhalation and exhalation were described.
115. The means by which breathing is controlled by the body were addressed.

# Video Script: Respiration

116. We then explored some respiratory problems including the common cold, pneumonia, bronchitis, asthma, and lung cancer.
117. Last, we discussed some of the things you can do to maintain a healthy respiratory system enabling you to live a long and active life.

## 118. Graphic Transition – Video Assessment

Fill in the blank to complete the sentence.

1. In aerobic cellular \_\_\_\_\_, oxygen gas and other materials are used to produce energy.
2. Speaking and singing originate in the \_\_\_\_.
3. The \_\_\_\_ are sites of gas exchange in the human body.
4. These small, grape-like structures in the lungs are called \_\_\_\_\_.
5. \_\_\_\_\_ is the process of drawing air into the lungs.
6. Air enters and exits the lungs due to differences in \_\_\_\_\_.
7. For the most part, breathing is an \_\_\_\_\_ process.
8. \_\_\_\_\_ is an ailment in which fluid accumulates in alveoli.
9. \_\_\_\_\_ tumors form as a result of irregular and uncontrolled cell growth.
10. A leading cause of lung cancer is \_\_\_\_\_.

# Answer Key to Student Assessments

## Preliminary Assessment (p. 15-16)

1. a - breathing
2. c - bronchi
3. d - aerobic cellular respiration
4. c - larynx
5. b - lungs
6. d - alveoli
7. d - diaphragm
8. a - inhalation
9. b - bronchitis
10. c - asthma
11. a - pressure
12. d - involuntary process
13. c - pneumonia
14. a - cancerous tumors
15. c - smoking
16. Breathing involves the exchange of gases between the body and the external environment.
17. Alveoli consist of thin membranes lined with a dense network of capillaries across which gas exchange occurs with blood cells.
18. A pressure difference causes air to enter and exit the lungs. In inhalation, the pressure outside the body is greater than that in the chest cavity (lungs) and air moves from an area of high pressure to low pressure. The opposite occurs in exhalation.
19. Students may describe one of the following respiratory problems: a common cold, pneumonia, asthma, emphysema, bronchitis, or lung cancer.
20. To help maintain a healthy respiratory system, it is important to not smoke, eat a well-balanced diet, engage in regular vigorous exercise, and have an annual physical medical examination.

## Video Review (p. 19)

1. Air enters the body through the nose or mouth.
2. Your chest and/or your stomach move out when you inhale.
3. Bronchitis involves an inflammation of the membranes of the bronchial tubes.

## Video Assessment (p. 19)

1. respiration
2. larynx
3. lungs
4. alveoli
5. inhalation
6. pressure
7. involuntary
8. pneumonia
9. cancerous
10. smoking

## Post Assessment (p. 17-18)

1. d - aerobic cellular respiration
2. d - alveoli
3. b - bronchitis
4. d - involuntary process
5. c - smoking
6. c - larynx
7. a - inhalation
8. c - pneumonia
9. c - bronchi
10. a - cancerous tumors
11. a - breathing
12. a - pressure
13. d - diaphragm
14. c - asthma
15. b - lungs
16. To help maintain a healthy respiratory system, it is important to not smoke, eat a well-balanced diet, engage in regular vigorous exercise, and have an annual physical medical examination.
17. Breathing involves the exchange of gases between the body and the external environment.
18. Students may describe one of the following respiratory problems: a common cold, pneumonia, asthma, emphysema, bronchitis, or lung cancer.
19. Alveoli consist of thin membranes lined with a dense network of capillaries across which gas exchange occurs with blood cells.
20. A pressure difference causes air to enter into the lungs. In inhalation, the pressure outside the body is greater than that in the chest cavity (lungs) and air moves from the area of high pressure to low pressure. The opposite occurs in exhalation.

