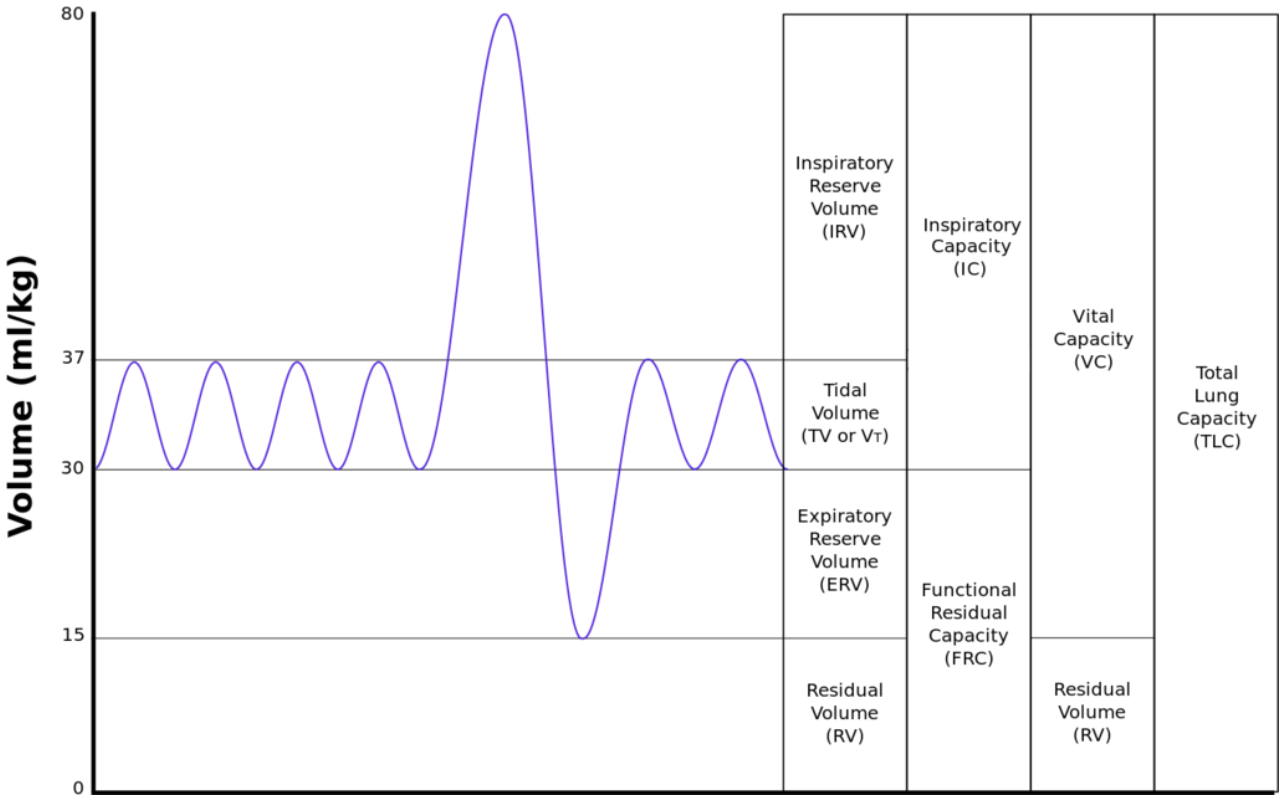
5.2.4

# Respiratory Volumes and Capacity

Ventilation efficiency can be measured by looking at how much air a person can breathe in or breathe out at rest and during deep breathing and forced expiration over a given period of time. In lab, we will be exploring these lung volumes and capacities in greater depth. Below you will see a graph that illustrates and defines various lung volume measurements:




***Lung Volumes.***

*Lung Volumes Updated. Wikipedia. Link: https://en.wikipedia.org/wiki/File:Lungvolumes_Updated.png License: Creative Commons Attribution-ShareAlike license version 3.0.*

**Total Lung Capacity** is the total amount of air inside the lung, including the air remaining in the lung that cannot be exhaled (Residual Volume). **Vital capacity** is the maximum amount of air a person can exhale after inhaling as much air as possible. The lungs have extra room to account for these deep breaths and this is known as the Inspiratory and Expiratory Reserve Volume. Just as the tides or waves of the ocean typically come in and out at a fairly constant rate, the **tidal volume** of air refers to the regular amount of air inhaled and exhaled during normal breathing at rest.

One of the most important tools for diagnosing lung capacities is the **FEV1/FVC ratio.** The forced expiratory volume (the maximum amount of air you can breathe out after a deep breath) is measured for 1 second (FEV1) and compared to the total volume of air that can be exhaled during a forced expiration or Forced Vital Capacity (FVC). In a healthy individual this ratio should be around 80%. If the ratio is below 80% there may be something obstructing the air flow out, such as chronic obstructive pulmonary disease (COPD) or an asthma attack that narrows the airway passages and causes wheezing as the air is exhaled. These conditions are known as **obstructive lung diseases.**

**Restrictive Lung Disease** is any condition that restricts or prevents a person from fully expanding their lungs to get a deep breath. Conditions that fall into this category include severe scoliosis, obesity or neuromuscular disease such as muscular dystrophy that prevents the full use of the muscles of respiration, as well as interstitial lung diseases like pneumonia or fibrosis that causes inflammation or scarring on the interstitium that restricts the alveoli or lungs from expanding. Typically, a person with restrictive lung disease will still have close to normal FEV1/FVC ratio around 80% because even though their total volume that they can inhale is reduced, they usually have no problem exhaling.

Total lung capacities can vary on gender, age, race, and health condition. If a person has a larger body and can expand their chest cavity to allow more volume of air in their lungs they will have greater lung capacity than a smaller person. Additionally, if a person has any condition that makes breathing more difficult it will decrease their lung capacities.