Understand the Organs of the Respiratory System

Unit. Human Structure and Function: The Respiratory System

Problem Area. Understand the Process of Respiration

Lesson. Understand the Organs of the Respiratory System

Student Learning Objectives.

Instruction in this lesson should result in students achieving the following objectives:

1. **Sequence the structures of the respiratory system in the order in which air will pass through them.**
2. **Describe the anatomy of the structures of the respiratory tract.**
3. **Identify the function of the structures of the respiratory tract.**

List of Resources.

The following resources may be useful in teaching this lesson:

Badasch, S., and Chesebro, D. (2004). *Introduction to Health Occupations,* 6th ed. Upper Saddle River, NJ: Prentice Hall.

Black, J., and Matassarin-Jacobs, E. (1993). *Luckmann and Sorensen's Medical-Surgical Nursing: A Psychophysiologic Approach,* 4th ed. Philadelphia: W.B. Saunders.

Gerdin, J. (2003). *Health Careers Today,* 3rd ed. St. Louis: Mosby.

Miller, B., and Keane, C. (1992). *Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health,* 5th ed. Philadelphia: W.B. Saunders.

Simmers, L. (2004). *Diversified Health Occupations,* 6th ed. Clifton Park, NY: Delmar Learning.

Smeltzer, S., and Bare, B. (2004). *Textbook of Medical-Surgical Nursing,* 10th ed. Philadelphia: Lippincott Williams & Wilkins.

Sorrentino, S. (2000). *Mosby's Textbook for Nursing Assistants,* 5th ed. St. Louis: Mosby.

List of Equipment, Tools, Supplies, and Facilities

- ✓ Overhead or PowerPoint projector
- ✓ Visual(s) from accompanying master(s)
- ✓ Copies of sample test, lab sheet(s), and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with Internet access
- ✓ Classroom resource and reference materials

Terms. The following terms are presented in this lesson (shown in bold italics):

- alveoli
- bronchial tree
- bronchioles
- bronchus
- cilia
- diaphragm
- epiglottis
- laryngopharynx
- larynx
- lobar bronchi
- lung
- mediastinum
- nares
- nasal septum
- nasopharynx
- nose
- oropharynx
- pharynx
- pleura
- pleural fluid
- segmental bronchi
- subsegmental bronchi
- trachea

Interest Approach. Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situation. A possible approach is included here.

> *Introduce the topic to the students. Ask the students to think about respiration. Assess their current knowledge of the structures through which air passes during respiration. Structures may not be identified using common names (voice box, wind pipe, etc.).*

SUMMARY OF CONTENT AND TEACHING STRATEGIES

Objective 1: Sequence the structures of the respiratory system in the order in which air will pass through them.

Anticipated Problem: What is the sequence of the structures of the respiratory system?

I. Air must pass through several structures of the respiratory tract.

A. Air enters the respiratory tract through the nose.

1. Note: Some people are mouth breathers, so air would not pass through the nose; air would travel from the mouth to the pharynx.

B. Air then passes through the nasal cavity to the pharynx.

C. Air then passes through the epiglottis before entering the larynx.

D. Air enters the trachea and travels down into the bronchus.

1. Each bronchus enters the lung.
2. The bronchus divides into bronchioles.
3. The bronchioles subdivide and end in one-cell-thickness air sacs called alveoli.

> *Many techniques can be used to help students master this objective. As an example, use VM–A (Structures of the Respiratory System) to illustrate the route of air through the respiratory structures in the appropriate sequence. Display the diagram and allow students to label and color each structure as it is discussed.*

Objective 2: Describe the anatomy of the structures of the respiratory tract.

Anticipated Problem: What is the anatomy of each structure of the respiratory system?

II. The respiratory system is composed of individual structures that work together.

A. ***Nose***
   1. The nose consists of bone and cartilage.
   2. The openings of the nose are called ***nares***.
   3. Each nare is separated by the ***nasal septum***.

