

Class: Grade 11 Biology

Lesson Title: Respiratory System Kinulation

Class Size: 24
Time: 60 mins

Curriculum Outcomes:

16-7, 212-6, 215-2, 213-5, 317-1: Investigate the structures and mechanics of respiratory system.

Learning Objectives:

1. Students will understand the process of the air travel through the respiratory system.
2. Students will get a first hand experience of what it is like to be oxygen and carbon dioxide molecules entering and exiting the system.

Materials:

- Masking tape
- Markers
- 2 Cups
- Water
- String
- 1-2 Blow dryers
- Nametags for student roles
 - 2 filters
 - 2 moisteners
 - 1 warmer
 - 5 dust
 - CO₂ (enough for the whole class)
 - O₂ (enough for the whole class)

Preparation beforehand:

- Create nametags for student roles in the respiratory system
- Fill the 2 cups with water
- Make sure hairdryers are plugged in and can reach to where the activity is taking place
- Tape the floor in a tube like structure to represent the trachea and have two branches off of it to represent the bronchi. Then, branch more and more from the bronchi to represent the bronchioles
- The alveoli can be represented with circles of string at the end of the bronchioles.
- See **figure 1** for an example of how to tape the floor. You can limit it to a few bronchioles if you are short on space.

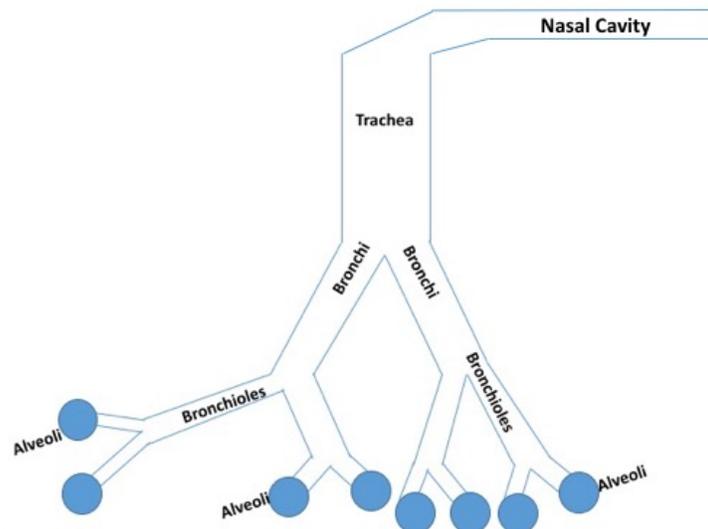


Figure 1

Introduction:

- Introduce the topic. Possible prompt questions include:
 - What exchange is occurring when we breath? (oxygen in, carbon dioxide out)
 - Where can oxygen enter our body? (nasal cavity or mouth)
 - Where does the air travel once it is in our nasal cavity? (bronchi)
 - Where does it go after that? (bronchioles)
 - Where does the actual exchange of gases occur? (alveoli)
 - Does anything happen to the air when it is in our nasal cavity? (moistens, warms, filters)
- Explain what a kinulation is (broken up into kinesthetic and simulation). Tell them that these are used to help students learn difficult concepts that are otherwise difficult to picture. It allows students to become part of the demonstration, and therefore easier to remember and learn. Ask students if they would like to try one.

Phase 1 – Oxygen Entering the Nasal Cavity:

1. Ask for 2 student volunteers to be the “filters”. Their job will be to remove dust particles from the pathway and make sure they do not enter the lungs
 - a. They can do this by pulling the dust students aside out of the pathway.
2. Ask two new students to be the “moisteners”. They will be moistening the oxygen that enters the system by each having a cup of water and flicking it on the oxygen molecules.
3. Have 1 student volunteer be the “warmer”. They will point the blow dryer at the oxygen molecules as they pass by and warm them before going to the trachea.
4. Next, have these student volunteers stand in the correct spots.
 - a. You can have the beginning of the nasal cavity taped anywhere in your classroom where there is room or have the opening of the nasal cavity at the classroom door (like in the video)
 - b. The filters can line up on either side of the nasal cavity, facing one another
 - c. The moisteners can line up the same way, as well as the warmer.
5. Ask for 4-5 students to volunteer to play the role of “dust”. The remaining students will be oxygen molecules.
 - a. Get these students to stand at the opening of the nasal cavity (if taped at the door, they can stand in the hallway before entering the respiratory system)
6. Explain to students that they are going to imagine that they just breathed in oxygen and this is occurring in their nasal cavity right now.
 - a. Ask the oxygen molecules and dust particles to enter the nasal cavity (walk along the taped area)
 - b. The filters should push the dust particles aside and out of the system, the warmers and moisteners should do their job to warm and moisten the oxygen
 - c. Have students stop at the beginning of the trachea

Phase 2 – Oxygen Travelling to the Lungs:

1. Explain to students that after oxygen has passed through the nasal cavity it must go to the trachea, bronchi and bronchioles
 - a. Now, everyone will get to be an oxygen molecule.
2. Once they enter the bronchi, they can choose the bronchiole path they wish to follow.
 - a. Ask students to stop when they reach an alveolus
 - b. Is everyone spread out? Is this how it occurs in real life?

Phase 3 – Gas Exchange in Alveoli:

1. Give half of the class carbon dioxide nametags and have them stand on the other side of the alveoli
 - a. Where is the CO₂ coming from? (the blood stream)
 - b. What do we want to do with the CO₂? (get rid of it as a waste product)
2. Ask students to cross over the alveoli and have an O₂ student high five a CO₂ student to show the exchange of gases.
 - a. The CO₂ can exit out of the nasal cavity by following the path back up through the bronchioles, bronchi and trachea
 - b. the O₂ will stay in the blood stream to be used by the body

Phase 4– The Whole Process:

1. Let students kinulate the entire process of respiration from beginning to end. You'll have to leave some students at the end of the alveoli to be CO₂ to begin this time.
2. Check for understanding from students (exit slip, discussion, etc.)

Conclusion – Possible wrap-up questions:

1. What does the oxygen do once in the blood stream?
2. Does this all happen at the same time? Do you breathe in and out and the same time? Does the oxygen and carbon dioxide bump into either other?
3. Where does all of the dust end up that gets filtered?