

Lecture 12: Respiration (Spirometers)

0. Review

1. Basics of Lung Anatomy

2. Spirometers

3. Pneumotachometers

- PreLab 5 due at lab session

- Thu: HW 5 due

- Lab 4 report due Fri (Feb 21)

★ Ellis Hospital Tour

Mar 10 (Tue)

GROUP 1: 12:45 - 2:30 PM

2: 2:45 - 4:30 PM

★ Student presentations (Mar 10 + 12)

→ Teams of 2-3 students (3 is preferable)

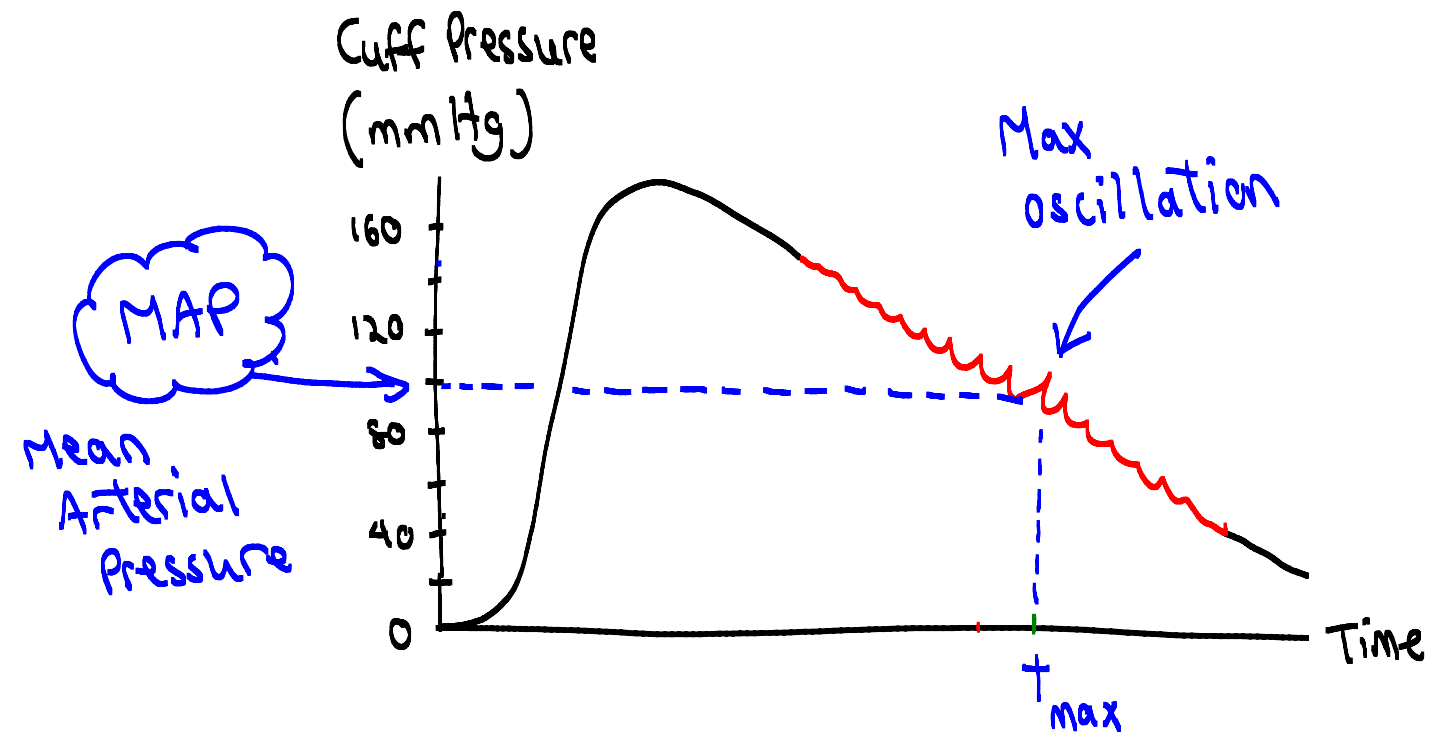
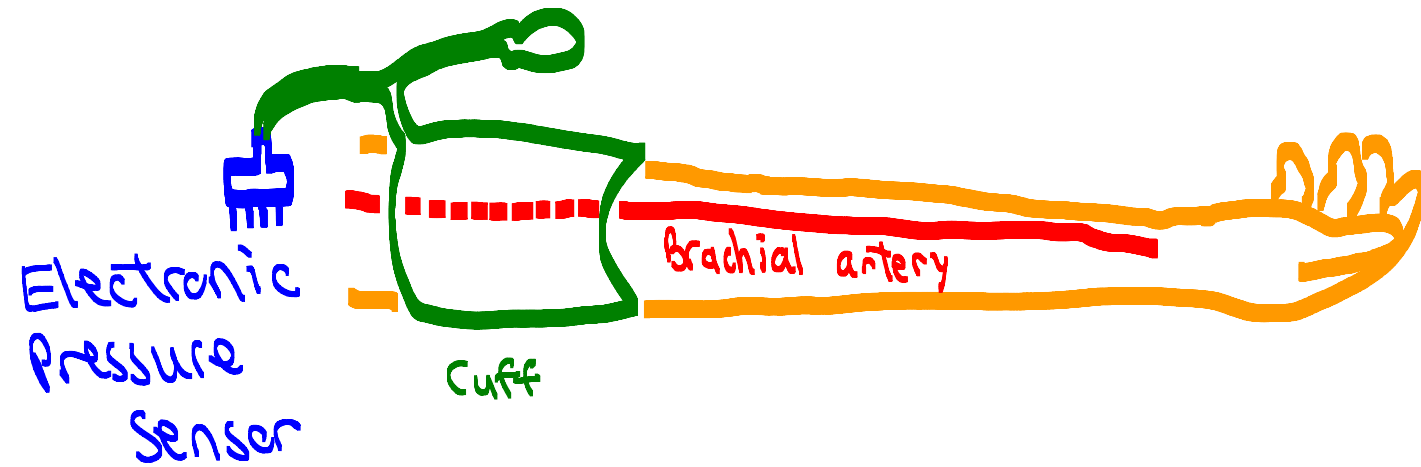
→ 15 min powerpoint