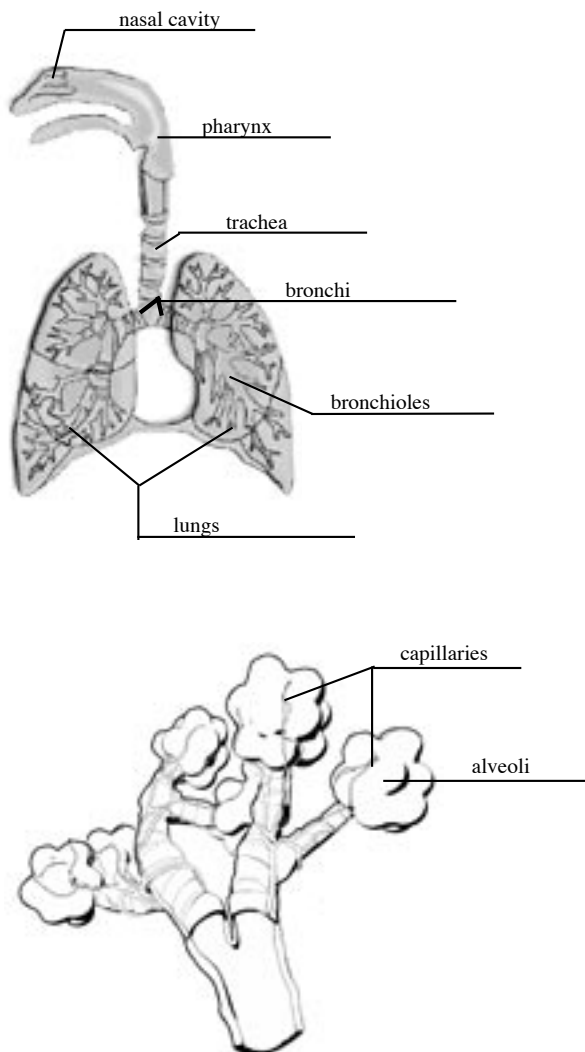
## Vocabulary (p. 20)

1. e - lungs
2. j - intercostal muscles
3. o - lung cancer
4. f - bronchioles
5. l - pneumonia
6. c - larynx
7. k - respiratory center
8. d - trachea
9. n - asthma
10. i - diaphragm
11. h - emphysema
12. m - bronchitis
13. b - cellular respiration
14. g - alveoli
15. a - breathing

# Answer Key to Student Activities

## Parts of the Respiratory System (p. 21)

1. Balloon-like sacs in the chest cavity; site of gas exchange.
2. Area of head through which air flows from the nose.
3. Two tubes that lead from the trachea to the lungs.
4. Blood vessels that line alveoli; actual site of gas exchange with blood.
5. Air passes through this area located in back of the throat.
6. Tiny tubes in lungs that lead to alveoli
7. Grape-like structures in lungs that consist of thin membranes lined with capillaries.
8. A tube that is about 12 cm long that leads from larynx to bronchi.



## Respiration Rates (p. 22-23)

1. Respiration rate generally refers to the number of breaths taken in a 60 second interval.
2. The degree of physical activity, stress, fear and general state of physical fitness may influence the rate of respiration.
3. As the amount of physical activity increased, the respiration rate increased.
4. As physical activity increases the body needs more oxygen and also produces more waste gas. To meet this demand a greater degree of gas exchange is accomplished by increasing the rate of respiration.
5. As physical activity increased, the pulse rate increased. As the body requires more oxygen and releases greater amounts of waste gas, the rate of respiration and the pulse rate needs to be increased to meet the demands of the body.

