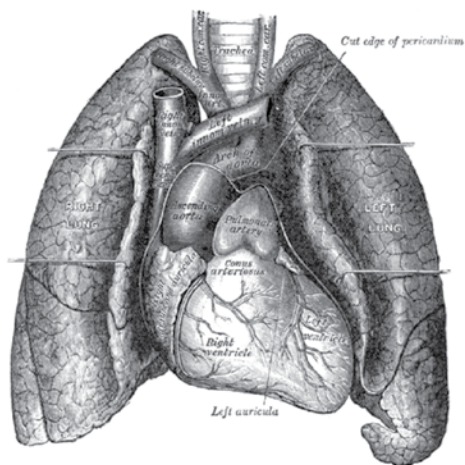


Endurance and Lung Capacity



Lung capacity, or the amount of air your lungs can hold, is an important factor in your body's endurance. In many sports, endurance is the key to success. This activity is one method of measuring lung capacity.

Stuff You'll Use: ▶ 1 gallon (3.8-L) milk or water jug with lid ▶ rubber tube
▶ 10-quart (9.5-L) dish pan ▶ measuring cup ▶ straws (1 per student) ▶ funnel

What to Do:

- 1 Fill the dish pan with water to a depth of 2 inches (5 cm).
- 2 Fill the jug with water. Top the jug off with water from the dish pan using the measuring cup and funnel. The water should bulge over the rim of the jug. *What property of water allows it bulge over the top of the rim?*
- 3 Put the cap on the jug. (Because the jug is completely full, some water should spill out.) Little or no air should remain in the jug.
- 4 Making sure the lid is secure, turn the jug upside down. Put the mouth of the jug below the water level in the dish pan. Reach under the water to remove the lid, being careful that the mouth remains under water.
- 5 Put one end of the rubber tube into the jug. Place a straw into the other end so that at least half of the straw sticks out from the tube.
- 6 Have your partner or test subject take a deep breath, hold the nose closed, and blow out all of the air in the lungs into the straw. Make sure your subject completely exhales all the air possible. *What happens to the water in the jug?*
- 7 Reach under the water and put the jug lid back on. Take the jug out of the water and set it upright. The subject's lung capacity is the same as the amount of water in the jug that was displaced by air. Determine this by measuring the amount of water that's needed to completely refill the jug, using the measuring cup, funnel, and water from the dish pan. If the subject is able to empty all of the water from the jug, just call the lung capacity "greater than 3.8 L."
- 8 For best accuracy, repeat steps 2–7 three times and find the average. Enter the information in a data table.
- 9 Compare your test subject's lung capacity to that of others in the class. Compile a list of characteristics, such as height, age, gender, and sports participation. See if lung capacity increases with any of the characteristics you choose. Draw a graph of your data with lung capacity as the vertical axis and your selected characteristic on the horizontal axis.

Sample data table

Test Subject:	
Trial	Lung Capacity (L)
1	
2	
3	
Average	



How It Works:

When you blow air from your lungs into the jug, the air displaces an equal volume of water, which flows out into the dish pan. That's why it's important to completely fill the jug and remove any extra air. You are able to fill the jug above the rim because water has a property called surface tension.

If you could completely empty your lungs, then the amount of water displaced would equal your total lung capacity, which is about 1.6 gallons (6.0 L) for an

average adult. In reality, it is impossible for people to empty all of the air from their lungs. What this activity measures is called vital lung capacity, which is about 1.2 gallons (4.6 L) on average.

Lung capacity varies with gender and body size, so you'll probably find the highest lung capacity in adults and large adolescent males. Depending on the group of people you are testing, you may find many subjects who have no problem blowing all of the air out of the jug.

People can increase their lung capacity through training, so you may find that classmates who participate in competitive sports have a higher lung capacity than those who don't, other factors being equal.