B. ***Pharynx***
   1. The pharynx is often called the "throat."
   2. It is funnel-shaped and extends from the nose to the larynx.
   3. There are three sections of the pharynx:
      a. The ***nasopharynx*** is located behind the nose.
      b. The ***oropharynx*** is located behind the oral cavity (mouth).
      c. The ***laryngopharynx*** is located superior to the pharynx.

C. ***Epiglottis***
   1. The epiglottis is a "flap" or "lid" at the base of the tongue and lies over the larynx.
   2. This "flap" closes the larynx during swallowing to prevent the passage of food or drink into the larynx and trachea.

D. ***Larynx***
   1. The larynx is often called the "voice box."
   2. The larynx is composed of cartilages, which are held together by muscles and ligaments.

E. ***Trachea***
   1. The trachea is also called the "wind pipe."
   2. It is a flexible, muscular passage that is about 4–5 inches long.
   3. It consists of C-shaped rings of cartilage.
   4. The trachea divides into the right and left bronchi.

F. ***Bronchus***
   1. The right bronchus is shorter and straighter than the left.
   2. For this reason, foreign bodies are more likely to become trapped in the right bronchi.
   3. The bronchi subdivide in each lung.
      a. The first division is the ***lobar bronchi***; there are three in the right lung and two in the left lung.
      b. The lobar bronchi subdivide into the ***segmental bronchi***; there are ten on the right and eight on the left.
      c. The segmental bronchi extend into ***subsegmental bronchi***.

4. The ***bronchioles*** branch off of the subsegmental bronchi.
    a. Bronchioles decrease in size as they extend out.
    b. Bronchus and bronchioles together form the ***bronchial tree***.

G. ***Alveoli***

1. The alveoli are small air sacs located at the end of the bronchioles.
2. Microscopically, alveoli resemble clusters of grapes.
3. There are millions of alveoli in the lungs.

H. ***Lungs***

1. Each lung is divided into lobes.
    a. The right lung contains three lobes.
    b. The left lung contains two lobes.
2. Each lung can be subdivided into about 10 smaller units.
3. Lungs are elastic (so they can stretch).
4. The ribs, sternum, and vertebrae protect the lungs.

I. ***Pleura***

1. The pleura is a two-layered sac that covers each lung.
    a. Visceral pleura is the inner layer that is attached to the lung.
    b. Parietal pleura is the outer layer that is attached to the chest wall.
2. ***Pleural fluid*** is secreted between the two layers and keeps them from rubbing together.

J. ***Mediastinum***

1. The area that contains the heart, great blood vessels, esophagus, and lymph nodes is the mediastinum.
2. The two lungs are separated by the mediastinum.

K. ***Diaphragm***

1. The diaphragm is a muscle that separates the lungs from the abdominal cavity.
2. It is attached to the six lower ribs, the sternum, and the spine.
3. It is dome shaped in the relaxed position.
4. On inspiration, the dome of the diaphragm flattens and the rib cage lifts, allowing for expansion of the lungs.

Many techniques can be used to help students master this objective. As an example, students could use Chapter 27 in Mosby's Textbook for Nursing Assistants. Use VM–A.

Objective 3: Identify the function of the structures of the respiratory tract.

Anticipated Problem: What is the function of each structure of the respiratory tract?

III. Each structure of the respiratory tract functions to assist with respiration.

A. Nose
   1. The nose secretes mucus.
   2. The vast blood supply in the nose warms and humidifies inspired air.
      a. By the time air reaches the lungs, it is warmed to 96.8–98.6 degrees Fahrenheit.
      b. Air is humidified to 70–80% before it enters the lungs.
      c. The mucus assists in trapping foreign particles and preventing them from entering the respiratory tract.
      d. It provides the sense of smell and assists with taste.
      e. Excess tears are excreted through a duct in the nose.