## Lung in a Bottle (p. 24-25)

1. Inhalation is the process of breathing in. During this process fresh oxygen enters the lungs. Exhalation is the process of breathing out. During this process waste gases leave the body.
2. Air enters the lungs when the chest cavity expands as a result of the chest going out and the diaphragm lowering. This creates lower pressure in the chest cavity than outside the body. Air then moves from higher pressure outside the body into the lungs. When the chest cavity decreases in size, pressure in the lungs increases as compared to outside the body. This causes air to leave the lungs in the process of exhalation.
3. When you inhale the chest goes out and/or the stomach goes out. The reverse occurs when you exhale.
4. When you pulled down on the large balloon, the small balloon filled with air, this caused the volume to increase inside the bottle, and lowered the pressure inside the bottle.
5. The chest cavity is represented by the bottle. The large balloon on the bottom represents the diaphragm. It has the ability to move, and this causes the size of the chest cavity to fluctuate. The pressure in the bottle increases or decreases as a result of the movement of the "diaphragm" and this causes the small balloon to "inhale" or "exhale".

# Preliminary Assessment

Name: \_\_\_\_\_

**Directions:** Circle the best answer for each of the following:

1. This process involves the exchange of gases between the body and the external environment:
  - a. breathing
  - b. digestion
  - c. circulation
  - d. filtration
2. The trachea divides into two branches called:
  - a. kidneys
  - b. alveoli
  - c. bronchi
  - d. ureters
3. Oxygen gas and other materials are used to produce energy in this process:
  - a. photosynthesis
  - b. chemosynthesis
  - c. anaerobic respiration
  - d. aerobic cellular respiration
4. Speaking and singing originates in the:
  - a. trachea
  - b. alveoli
  - c. larynx
  - d. bronchi
5. The sites of gas exchange in the human body are:
  - a. arteries
  - b. lungs
  - c. kidneys
  - d. bronchi
6. The grape-like structures in the lungs where gas exchange occurs are called:
  - a. capillaries
  - b. villi
  - c. cilia
  - d. alveoli
7. The sheet of muscle below the lungs separating the chest cavity from the abdomen is called the:
  - a. tricep
  - b. quadricep
  - c. intercostal muscle
  - d. diaphragm
8. The process of air going into the lungs is called:
  - a. inhalation
  - b. exhalation
  - c. respiration
  - d. osmosis
9. A specific inflammation of the membranes of bronchi is called:
  - a. tuberculosis
  - b. bronchitis
  - c. lung cancer
  - d. emphysema
10. An allergic and/or inflammatory response in which airways constrict, making it difficult to breathe is called:
  - a. edema
  - b. acid reflux
  - c. asthma
  - d. lung cancer
11. Air enters and exits the lungs due to differences in:
  - a. pressure
  - b. weight
  - c. size
  - d. density
12. For the most part, breathing is a(n):
  - a. behavioral response
  - b. learned activity
  - c. auditory process
  - d. involuntary process
13. The accumulation of fluid or debris in alveoli is a condition referred to as:
  - a. bronchitis
  - b. atherosclerosis
  - c. pneumonia
  - d. indigestion
14. These structures form as a result of irregular and uncontrolled cell growth:
  - a. cancerous tumors
  - b. alveoli
  - c. bruises
  - d. blood clots
15. The leading cause of lung cancer is:
  - a. stress
  - b. obesity
  - c. smoking
  - d. bronchitis