- Disease or medical condition
- Electronic instrumentation

← See course website
for guidelines

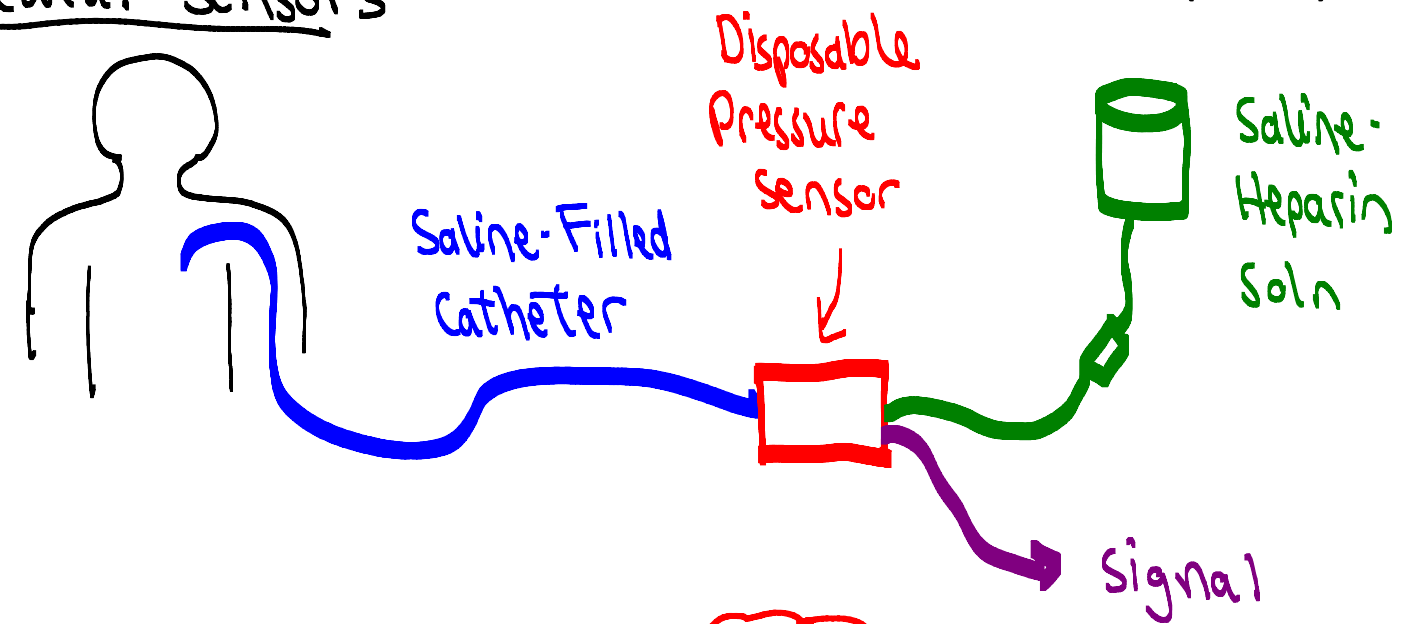
0. Review

① Oscillometric Method



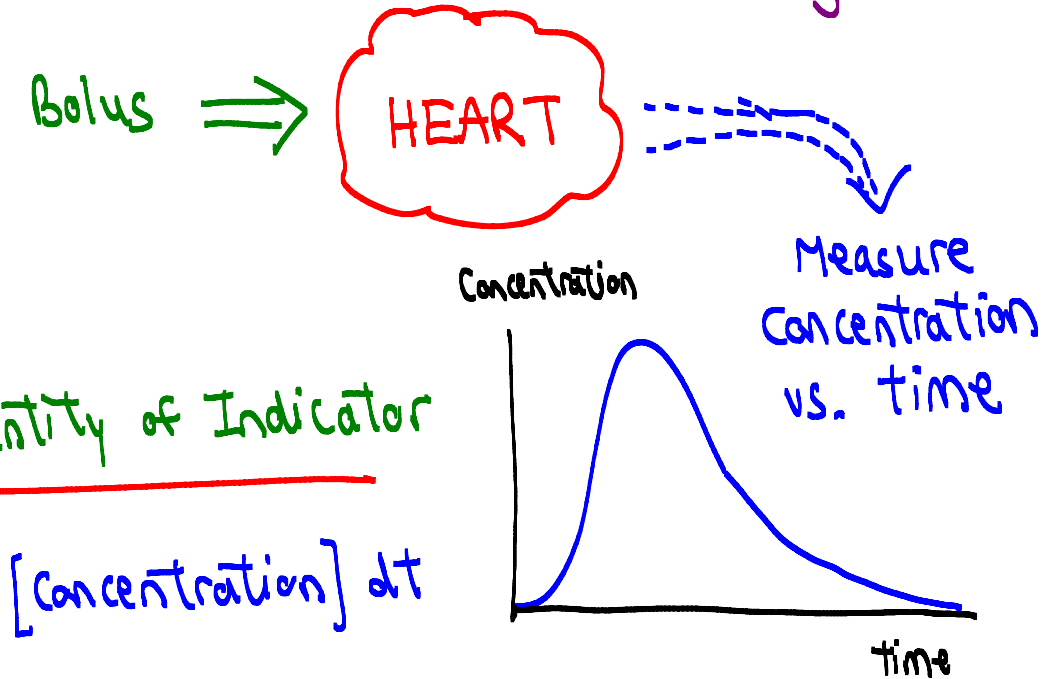
② Extravascular Sensors

(12.0)



③ Cardiac Output

Liters/min



Indicator Dilution Method

$$F = \frac{\text{Quantity of Indicator}}{\int [\text{Concentration}] dt}$$

Thermodilution is common technique

1. Basics of Lung Anatomy

• Purpose of respiratory system:

