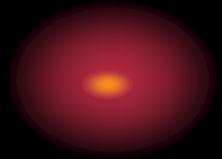


Student Spirometry



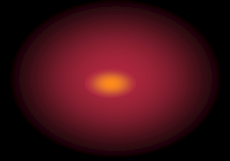
OBJECTIVES:

To be able to:

- a. use a spirometer and determine lung volumes and capacities,**
- b. define and provide normal values for the various lung volumes and capacities and**
- c. recognize the physiological and some pathological factors that modify lung volumes and capacities.**



APPARATUS: Spirometer



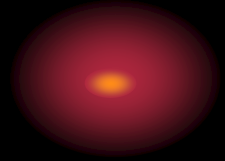
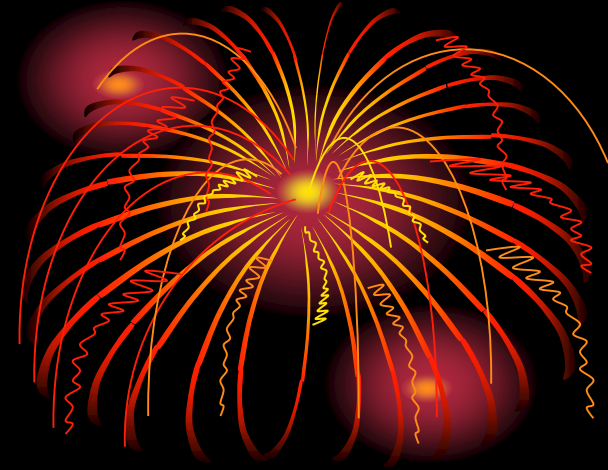
Cont... spirometer