# Post Assessment

Name: \_\_\_\_\_

**Directions:** Circle the best answer for each of the following:

- Oxygen gas and other materials are used to produce energy in this process:
  - photosynthesis
  - chemosynthesis
  - anaerobic respiration
  - aerobic cellular respiration
- The grape-like structures in the lungs where gas exchange occurs are called:
  - capillaries
  - villi
  - cilia
  - alveoli
- A specific inflammation of the membranes of bronchi is called:
  - tuberculosis
  - bronchitis
  - lung cancer
  - emphysema
- For the most part, breathing is a(n):
  - behavioral response
  - learned activity
  - auditory process
  - involuntary process
- The leading cause of lung cancer is:
  - stress
  - obesity
  - smoking
  - bronchitis
- Speaking and singing originates in the:
  - trachea
  - alveoli
  - larynx
  - bronchi
- The process of air going into the lungs is called:
  - inhalation
  - exhalation
  - respiration
  - osmosis
- The accumulation of fluids or debris in alveoli is a condition referred to as:
  - bronchitis
  - atherosclerosis
  - pneumonia
  - indigestion
- The trachea divides into two branches called:
  - kidneys
  - alveoli
  - bronchi
  - ureters
- These structures form as a result of irregular and uncontrolled cell growth:
  - cancerous tumors
  - alveoli
  - bruises
  - blood clots
- This process involves the exchange of gases between the body and the external environment:
  - breathing
  - digestion
  - circulation
  - filtration
- Air enters and exits the lungs due to differences in:
  - pressure
  - weight
  - size
  - density
- The sheet of muscle below the lungs separating the chest cavity from the abdomen is called the:
  - triceps
  - quadriceps
  - intercostal muscle
  - diaphragm
- An allergic and/or inflammatory response in which airways constrict, making it difficult to breathe is called:
  - edema
  - acid reflux
  - asthma
  - lung cancer
- The sites of gas exchange in the human body are:
  - arteries
  - lungs
  - kidneys
  - bronchi

# Post Assessment

Name: \_\_\_\_\_

**Directions:** Answer the following using complete sentences

16. List three things you can do to maintain a healthy respiratory system.

17. What is breathing?

18. Describe a specific respiratory problem.

19. What are alveoli and what is their role?

20. What causes air to enter and exit the lungs?

# Video Review

Name: \_\_\_\_\_

**Directions:** Answer these questions as you watch the video:

**1. You Observe!**

Where did you feel air enter your body?

**2. You Observe!**

What happens to your chest when you inhale?

**3. You Decide!**

What part of the respiratory system is affected by bronchitis?

## Video Assessment

**Directions:** After you watch the video, fill in the blank to complete the sentence.

1. In aerobic cellular \_\_\_\_\_, oxygen gas and other materials are used to produce energy.
2. Speaking and singing originate in the \_\_\_\_\_.
3. The \_\_\_\_\_ are sites of gas exchange in the human body.
4. These small, grape-like structures in the lungs are called \_\_\_\_\_.
5. \_\_\_\_\_ is the process of drawing air into the lungs.
6. Air enters and exits the lungs due to differences in \_\_\_\_\_.
7. For the most part, breathing is an \_\_\_\_\_ process.
8. \_\_\_\_\_ is an ailment in which fluid accumulates in alveoli.
9. \_\_\_\_\_ tumors form as a result of irregular and uncontrolled cell growth.
10. A leading cause of lung cancer is \_\_\_\_\_.

# Respiration Vocabulary

Name: \_\_\_\_\_

**Directions:** Unscramble the vocabulary words in the first column. Match the words to the definitions in the second column.

\_\_\_\_ 1) nlsug \_\_\_\_\_

\_\_\_\_ 2) esiclotnrat emelssu \_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_ 3) ugl n acrnce \_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_ 4) onshbcleiro \_\_\_\_\_

\_\_\_\_ 5) oeapanmuni \_\_\_\_\_

\_\_\_\_ 6) xyanlr \_\_\_\_\_

\_\_\_\_ 7) srorirpytea etrnce \_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_ 8) carathe \_\_\_\_\_

\_\_\_\_ 9) haasmt \_\_\_\_\_

\_\_\_\_ 10) hrpaagimd \_\_\_\_\_

\_\_\_\_ 11) hmpasyeme \_\_\_\_\_

\_\_\_\_ 12) tcrinsohbi \_\_\_\_\_

\_\_\_\_ 13) llauerc rriineoapts \_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_ 14) aeiollv \_\_\_\_\_

\_\_\_\_ 15) hebgirnta \_\_\_\_\_

a. The exchange of gases between the body and the external environment.

b. The process in which oxygen gas and other materials are used to produce energy.

c. Structure that contains vocal cords; also called voice box.