B. Pharynx
   1. The nasopharynx receives air from the nasal cavity.
   2. The oropharynx receives air from the nasopharynx and food from the oral cavity.
   3. The laryngopharynx connects to the larynx and receives air and food from the oropharynx.

C. Larynx
   1. The respiratory function of the larynx is to allow air to pass through as it travels from the pharynx to the trachea and again on its way back from the lungs.
   2. The larynx connects the upper (pharynx) and lower (trachea) airways.
   3. The larynx also contains the vocal cords and is the source of the sounds heard in speech.

D. Trachea
   1. The trachea is lined with a mucous membrane covered with cilia.
      a. ***Cilia*** are microscopic hair-like structures responsible for moving foreign objects and pollutants out of the breathing passages and toward the mouth.

E. Bronchus
   1. Cartilage surrounds the airway to prevent collapsing.
   2. The bronchus serves as a passage for air from the trachea to the lungs.

F. Alveoli
   1. The alveoli are surrounded by a network of capillaries (smallest blood vessels).
   2. These capillaries pick up oxygen from the alveoli and take it back to the heart to be pumped throughout the body.

3. Alveoli collect carbon dioxide from the capillaries and send it through the bronchial tree.

Many techniques can be used to help students master this objective. As an example, students could use Chapter 27 in Mosby's Textbook for Nursing Assistants. Use VM–A.

Review/Summary. Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at the ends of chapters in the textbook may also be used in the review/summary.

Application. Application can involve one or more of the following student activities:

- Use VM–A.

Evaluation. Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

Answers to Sample Test:

Part One: Completion

1. warming; humidifying
2. epiglottis
3. left

Part Two: Labeling

1. pharynx
2. epiglottis
3. larynx
4. trachea
5. pleura
6. bronchioles
7. bronchus/bronchi
8. diaphragm

Sample Test

Name _____

Understand the Organs of the Respiratory System

Part One: Completion

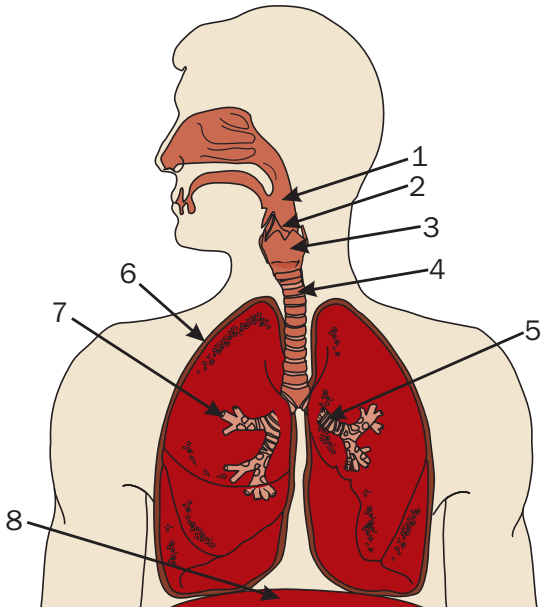
Instructions: **Provide the word or words to complete the following statements.**

1. The nose functions to aid in respiration by _____ and _____ air.
2. The lid over the larynx that opens for breathing and closes during swallowing is the _____.
3. The _____ lung has only two lobes.

Part Two: Labeling

Instructions: **Label the following structures of the respiratory system.**

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____



Assessment

Labeling the Structures of the Respiratory System

Overview

Health Science Technology students will create a diagram of the respiratory system, identify each structure, and discuss the function of each structure and how it assists with respiration.

- *Number:* Create a diagram of the respiratory system; identify the names of all structures involved in respiration; and discuss the major functions of all structures involved in respiration.
- *Include Accurate Information:* Identify the correct names of each structure; accurately spell the names of each structure identified; and accurately note the appropriate function of each structure identified.