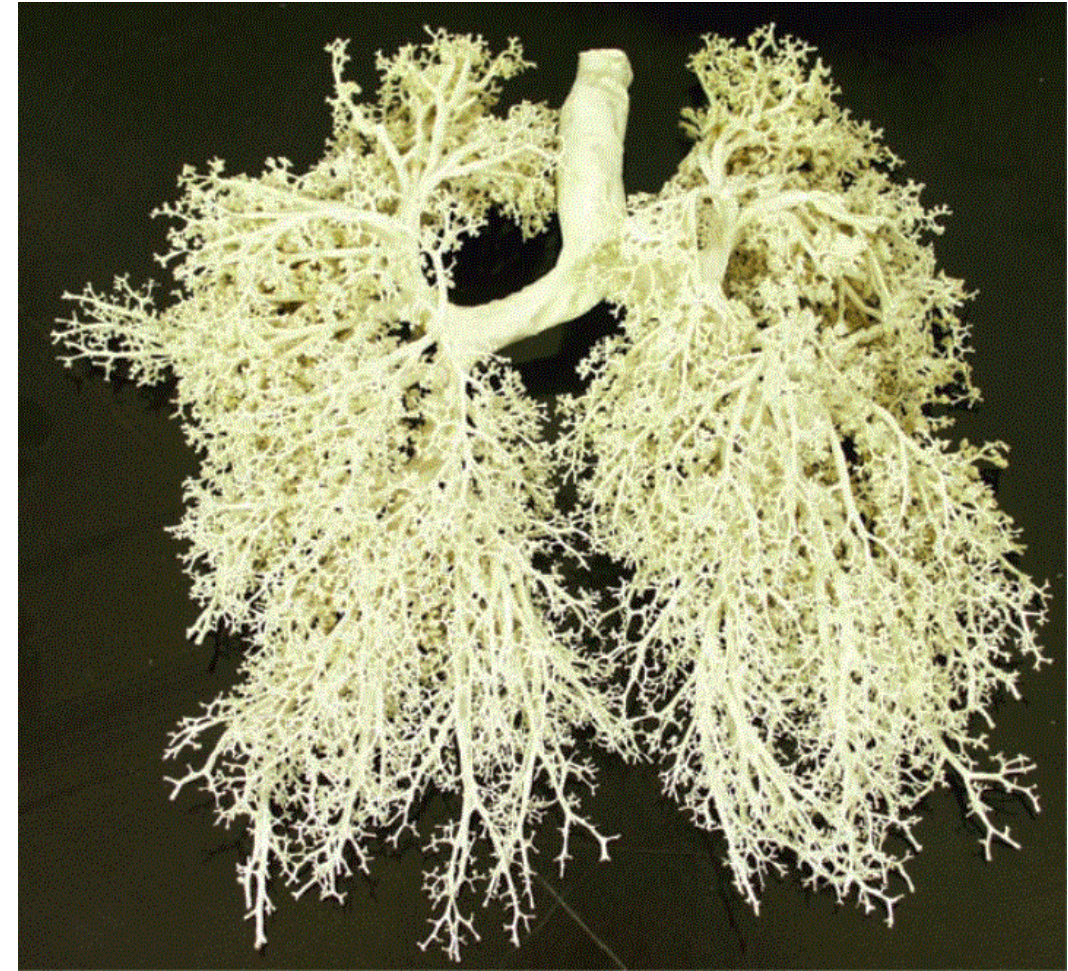
①

②

Ventilation

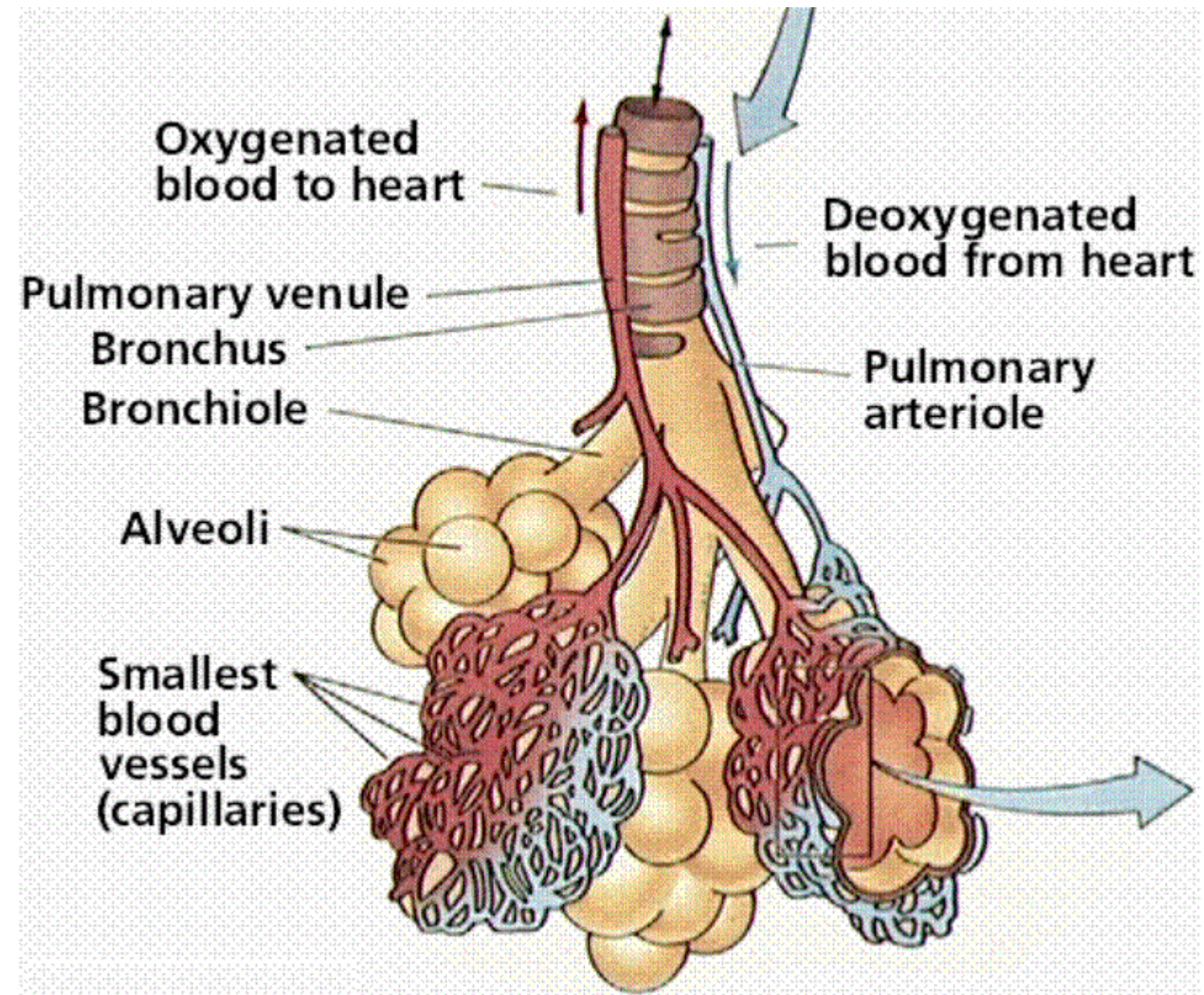
Breathing Rate

(12.1)



F. deJongh, Breathe, pp. 251-254 (2008)

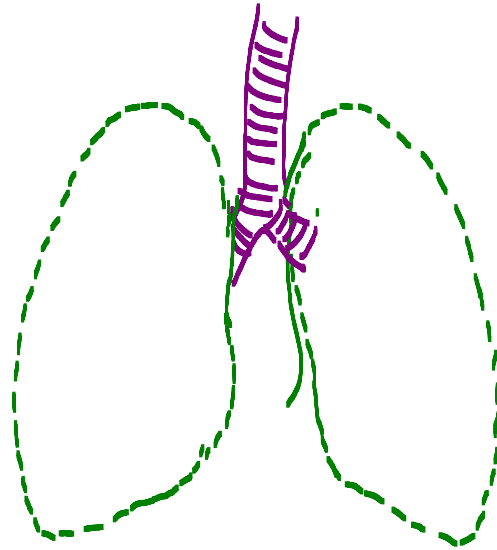
- Bronchial Tree + Pulmonary Vasculature