d. Narrow tube that leads to the bronchi; also referred to as the windpipe.

e. The organs in the body responsible for gas exchange.

f. Small, branching tubes in the lungs that end in alveoli.

g. Tiny air sacs in the lungs arranged like grapes on a stem; sites in which gas exchange occurs.

h. A disease that greatly inhibits the body's ability to breathe.

i. A sheet of muscle below the lungs separating the chest cavity from the abdomen.

j. Muscles located between ribs that play a role in causing the chest to expand in the process of breathing.

k. The part of the brain responsible for regulating the process of breathing.

l. a respiratory problem caused by a virus, fungus, or bacteria leading to the accumulation of debris or fluid in alveoli inhibiting the ability of the lungs to exchange oxygen.

m. An inflammation of the membranes of the bronchial tubes.

n. An allergic and inflammatory response in which airways constrict, making it difficult to breathe.

o. A very serious ailment in which tumors or irregular cancerous growth of cells in the lung occurs.

# Parts of the Respiratory System

Name: \_\_\_\_\_

## Background:

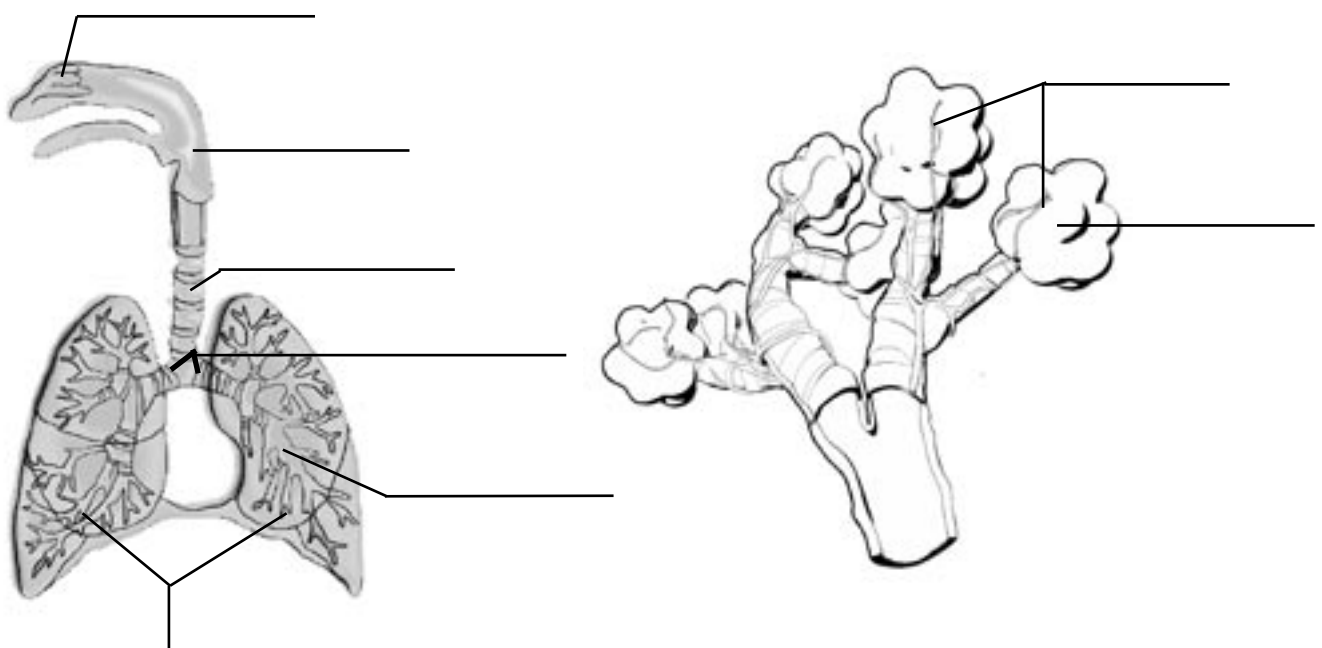
Every time you take a breath, air begins a journey through a series of structures in your body specifically designed for respiration. Air enters the body through the nose or mouth. The air you breathe is cleaned, filtered, warmed, and moistened as it leads to your lungs. The nasal cavity and upper part of the respiratory system is lined with mucus membranes and small hairs that help accomplish these tasks. From the nasal cavity or mouth, air enters the pharynx, or throat. After leaving the pharynx, air passes into the larynx, also called the voice box. The voice box, consisting mostly of cartilage, also contains vocal cords that consist of thin membranes stretched across the larynx. Exhaled air vibrates the vocal cords. We use these vibrations to speak and sing.