Procedures

1. In order to describe and explain the structures and functions of the human body systems and how they interrelate, students should experience sufficient learning opportunities to develop the following skill:

   - Recognize that all of the body's systems interrelate and impact each other.

   Students employed in various health careers are required to know the academic subject matter required for proficiency within their area.

2. Health Science Technology students will review and discuss the assessment task and how the rubric will be used to evaluate their work.
3. Each student will create a diagram of the structures involved in respiration and discuss the function of each.
4. In class, the Health Science Technology student will prepare a diagram of the respiratory system without using the visual master provided during the lecture.
5. Each student's performance will be evaluated using the rubric. Add each student's scores to determine the performance level.

Time Requirements

Thirty minutes of the class period

Resources

- One sheet of poster paper
- Pencil
- Markers
- Labeling the Structures of the Respiratory System rubric

Diagram Instructions

Labeling the Structures of the Respiratory System

Using the blank sheet of poster paper, draw an illustration of the respiratory system. This diagram should include all of the major structures involved with respiration. Each structure should be accurately labeled, and the name of the structure must be spelled correctly. Next to the name of each structure, include the major function of that structure and how it assists with respiration.

Each poster should include:

1. A diagram of the respiratory system
2. The name of each structure involved with respiration
3. The major function of each structure identified
4. The role this structure has in respiration
5. Optional: Include common names of three of the structures of the respiratory system.

Sample Identified Structure:

Epiglottis: Closes during swallowing to prevent food or liquid from entering the larynx or trachea.

Scoring Rubric

Student's Name _____

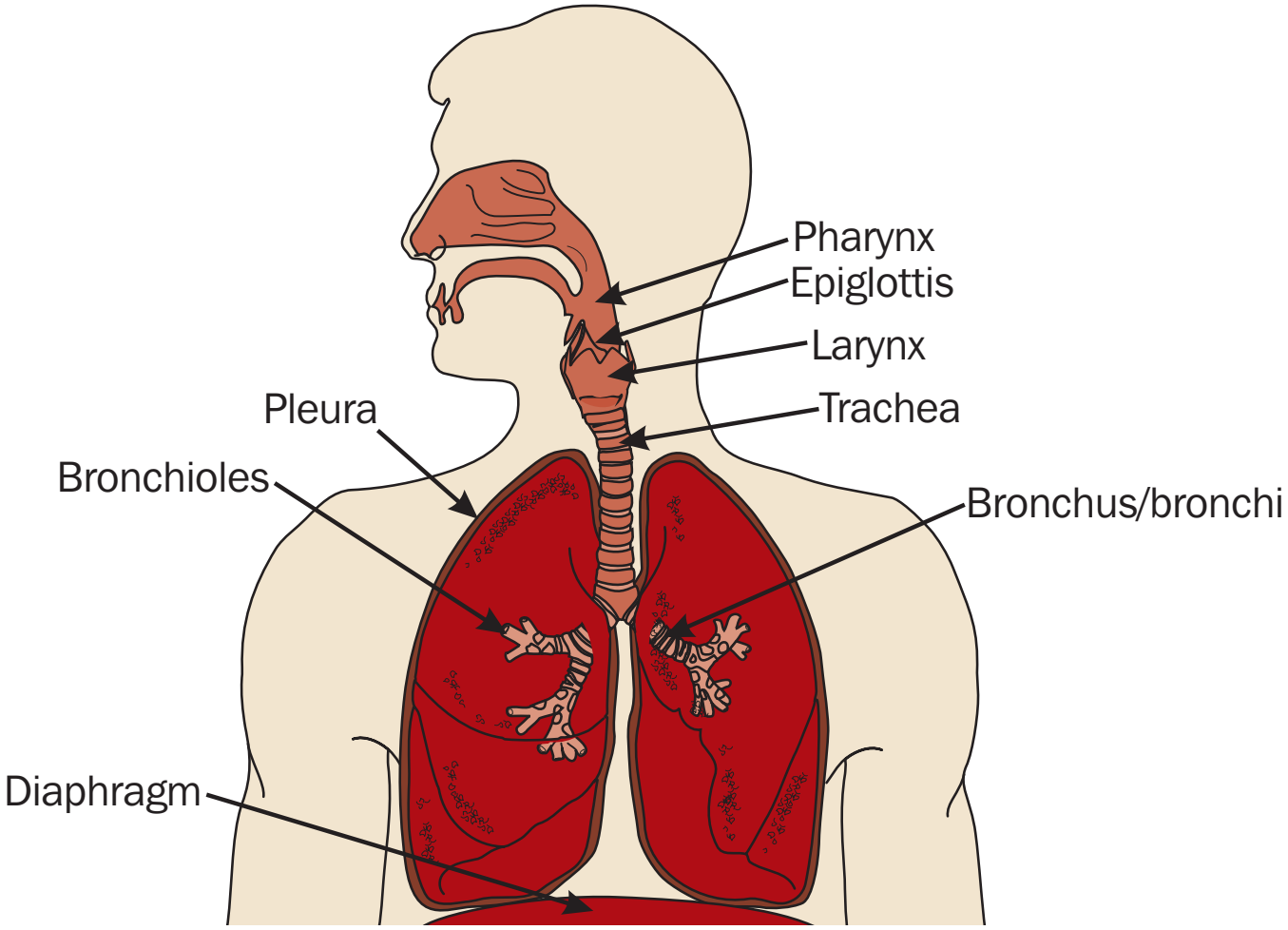
Labeling the Structures of the Respiratory System