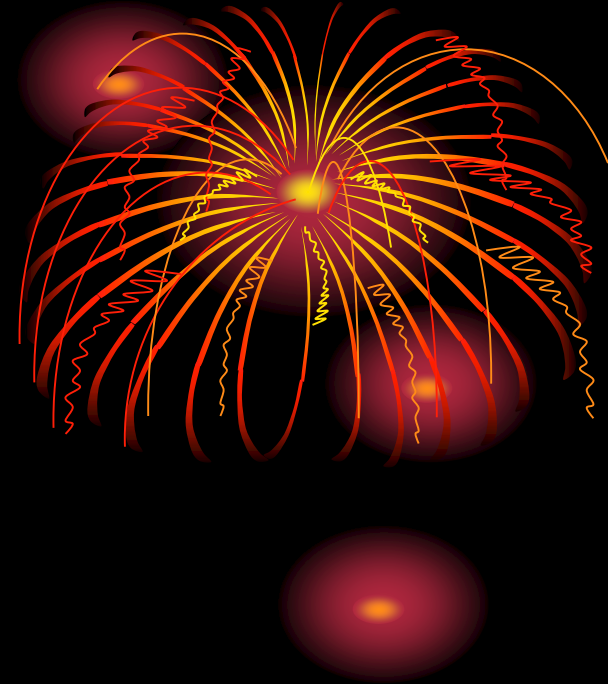
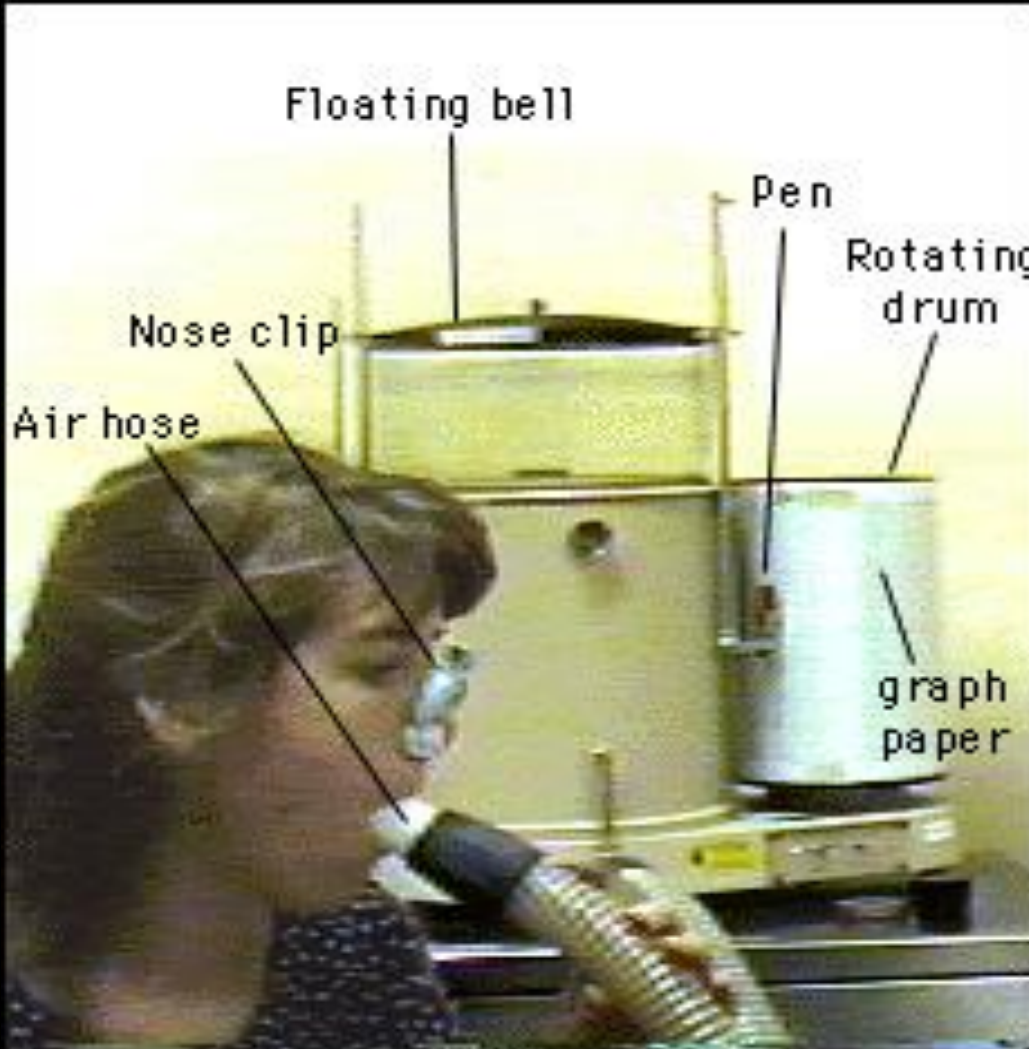


METHOD:

Insert a sterilized mouthpiece in such a way that the edges of it are between the subject's lips and gums.

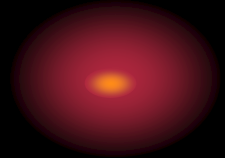
- 1. Close the nose with the nose clip. Ask the subject to take normal breaths through the mouthpiece for a short time, then take a deep forceful inspiration to fill the lungs completely, then breath normally for a short time.**







