

Breathe it all In	Gr. 10 Biology - Tissues, Organs, and Systems of Living Things
<h2 style="margin: 0;">Lesson Plan</h2>	
<p>Learning Outcomes</p> <p>Look at how the lungs function by building a model.</p> <p>Learn about different diseases associated with the organ system.</p>	<p>Specific Expectations</p> <p>B2.7 use a research process to investigate a disease or abnormality related to tissues, organs, or systems of humans or plants (e.g., heart disease, tobacco mosaic virus, wheat rust) [IP, PR, C]</p> <p>B3.4 explain the primary functions of a variety of systems in animals (e.g., the circulatory system transports materials through the organism; the respiratory system supplies oxygen to and removes carbon dioxide from the body)</p> <p>B3.5 explain the interaction of different systems within an organism (e.g., the respiratory system brings oxygen into the body, and the circulatory system transports the oxygen to cells) and why such interactions are necessary for the organism’s survival</p>
<p>Description</p> <p>In this activity, students will build a model set of lungs and test it under different conditions which model diseases of the respiratory system.</p>	
<p>Materials</p> <ol style="list-style-type: none"> 1. Bell Jars (can use bottomless pop bottles) 2. Y-fitting/Connector 3. Stoppers with holes through them 4. Balloons 5. Water Balloons 6. Paper 	
<p>Introduction</p> <p>When we describe where lung conditions happen, they tend to fall under three categories:</p> <ol style="list-style-type: none"> 1. Airway Conditions – these are conditions which affect the bronchi, or the airways/tubes which carry air in and out of the lungs. Usually, this looks like a tightening of those passages. Examples of these conditions include asthma, chronic obstructive pulmonary disease (COPD), and bronchiolitis. The bronchi are represented in our model by the Y fitting. 	

2. Tissue Conditions – Scarring or inflammation of the lung tissue restricts how much they can expand. Examples of these conditions include pulmonary fibrosis and sarcoidosis. The lungs are represented by balloons.
3. Circulation Conditions – The blood vessels in the lungs are clotted or scarred, which affects how the lungs can take up oxygen and release carbon dioxide. This often is associated with heart conditions, such as pulmonary hypertension.

Many lung conditions fall into more than one of these categories.

Lung conditions can also be categorized by their impact.

1. Obstructive Conditions – these are conditions like COPD which are caused by a blocking of the airway.
2. Restrictive Conditions – these are conditions which limit how much the lungs can expand – for example, pulmonary fibrosis.
3. Ventilation Conditions – these are conditions where the exchange of oxygen is impacted. Often this is related to fluid in the alveoli, such as in pneumonia.
4. Perfusion Conditions – these are conditions in which the problem is in the circulatory system. If a blood vessel is blocked near the alveoli, the exchange of oxygen cannot be completed.

Obstructive conditions tend to be airway conditions; restrictive and ventilation conditions are problems in the tissue; and perfusion conditions are problems in the circulation.

Action

Part 1 – Model a Healthy Lung

1. Wedge the Y-connector into the hole in the stopper of the bell jar.
2. Attach one balloon to each of the remaining two Y-connector's openings. These are the lungs.
3. Cut the mouth off a third balloon and stretch it across the bottom of the bell jar. This is the diaphragm.
4. Pull on the diaphragm to see the lungs expand. Push the diaphragm in to see the lungs deflate.

Part 2 – Lung Diseases

1. Assign one disease to each group.
 - a. COPD
 - b. Asthma
 - c. Pulmonary Fibrosis
 - d. Cystic Fibrosis
 - e. Pulmonary Hypertension

2. Use the worksheets provided to do some preliminary research on that disease.

Part 3 – Match The Disease

3. Make a set of modifications to the models, and then have students answer questions on the worksheet.
 - a. Airway Condition:
 - i. Roll up a sheet of paper so it fits inside the branches of the Y-connector.
 - ii. Tape it to that shape and cut sections to size.
 - iii. Slide the paper rolls inside the Y-connector and reattach the balloon lungs.
 - b. Tissue Condition:
 - i. Replace the latex balloons with water balloons of a similar size.

Consolidation/Extension

Have students research treatments for these different conditions. What do those treatments change in the lungs, or in another part of the body, which improve these conditions?

Discuss the social elements of lung disease. How can our environment impact our health? Who might be at greater risk of social and environmental causes for lung disease? Indigenous children are disproportionately impacted by respiratory illness; what environmental and social factors might be related to that? How can we improve social and environmental conditions to reduce instances of respiratory illness?

Additional Resources

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<https://europeanlung.org/wp-content/uploads/2023/12/Modelling-the-Mechanism-of-Breathing-Teacher-Demonstration-Guide.pdf>

<https://www.youtube.com/watch?v=-oHlcuS7AeU&t=13s> - Pulmonary disease explainer

<https://www.youtube.com/watch?v=YD9Lhx2W5Jg> - Obstructive vs restrictive pulmonary conditions

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<https://www.youtube.com/watch?v=NkeDqng1umI> - Explication des types des maladies des poumons

<https://www.youtube.com/watch?v=ni47GHVcJRI> - les infections respiratoires