- Exceeds standard (7–8 total points)
- Meets standard (5–6 total points)
- Approaches standard (3–4 total points)
- Begins standard (2 total points)

	Numbering	Accuracy of Information
4	• The poster has been completed. • Ten required structures are included. • Ten required structures are labeled. • Discussion of the function of each identified structure is provided. • Some of the structures include optional information.	• Each structure is labeled correctly. • Each structure is spelled correctly. • The major respiratory function of each structure is included. • When included, optional information is accurate.
3	• The poster has been completed. • Seven or more required structures are included. • Seven or more required structures are labeled. • Discussion of the function of most identified structures is provided.	• Seven or more of the required structures are accurately identified. • Seven or more of the required structures are correctly spelled. • Most of the major respiratory functions are included. • When included, most optional information is accurate.
2	• The poster has been completed. • Five or more required structures are included. • Five or more required structures are labeled. • Discussion of the function of a few identified structures is provided.	• Five or more of the required structures are accurately identified. • Five or more of the structures identified are spelled correctly. • A few of the major respiratory functions are included.
1	• The poster is incomplete. • One or two of the structures are included. • One or two of the structures are identified. • Little or no information is provided about the function of each identified structure.	• None to few of the structures are accurately identified. • None to few of the structures are spelled correctly. • Little to no information about the function of each structure is accurate.
Score		

VM–A

THE STRUCTURES OF THE RESPIRATORY SYSTEM



Follow the CO_2 Molecule

Purpose

The purpose of this activity is to allow students to visualize the transport of carbon dioxide out of the respiratory tract by tracing the route.

Objectives

1. Allow students to visualize the transport of carbon dioxide out of the respiratory tract.
2. Allow students to demonstrate their understanding of the transport of carbon dioxide out of the respiratory tract.

Materials

- writing utensil
- colored pencils / markers
- white poster board (several sheets as needed)

Procedure

1. Have students form groups of four.
2. Tell students that they are a molecule of carbon dioxide and have diffused from the blood into the alveoli.
3. Assign students to draw and label the respiratory system. Then they should trace and describe the passageway out of the body.

Answer Key

Structures need to be in this order: alveoli, bronchioles, bronchi, trachea, larynx, laryngopharynx, oropharynx, nasopharynx, and nostrils.