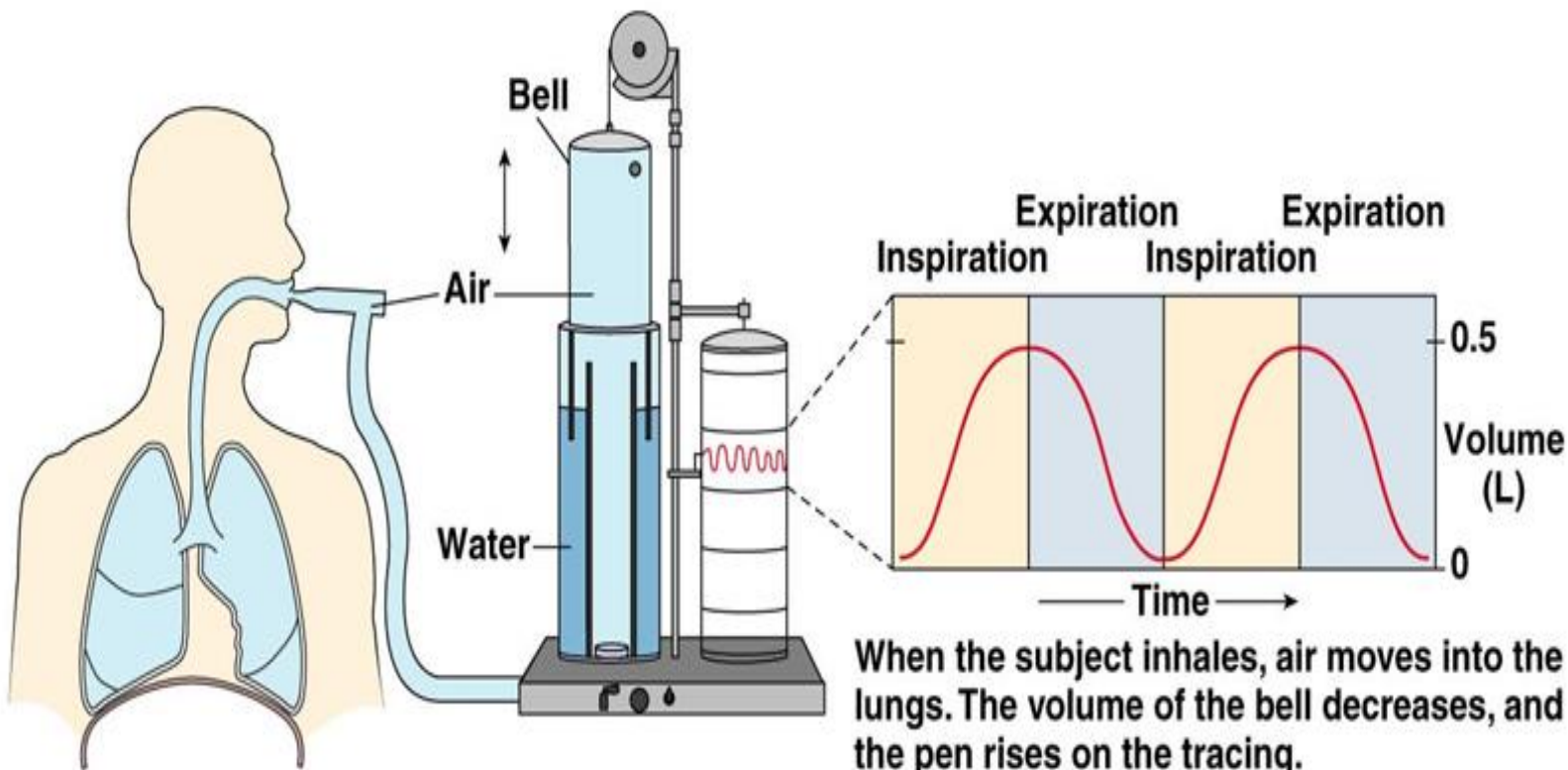
2. Ask the subject to expire quickly, forcibly and as completely as possible, then ask the subject to breath normally for a short time.



