

Sec: _____ Name: _____

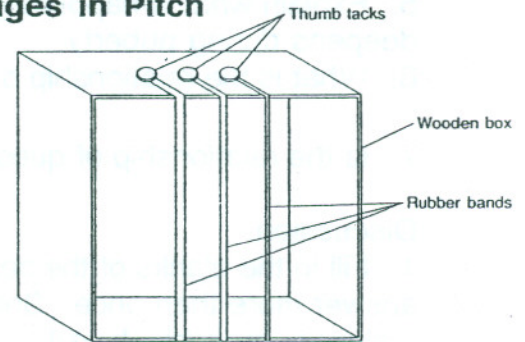
Experiment: Controlling Breathing and Pitch of Our Voice (B. Science 10-37-3f)

Purpose: To determine whether the relative amounts of CO_2 or O_2 are most sensitive to controlling breathing. Also to understand how pitch is controlled in our voice box.

Materials: three sizes of rubber bands
open box 6 thumb tacks
plastic cup seltzer tablet

Methods: **Part A: Changes in Pitch**

1. Obtain a box and place three different sizes of cut rubber bands across the opening in the box as seen in the diagram. (Use thumbtacks to attach the rubber bands).
2. Pluck the three different rubber bands one at a time and record the one with the highest pitch and one with the lowest pitch.
3. How does thickness of the rubber band and thus the vocal cords relate to the pitch of the sound produced by the vocal cords?



4. Use the middle sized rubber band and pluck it to hear the sound and see the vibrations. Now put the thumb tacks closer to each other, thus lowering tension. Pluck it to hear the sound and to see the vibrations. Record the differences of your observations when there is less tension.

Part B: Control of Breathing Rate

1. Which do you think is more important in regulating breathing, the level of oxygen in the air or the level of carbon dioxide?
2. Write a hypothesis about how your breathing will be affected if the level of carbon dioxide increases.
3. Place approximately 100 mL of water in the plastic cup and add a seltzer tablet. The Bubbles i the water are carbon dioxide. Bring the cup up to your face and inhale deeply. (Don't drink it). Describe what happened when you inhaled the carbon dioxide.
4. Air is about 21 % oxygen and about 0.04 % carbon dioxide. Did your oxygen intake or your carbon dioxide intake change more during step 3.
5. Did your results support your hypothesis or not? Explain.

Results:

Part A: Changes in Pitch

2. highest pitch: _____ lowest pitch: _____
3. thickness of vocal cord and pitch: _____
4. When the tension of the rubber band is lessened the...
pitch changes by: _____
and the vibrations changes by becoming: _____

Part B: Control of Breathing Rate

1. important : _____
2. what happened: _____
3. which gas changed: _____
4. hypothesis: _____
5. support?: _____ Explain: _____

Conclusions:

1. Describe the change in pitch when the rubber bands are tightened.
2. Describe the change in pitch when the vocal cords are tightened.
3. Describe the change in pitch when using a large rubber bands compared to a small rubber band.
4. Describe the change in pitch when using a large vocal cord compared to a small one.
5. Explain what is happening to the size of the vocal cords when a males voice deepens during puberty.
6. What is the relationship between CO₂ production and respiration rate?
7. Is the relationship of question 6 of an adaptive value? Explain

Discussion:

1. Fill in the blanks of the sentences below with answers from the list. You may use an answer more than once. Some answers may not be required.

alveoli bronchi breathe O₂ CO₂ NaOH oxygen pink trachea

The _____ divides into two bronchi. In the lungs, gases are exchanged between the capillaries and the air in the _____. The lungs function to carry _____ containing air to moist membranes through which the _____ enters the blood. During exercise more _____ passes into the lungs and is exhaled. _____ gas is emitted into the air when seltzer tablet is added to water. When we inhaled carbon dioxide it made us feel like we had to _____.

- 2a. Quote portions of Rom. 12: 1, to describe what our "spiritual act of worship" is?
- 2b. Quote portions of I Cor. 6:13 to describe what the body is meant for.
- 2c. In I Cor. 6: 15 - 17 Paul encourages us to unite ourselves "with the Lord is one with him in spirit." What illustration does he use to help us see that we should not unit with things of this world but unit with Christ?
- 2d. Quote I Cor. 6: 19 - 20 to help us understand how we should treat our bodies.
 - 19
 - 20
- 2e. Read II Cor 6:16 where Paul once again relates our bodies as a temple of the living God. Seventh - day Adventists have been teaching people to not smoke decades before modern science started to teach the same. Relate the previous Bible texts to the SDA's appeal to not smoke.