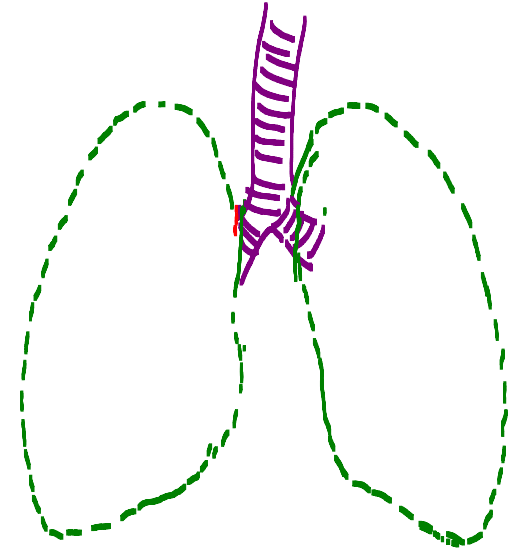
emc.maricopa.edu

- Ventilation

INSPIRATION

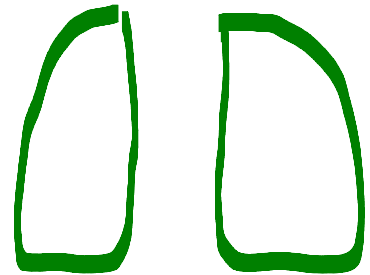


EXPIRATION

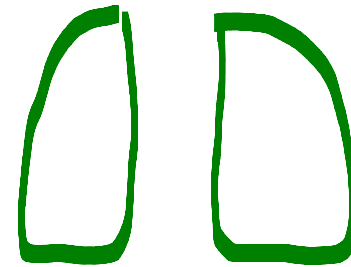


• Lung Volume Parameters

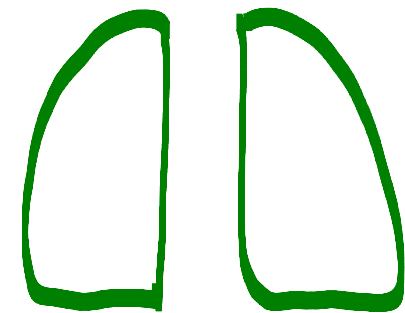
① Tidal Volume



② Inspiratory Reserve Volume



