

LUNG CAPACITY

Explain to students that they will measure their tidal volume and vital capacity experimentally and also use a formula to calculate their theoretical expected vital capacity.

Provide each small group with the following materials:

- a large pan or tank of water,
- a plastic jug marked incrementally every 250 ml and filled with water (jugs may be calibrated by adding water 250 ml at a time and marking the side at the water level)
- a plastic tube and alcohol wipes to clean the tube.

Next, provide the following procedures and facts for determining lung capacity (copied into a handout):

Determining experimental tidal volume and vital lung capacity:

- First, invert the plastic jug into the tank of water so that no air enters the jug.
- Insert one end of the tube into the mouth of the bottle, leaving the other end out of the tank.
- Holding your nose, exhale a normal breathe into the tube and measure the amount of water displaced. This is tidal volume.
- Fill the bottle with water and repeat.
- Find and record the average of your two results.
- Refill the bottle with water.
- Holding your nose, inhale deeply and exhale as much as you can through the tube. This is vital capacity.

- Again, refill the bottle and repeat to find an average vital capacity.
- Clean the tube and repeat procedure with other group members.

Determining theoretical expected lung capacity:

This can be calculated using weight and height by following the following formula:

- Height in cm x weight in kg = _____
 - Divide this number by 3600 cm kg/m⁴ = _____
 - Find the square root of this number = _____.
- This is your body surface area (BSA).

- To find the vital capacity, males multiply the BSA by 2500 and females by 2000.
- Theoretical vital capacity = _____.

Express each individual's lung capacity as a ratio by dividing your experimental vital capacity by your theoretical vital capacity.

This enables comparison between and among classmates' values, as it accounts for natural variation in the size and sex of people.

Anonymously, by assigning random numbers or letters to students, write each student's number in a class chart on the board.

Facts about lung capacity:

- Age, gender, weight and activity level all affect a person's lung capacity.
- Lung capacity is largely determined by heredity and genetics.
- Average total lung capacity is 5.8 liters or 5800 cubic

centimeters.

- Elite endurance athletes, such as cyclists, can have total lung capacities as high as 8 liters or 8000 cubic centimeters.
- Tidal volume is the volume of air released in a normal breathe.
- An average person has a tidal volume of 0.5 liters.
- Vital capacity is the maximum amount of air that can be released with a forceful breath
- Typically 75% of total lung capacity, since the lungs will never empty completely.

Adapted From:

[Science Buddies](#)