**Virtual Lab: Pulmonary Function Tests**

* Completion of this laboratory requires that you have some prior basic knowledge regarding lung volumes.
* Air flow can be measured to create air flow-volume loops and diagnose lung diseases.
* A respirometer can be used to measure lung volumes and capacities.



Figure Respirometer

* In this lab, you will perform respirometry on several patients to perform pulmonary function tests and diagnose pulmonary diseases.
* The computer screen in the lab will have two tabs with reference material:
	+ Lung Function Diagnosis: a chart of measured lung values and diagnosis parameters.
	+ Disease Diagnosis: a chart of patient histories and symptoms that indicate diseases.
* Average values given in this simulation are for a healthy adult male patient.
* Obstructive lung disorders result in a flow of air that is less than it should be.
* Restrictive lung disorders have a normal flow of air but a low vital capacity and low inspiratory and expiratory volumes.
* Use the patient history chart to formulate a hypothesis regarding each patient.
* Use the lung volume test and flow-volume loop analysis to diagnose each patient.

Make sure you are comfortable with the following terms:

**Tidal volume (TV)**

Volume of air in each breath during regular breathing.

**Inspiratory reserve volume (IRV)**

The additional volume of air that can be moved into the lungs above tidal volume.

**Expiratory reserve volume (IRV)**

The additional volume of air that can be moved out of the lungs below tidal volume.

**Vital capacity (VC)**

The total amount of movable air. This is TV+IRV+ERV.

**Forced vital capacity (FVC)**

The total amount of air forcefully exhaled from fully inflated lungs. This is how vital capacity is measured.

**Forced expiratory volume 1 (FEV1)**

The percentage of the FVC that is expired in 1 second.

**Forced expiratory flow 25-75 (FEF25-75)**

The average flow rate of the middle half of the FVC.

Understand the graph shown below.



Figure Normal flow-volume has rapid rise with inhalation then linear fall as person exhales. Obstructive disease has decreased air flow and prolonged non-linear exhalation. Restrictive disease has significant decreased inhalation and exhalation volumes.

* Flow-volume loop analysis will confirm the diagnosis of an obstructive or restrictive lung disease.
* Pulmonary volume tests are used in conjunction with flow tests (FEV1 and FEF25-75) to differentiate obstructive and restrictive lung diseases.