To prevent choking while swallowing food and water, the larynx is blocked by a flap called the epiglottis. Choking is the result of food or other material mistakenly getting past the epiglottis into the larynx and blocking air from entering the passage. The larynx leads directly into the windpipe, also called the trachea. The trachea is about 12 centimeters long and only about 2.5 centimeters wide. The trachea divides into two branches called the bronchi. Each bronchi leads to a lung. The lungs are the sites of gas exchange in the human body.

Under the ribs in your chest are two very important structures called lungs. In the lungs, bronchi branch out into smaller and smaller tubes called bronchioles. Small bronchioles end in tiny air sacs called alveoli, arranged kind of like grapes on a stem. Alveoli consist of thin membranes lined with a dense network of capillaries across which gas exchange occurs with blood cells. Here, oxygen is picked up and carbon dioxide is given off by the blood. There are over 300 million alveoli in the lungs. Their total surface area would cover a good part of a soccer field!

**Directions:** Begin the activity by stating the function of the following structures of the respiratory system. After completing this task, label the diagram with the correct term.

1. Lungs
2. Nasal cavity
3. Bronchi
4. Capillaries
5. Pharynx
6. Bronchioles
7. Alveoli
8. Trachea



# Respiration Rates

Name: \_\_\_\_\_

## Background:

It's possible to consciously control your breathing. But, for the most part, breathing is an involuntary process. Breathing continues even though you don't consciously control it. This occurs even while you sleep. Breathing is controlled in a part of the brain generally referred to as the respiratory center. Feedback is continually given to this part of the brain to adjust the rate of breathing. Receptors in the aorta and other arteries sense pH levels and gas levels, such as carbon dioxide, in the bloodstream. As carbon dioxide levels increase, the brain sends a message to the diaphragm and intercostal muscles to increase the rate and depth of breathing. This lowers the amount of carbon dioxide and raises the amount of oxygen in the blood. Your resting respiration rate varies between 12 to 25 breaths per minute. But it is easily and quickly altered by changes in activity as well as fear, or stress.



Respiration rate is generally calculated as the number of breaths in a 60 second interval (breaths/minute). Your respiration rate is continually changing. When you walk up a flight of stairs your respiration rate increases, and when you sleep it decreases. In this activity you will see how your respiration changes with various activities.

## Materials:

stopwatch or a watch with a second hand, Respiration Rate Data Table

## Directions:

1. In this activity you will work with a partner. Before starting the activity you need to practice taking your respiration rate. Have your partner use a stopwatch or watch with a second hand to time you for 60 seconds while you count the number of breaths you take.
2. On the command of the timekeeper begin counting the number of times you inhale. Stop recording at 60 seconds.
3. Record the respiration rate in the Data Chart in the blank box next to "Sitting".
4. Next, have your partner record their respiration rate while you act as the timekeeper. Record the respiration rate.
5. Now you will record your respiration rate while standing. Make sure you stand for one minute before you begin to measure the respiration rate.
6. Take the respiration rate for 60 seconds and record the measurement in the Data Table in the box next to "Standing". Then have your partner record their respiration rate after completing the same process.
7. Next, walk in place for one minute while lifting your feet high off the ground. Record the respiration rate for 60 seconds. Record your data. Switch places and have your partner measure their respiration rate while walking in place for one minute.
8. Carry out the same process, but walk in place for 2 minutes before recording the respiration rate.
9. You will now increase your degree of physical exertion by running in place for one minute. Record your respiration rates.
10. Increase your length of physical activity by running in place for 2 minutes. Record the respiration rate. Take a rest!
11. After you have completed the chart, make a simple graph of your data. Then answer the questions.