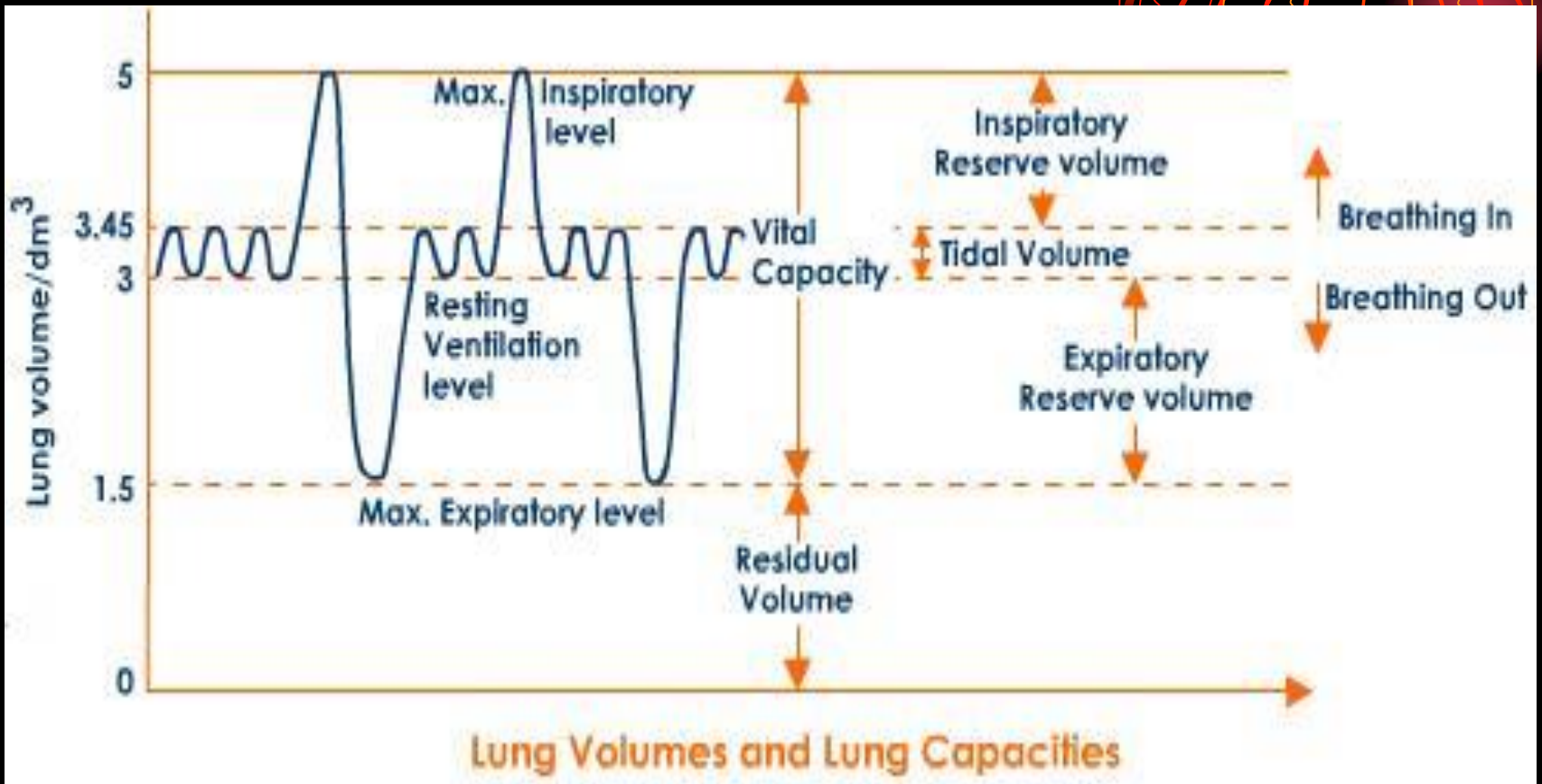


3. Ask the subject to take a deep forceful inspiration and immediately to expire quickly, forcibly and as completely as possible, then ask the subject to breath normally for a short time.

The spirogram is recorded on a moving drum.



When the subject inhales, air moves into the lungs. The volume of the bell decreases, and the pen rises on the tracing.