③ Expiratory Reserve Volume

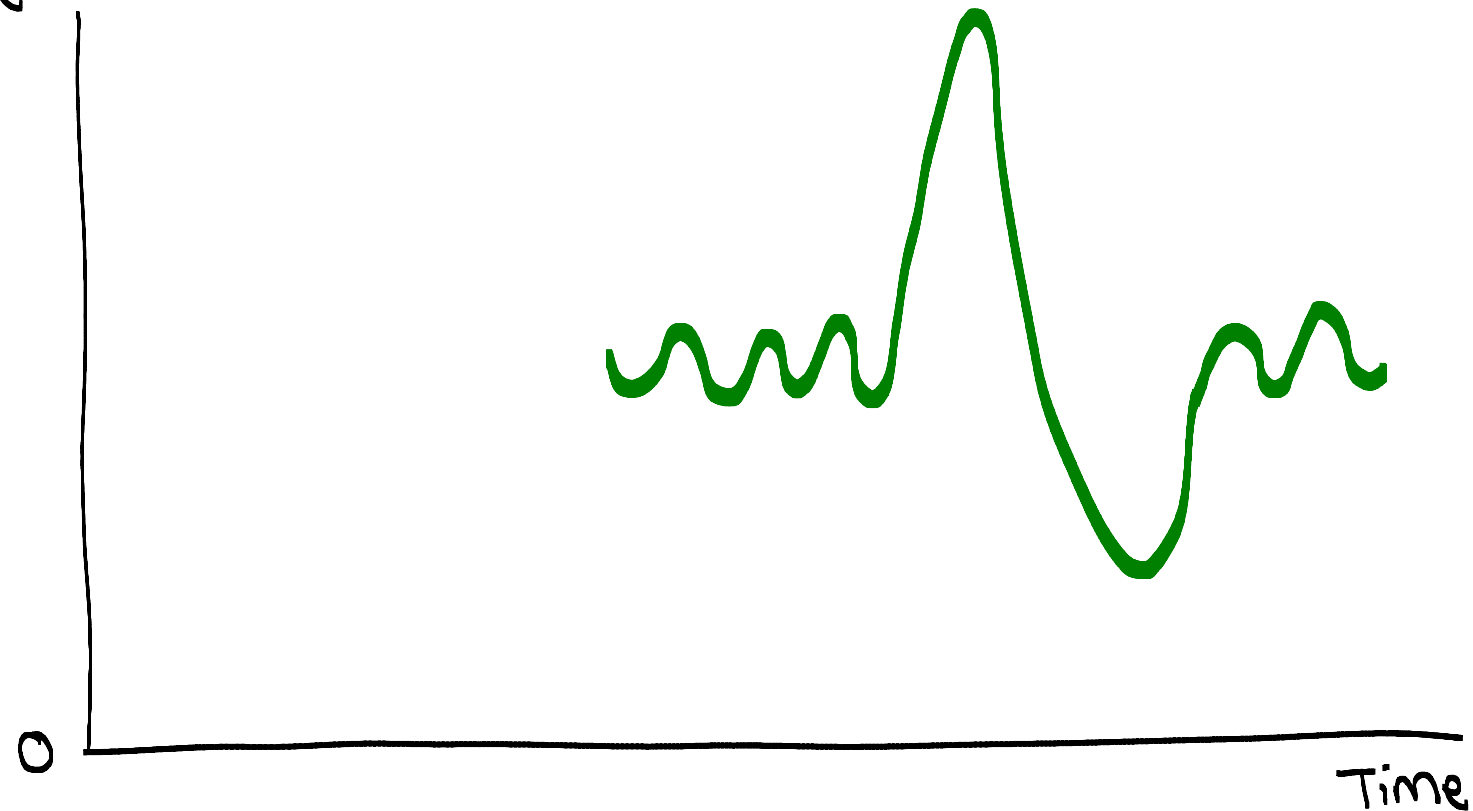


Summary of
lung volume
parameters

Absolute
Volume

Change
in
volume

Lung
Volume

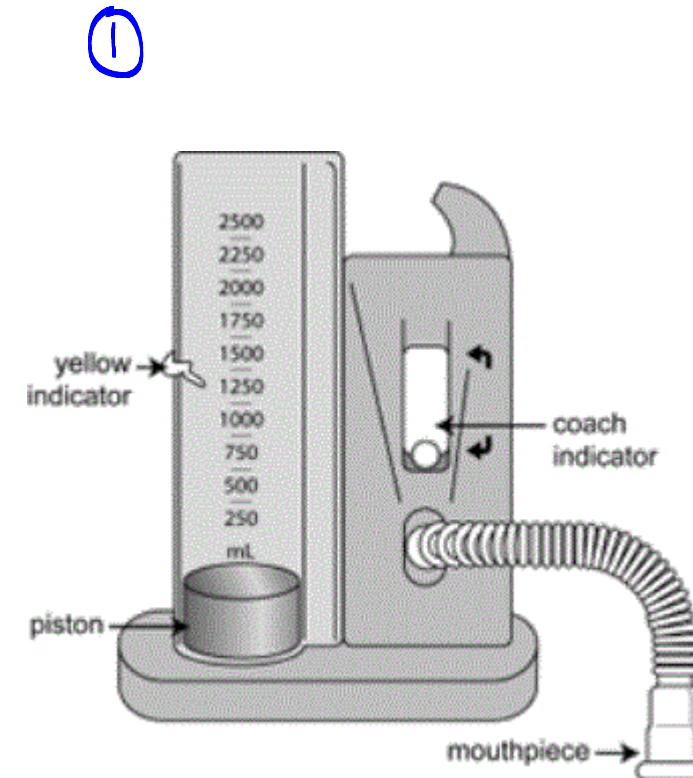


2. Spirometers

- Spirometry: Medical screening test that measures

① Subject is asked to perform a

② Inhaled + exhaled air are measured by a

