

Component I: Core

Module B: Terminology, Anatomy and Physiology

Topic 9: Respiratory System

Statement of Purpose

To prepare the learner with basic knowledge of the respiratory system.

Student Learning Outcomes

Upon completion of this topic, the learner will be able to:

1. Spell and define key terms.
2. Discuss the mechanisms of breathing.
3. Label the structures of the respiratory system on an anatomical illustration.
4. Describe the function of the respiratory system.

Terminology

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|--------------------------|-----------------------|
| 1. Alveoli | 17. Oxygen |
| 2. Bronchi | 18. Parenchyma |
| 3. Bronchioles | 19. Pharynx |
| 4. Bronchial tree | 20. Pleura |
| 5. Carbon dioxide | 21. Pneumonia |
| 6. Cilia | 22. Respiration |
| 7. Cricoid cartilage | 23. Respiratory |
| 8. Diaphragm | 24. Trachea |
| 9. Epiglottis | 25. Tertiary bronchi |
| 10. External respiration | 26. Thyroid cartilage |
| 11. Internal respiration | 27. Trachea |
| 12. Larynx | 28. Ventilation |
| 13. Lungs | 29. Vocal cords |
| 14. Medulla oblongata | 30. Voice box |
| 15. Mouth | 31. Windpipe |
| 16. Nares | |

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Websites

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Content Outline/Theory Objectives	Suggested Learning Activities
<p>Objective 1 Spell and define key terms.</p> <ul style="list-style-type: none"> A. Review the terms listed in the terminology section. B. Spell the listed terms accurately. C. Pronounce the terms correctly. D. Use the terms in their proper contexts. 	<ul style="list-style-type: none"> A. Games: word searches, crossword puzzles, Family Feud, Jeopardy, bingo, spelling bee, hangman and concentration. B. Administer vocabulary pre-test and post-test. C. Discuss learning gaps and plan for applying vocabulary.
<p>Objective 2 Describe the function of the respiratory system.</p> <ul style="list-style-type: none"> A. External respiration exchange of oxygen (O₂) and carbon dioxide (CO₂) between the atmosphere and body cells. <ul style="list-style-type: none"> 1. Air containing oxygen passes through the respiratory tract. 2. Nose, pharynx, larynx, trachea, and bronchi to the lungs (inhalation). B. Internal respiration <ul style="list-style-type: none"> 1. The body cells take on oxygen from the blood and simultaneously give back carbon dioxide, a waste produced when food and oxygen combine in cells. 2. CO₂ is transported by the blood back to the lungs for exhalation. C. Ventilation <ul style="list-style-type: none"> 1. Movement of air into and out of the lungs. D. One respiration equals one inhalation and one exhalation. 	<ul style="list-style-type: none"> A. Lecture/Discussion B. Assigned Readings C. Use anatomical diagrams/posters/videos/computer assisted learning/workbook activities.
<p>Objective 3 Label the structures of the respiratory system on an anatomical illustration.</p> <ul style="list-style-type: none"> A. Organs of the respiratory system are the nose, pharynx, larynx, trachea, bronchial tree (bronchi and bronchioles) and lungs. B. Upper respiratory tract includes nose, pharynx and larynx. C. Lower respiratory tract includes trachea, bronchi and lungs. D. Nose is made up of bones, cartilage and skin covering <ul style="list-style-type: none"> 1. The nares of the nose are the primary pathways for air to enter and leave the system. 2. The mouth is a secondary pathway for air to enter and leave the system. E. The pharynx is the passageway for air and food <ul style="list-style-type: none"> 1. Nasopharynx and oropharynx. 2. Air moves from pharynx to the larynx. F. Larynx <ul style="list-style-type: none"> 1. Contains a trap door structure called the epiglottis which prevents food from entering trachea. 	<ul style="list-style-type: none"> A. Lecture/Discussion B. Assigned Readings C. Use anatomical diagrams/posters/videos/computer assisted learning/workbook activities. D. Utilize models of respiratory tract and track oxygen via inspiration and expiration. E. Ask students to identify respiratory structures.