LUNG VOLUMES AND CAPACITIES:

1. TIDAL VOLUME (TV)

- **volume of air inspired or expired with each normal breath.**
- **N = 500 ml (male and female)**

2. INSPIRATORY RESERVE VOLUME (IRV)

- **the extra volume of air that can be inspired by a maximal inspiratory effort after normal inspiration.**
- **N = 3.3 L (male)**
1.9 L (female)

3. EXPIRATORY RESERVE VOLUME (ERV)

- **the extra volume of air that can be expired by forceful expiration after the end of a normal tidal expiration.**
- **N = 1 L (male)**
700 ml (female)

4. VITAL CAPACITY (VC)

- **maximum amount of air a person can expel from the lungs after first filling the lungs to their maximum extent and then expiring to the maximum extent.**
- = TV + IRV + ERV**
- **N = 4.8 L (male)**
3.1 L (female)



5. INSPIRATORY CAPACITY (IC)

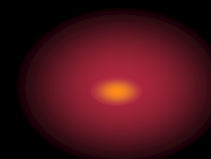
- **volume of air inspired by a maximal inspiratory effort after normal expiration.**
- **TV + IRV**
- **N = 3.8 L (male)**
2.4 L (female)

6. FUNCTIONAL RESIDUAL CAPACITY (FRC)

- **the amount of air that remains in the lungs at the end of normal expiration.**
- **ERV + RV**
- **N (average) = 2.3 L**

7. RESIDUAL VOLUME (RV)

- **the volume of air remaining in the lungs after the most forceful expiration.**
- **N (average) = 1.2 L**





Physiological factors that influence lung volumes and capacities:

1. Age

- **↑ RV, ↑ FRC with ↑ age**
- **↓ VC with age**

2. Sex

- **females have 20 – 25% less values in all pulmonary volume and capacities than males.**

3. Body size

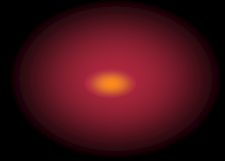
- **obese – ↓ FRC because there's ↑ elastic recoil of the lungs**

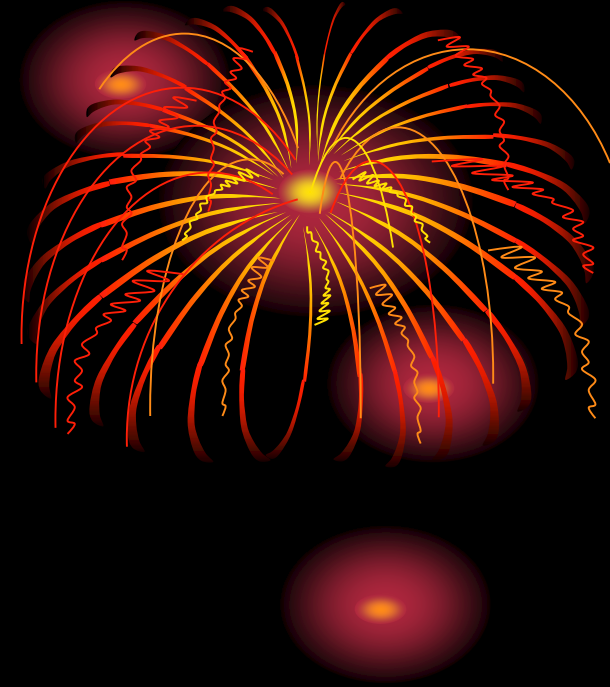
Pathological conditions that alter lung volumes and capacities:

a. Restrictive Lung diseases (e.g. Alveolar Fibrosis)

- reduce the compliance of the lungs --- compressed lung volumes

--- ↓ VC, ↓ IRV, ↓ ERV, ↓ RV, ↓ TLC
--- ↑ breathing frequency





b. Obstructive Lung diseases (e.g. Emphysema)

- **↑ resistance to airflow**
 - **↑ TLC, ↑ FRC, ↑ RV,**
 - **↓ VC, ↓ ERV**



Thank you!