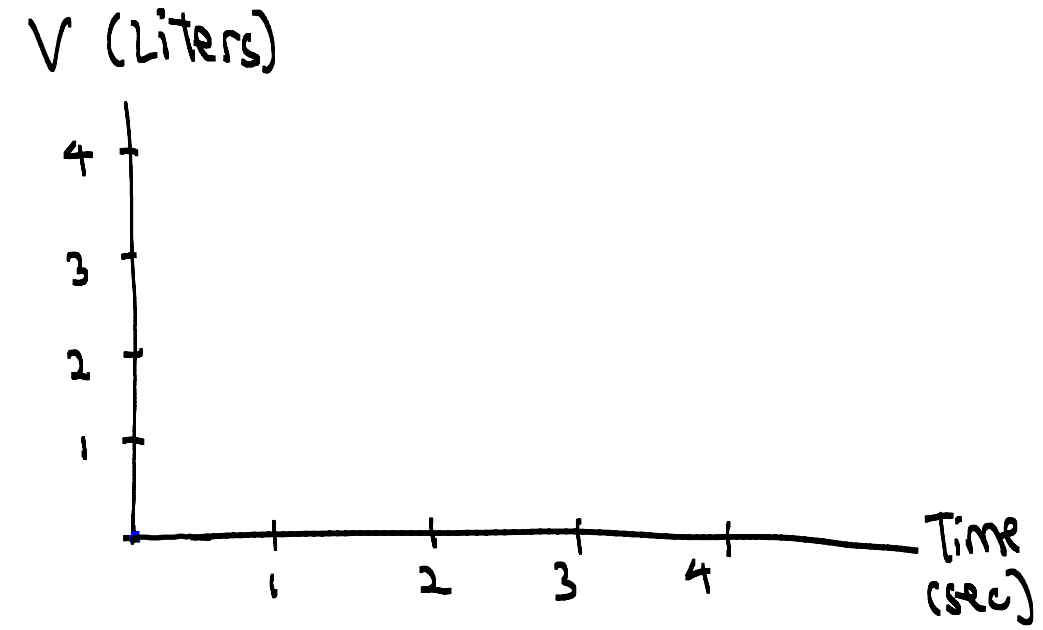


my_clevelandclinic.org



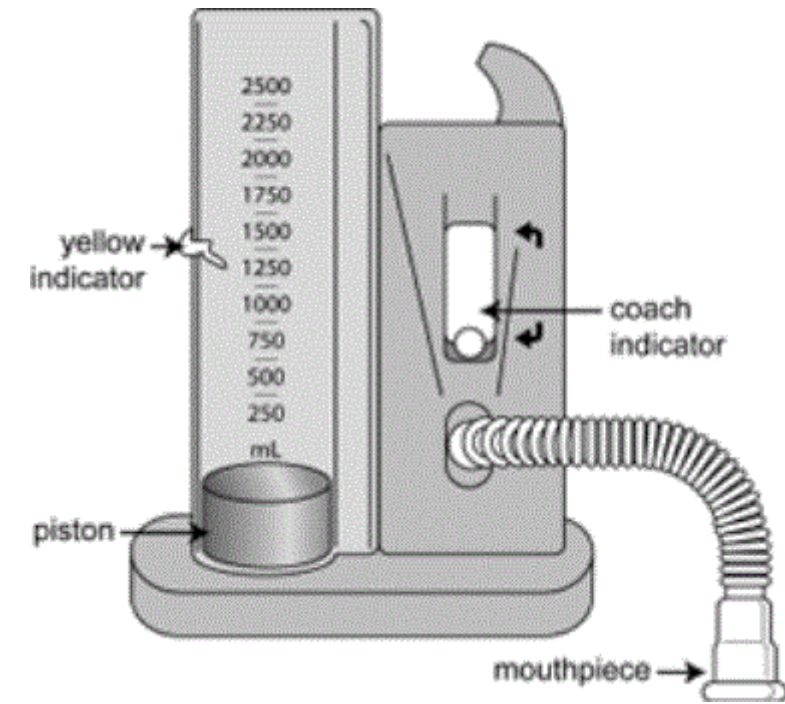
wikipedia

• Volume Measurement



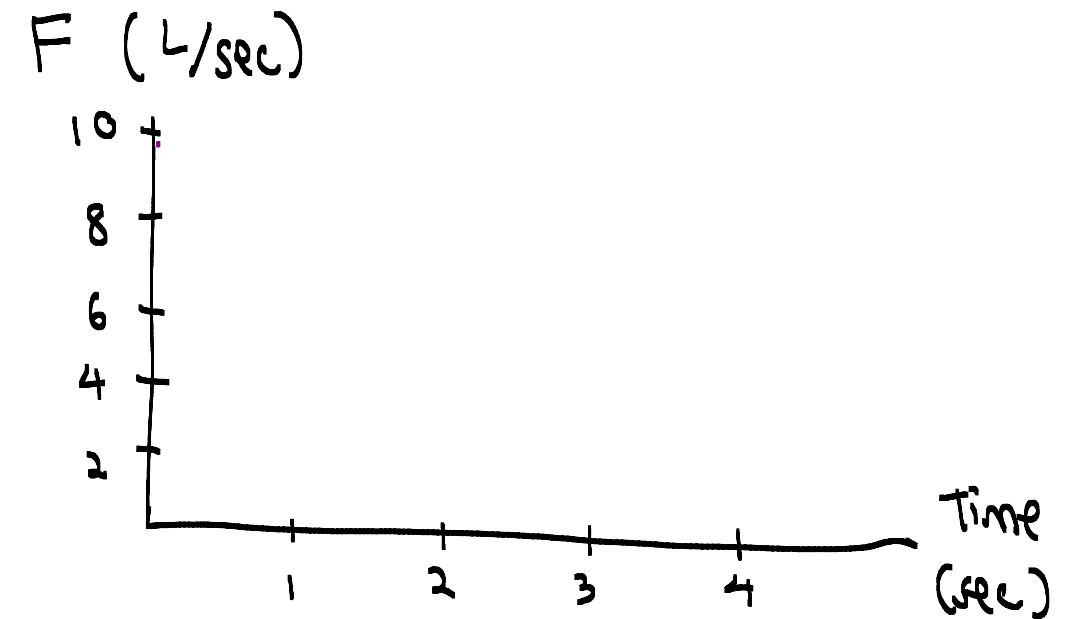
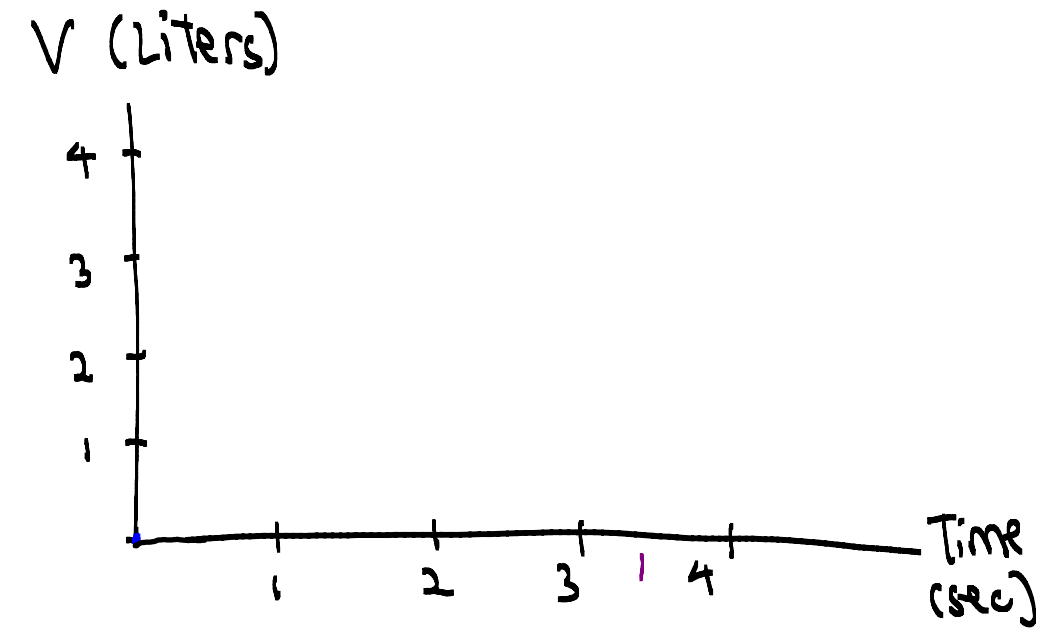
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- Flow Measurement

