

**BME 5010 – Engineering Physiology**  
**Pulmonary Function Tests – Virtual Laboratory**

This lab is designed to allow you to explore the effect of lung physiology and mechanical properties on respiratory volumes and function. Please work through all of the exercises outlined below. You are then welcome to explore the SimBioSys program as much as you wish.

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1. Start the SimBioSys PFT program. One of the Help windows will be visible, giving you an introduction to the program and a way to step through the various exercises. The first “Chapter” is an introduction to the SimBioSys interface. Take the two minutes to read this and become familiar with the interface. [Note: The way that the simulation works is to maintain a baseline performance until either 1) the patient is asked to do something (such as take the biggest breath possible and then blow it all out) or you perturb a variable (such as lung compliance).]
2. (Chapter 2, Lesson 1) Define the following terms, determine their standard abbreviations, and identify how the various volumes are determined from a spirometer tracing:
  - a. Spirometer
  - b. Vital capacity
  - c. Inspiratory capacity
  - d. Expiratory reserve volume
  - e. Tidal volume
  - f. Total lung capacity
  - g. Functional residual capacity
  - h. Residual volume
3. (Chapter 3, Lesson 1) Define the following terms, determine their standard abbreviations, and identify how the various quantities are determined from a spirometer tracing:
  - a. Forced Expiratory Volume in 1 Second
  - b. Forced Vital Capacity
  - c. Forced Expiratory Volume Percent in First Second
  - d. Forced Expiratory Flow from 25 – 75% of Vital Capacity
4. (Chapter 3, Lesson 1) Conduct the following exercises:
  - a. Effect of Airway Narrowing
5. (Chapter 3, Lesson 3) Read the section on Flow-Volume Loops
6. (Chapter 6, Lessons 1-4) Conduct the following exercises:
  - a. Lung Statics in Restrictive Disease
  - b. Flow-Volume Loop in Restrictive Disease
  - c. Lung Statics in Emphysema
  - d. Flow-Volume Loop in Emphysema
  - e. Lung Statics in Bronchitis
  - f. Flow-Volume Loop in Bronchitis
  - g. Flow-Volume Loop in Asthma