2. The “voice box” produces the sounds of a person’s voice (vocal cords).
3. Moves air in and out of the trachea.
4. Cartilage and muscle tissue
 - a. Thyroid cartilage forms anterior wall of the larynx
 - 1) Testosterone, during male puberty, enlarges to form the “Adam’s apple”.
 - b. Epiglottic cartilage forms the framework of the epiglottis
 - c. Epiglottis, flap-like structure that closes off the larynx during swallowing
 - d. Cricoid cartilage is located at the posterior wall of the larynx and a small part of the anterior wall.

G. Trachea (windpipe)

1. Allows for airflow.
2. Tubular organ made of “C” shaped rings of cartilage and smooth muscle.
3. Extends from larynx to the bronchi.
4. Lined with cilia that constantly moves mucus up to the throat where it is swallowed.
5. Mucus traps bacteria, viruses and other harmful substances inhaled.
6. The distal end of the trachea branches and starts a series of tubes called the bronchial tree.

H. Bronchial Tree

1. Anatomic complex of the trachea and bronchi.
2. The bronchi branch from the trachea.
3. The right bronchus is wider and shorter than the left bronchus and it branches into three secondary bronchi, one passing to each of the three lobes of the right lung.
4. The left bronchus is smaller in diameter and about twice as long as the right bronchus. It is also more horizontal and more susceptible to obstruction. It branches into the secondary bronchi for the inferior and the superior lobes of the left lung.
5. The lungs contain alveoli; microscopic air sacs where oxygen and carbon dioxide exchange takes place.
6. Alveoli are surrounded by capillaries.
7. Considered working tissues (parenchyma) of lung because it is where gas is exchanged.
8. Blood in the capillaries release carbon dioxide into the alveoli, and then the alveoli releases oxygen into the blood of the capillaries.

I. Diaphragm is the muscular partition that separates the thoracic cavity from the abdominal cavity and is the main muscle of respiration.

J. Lungs

1. Cone-shaped organs.

<ul style="list-style-type: none"> 2. Contain connective tissue, the bronchial tree, nerves, lymphatic vessels and many blood vessels. 3. Right lung is larger than the left. 4. Right lung is divided into three lobes. 5. The left lobe has two lobes. 6. Surrounding the lung is a membrane called the pleura. <p>K. The intercostal muscles contract and relax to assist with breathing.</p>	
<p>Objective 4 Discuss the mechanisms of breathing.</p> <ul style="list-style-type: none"> A. Air flows into the airways during inspiration because the thoracic cavity enlarges. B. When the thoracic cavity enlarges, pressure decreases in the cavity and air passively flows from an area of high pressure to an area of low pressure. C. Events that lead to inspiration <ul style="list-style-type: none"> 1. Diaphragm contracts (becoming flat), increasing the amount of space in the thoracic cavity. 2. The intercostal muscles raise the ribs, creating even more room. 3. Expiration or exhalation, air rich with carbon dioxide flows out of the airways. 4. Air flows out because the thoracic cavity becomes smaller, which increases the pressure inside the cavity. D. Events that lead to expiration <ul style="list-style-type: none"> 1. Diaphragm relaxes. 2. As diaphragm relaxes it domes up into the thoracic cavity, which increases the space in the cavity. 3. The intercostal muscles lower the ribs, which further decreases the space in the cavity. E. Breathing is controlled by the respiratory center in the brain <ul style="list-style-type: none"> 1. Medulla oblongata contains the respiratory center, which controls the depth and rhythm of breathing. 2. The medulla oblongata is very sensitive to the partial pressure of carbon dioxide ($p\text{CO}_2$) in the arteries and to the pH level of the blood. 3. As carbon dioxide increases in the blood, the rate and depth of breathing increases. 4. When the pH drops, the rate and depth of breathing increases. 5. Pain and fear increases respiration rate. 	<ul style="list-style-type: none"> A. Lecture/Discussion B. Assigned Readings C. Use anatomical diagrams/posters/videos/computer assisted learning/workbook activities. D. Ask and discuss patient education strategies for these conditions.