Q: How to measure flow (L/sec)
with a volume spirometer?

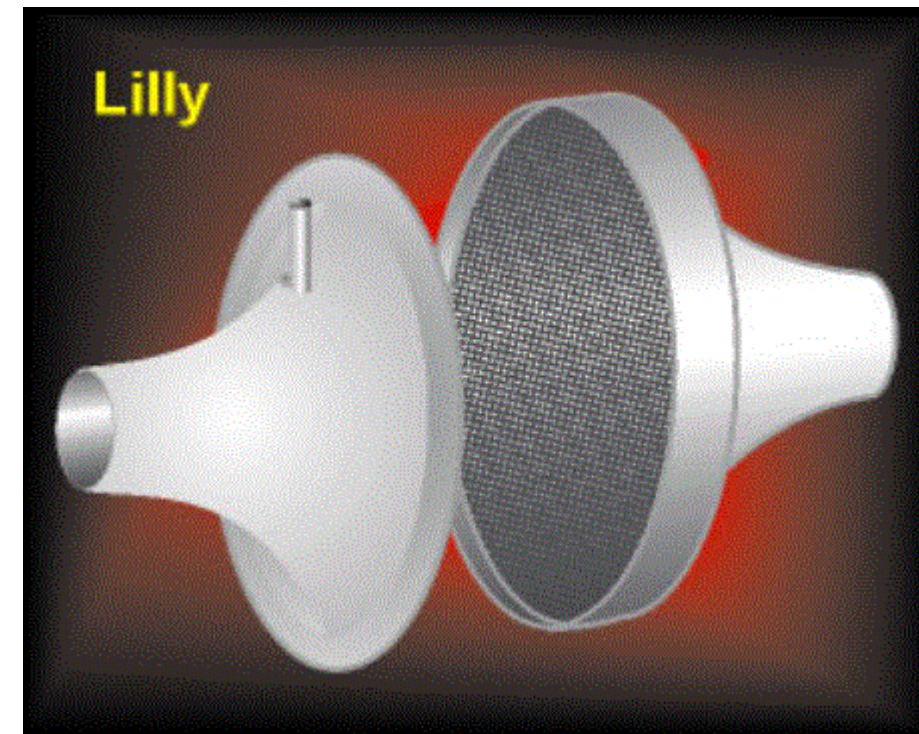


3. Pneumotachometers

Pneumotachometers measure flow by

①

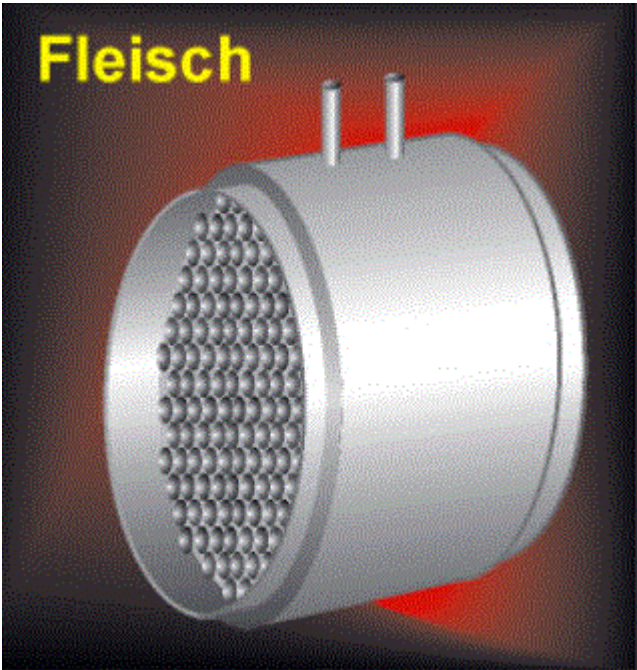
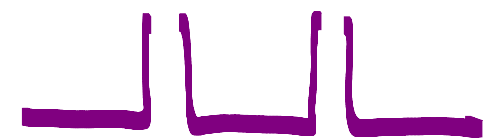
(12.9)



www.spirexpert.com

② Fleisch:

(12.10)



www.spirexpernt.com

③ Turbine (Rotary vane)

- Air flow
- Blades
- Rotating vane