# Respiration Rates

Name: \_\_\_\_\_

## Respiration Rate Data Table

	Partner #1 Respiration Rate (60 seconds)	Partner #2 Respiration Rate (60 seconds)
Sitting		
Standing		
Walking one minute		
Walking two minutes		
Running one minute		

### Questions:

1. What is respiration rate?
2. What factors may influence respiration rate?
3. Generally speaking, describe how respiration rate was affected by an increase in physical activity.
4. Why does respiration rate increase with physical activity?
5. What did you notice about your pulse rate as your respiration rate increased? Explain why this occurred.

# Lung in a Bottle

Name: \_\_\_\_\_

## Background:

Playing a musical instrument takes a lot of air. So does playing a sport. Maybe you've noticed that when breathing hard your chest rises and falls quickly. You feel the air rushing in and out of your nose and mouth. Breathing is the process of moving air into and out of the lungs. There are two main phases of breathing - inhalation and exhalation. Inhalation is the process of air going into the lungs. When you inhale your chest and/or your stomach move out. In fact, try to breathe in without moving your chest or stomach. It's impossible to inhale without them moving. Why? This is because the work of breathing is actually done by the diaphragm, and the intercostal muscles. The diaphragm is a sheet of muscle below the lungs separating the chest cavity from the abdomen. These are the muscles located between the ribs. When the diaphragm and intercostal muscles contract, the size of the chest cavity increases. The enlarged chest cavity creates a situation in which the air pressure is lower in the chest than outside the body. Air then rushes from an area of higher pressure outside the body to an area of lower pressure inside the lungs. So, when you breathe you aren't really sucking air in, but instead a pressure difference causes air to rush into the lungs.



## Materials:

plastic soda bottle (200ml to 500ml), small balloon, large balloon, rubber stopper, safety goggles, and scissors

## Directions:

1. Obtain the materials listed above from your instructor.
2. **Put safety goggles securely over your eyes.**
3. Place the soda bottle on its side. Carefully insert one point of the scissors through the side of the bottle about one to two centimeters above the bottom. If you don't feel comfortable doing this, ask your instructor for help.
4. Cut off the bottom of the bottle by evenly cutting around the outside of the bottle.
5. Stretch out the small balloon, and blow it up numerous times. Stretch the lip of the balloon over the bottom of the rubber stopper.
6. Carefully insert the bottom of the balloon through the mouth of the bottle and press the stopper tightly into the bottle. The stopper should snugly hold the balloon in place.
7. Next, cut about 1 cm off the rounded bottom of the large balloon.
8. Tie the neck of the balloon shut with a knot.
9. Stretch the cut end of the balloon over the bottom of the bottle. If you have a hard time getting the balloon to stay on the bottle, use duct tape to secure it.
10. Now you are ready to simulate the operation of a lung. While watching the small balloon, carefully pull down the knot of the large balloon. Watch what happens! Then press up on the knot of the large balloon. Observe the small balloon.
11. Answer the questions on the following page.

# Lung in a Bottle

Name: \_\_\_\_\_

## Questions:

1. What is inhalation? What is exhalation?
2. What causes air to enter and exit the lungs? Explain the role different structures play in creating differences in pressure.
3. Describe what happens to your chest and/or your stomach when you inhale and exhale.
4. Explain what happened to the small balloon when you pulled on the large balloon. Describe why this occurred.
5. How does the model you created simulate the process of breathing?