Bio& 242: Unit 2/ Lab 4
Respiratory System Physiology

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1. Review of Respiratory Muscles

Principal Muscles of Inspiration:
Diaphragm
Accessory Muscles of Inspiration:

External intercostals	Pectoralis minor	Scalenes
Sternocleidomastoid		

Principal muscles of expiration:
No active muscles- Diaphragm relaxes
Muscles of Expiration:

External Obliques	Internal Intercostals	Internal Obliques
Rectus Abdominus	Transversus Abdominus	

5. Lung Model:

Observe the lung model. The model consists of a glass bell jar with a Heavy plastic or rubber sheet covering the wide open end. The narrow upper opening is plugged with a rubber stopper through which a Y glass tube is passed. Small red balloons are fastened to the arms of the "Y" tube.

a.) What happens to the balloons when the bottom sheet is pulled downward?

b.) What happens when the sheet is pushed upward?

c.) Use Volume and Pressure changes to explain why the above changes occurred.

d.) What parts of the respiratory system are presented by these structural parts of the model?

1.) Rubber or Plastic sheet?

2.) Bell Jar?

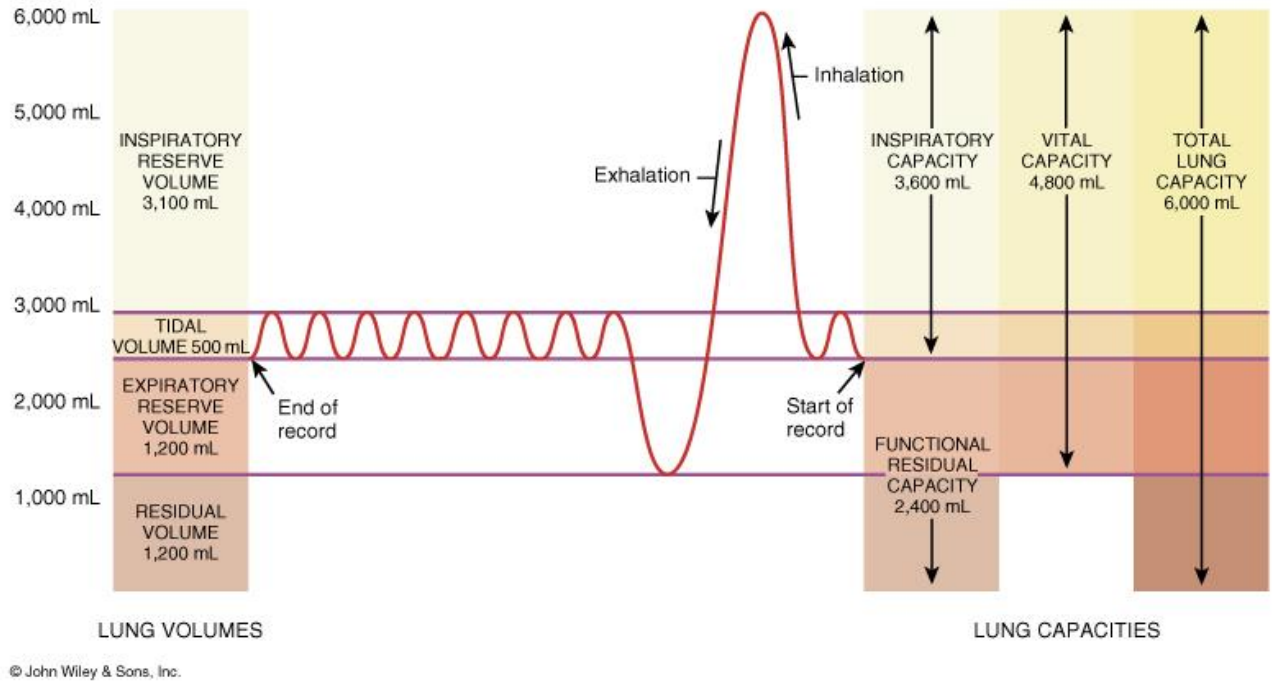
3.) "Y" tube?

4.) Red balloons?

e.) What type of breathing can be demonstrated with the model?

f.) What type of breathing can not be demonstrated with the model?\

Graphic Representation of Respiratory Volumes and Capacities.



6. <u>Respiratory air volumes and capacities:</u>

1. Review figure demonstrating the graphic representation of the respiratory volumes and capacities.
2. Obtain a handheld spirometer.
3. Set the needle to zero by rotating the adjustable dial.
4. Before using the spirometer, clean the mouthpiece stub with an alcohol wipe.
5. Obtain a new disposable mouthpiece and place it on the stub.
6. Keep in mind and the spirometer only measures expired air.

7. Measure tidal volume (TV): Tidal volume is the amount of air that enters and exits the lungs during normal quiet breathing.

   a. Sit quietly for a few moments.
   b. Make sure spirometer is set to zero.
   c. Place mouthpiece between your lips and exhale 3 ordinary expirations. Breathe in through your nose and out through the mouthpiece.
   d. Divide the total volume indicated by the needle by 3 to calculate Tidal Volume (spaces provided on next page)

Total volume from 3 expirations:_____

Tidal Volume:_____

e. To calculate the total volume of air exchanged for a minute (minute repiratory volume, MRV), you need to determine the numbers of breathes per minute and then multiply by your tidal Volume from above.

Breathes/Minute:_____ MRV:_____

8. Measure Expiratory Reserve Volume (ERV): Expiratory Reserve Volume is the volume of air in addition to the tidal volume that leaves the lungs during forced expiration.

a. Breathe normally for a few moments. Set spirometer needle to zero.
b. Place mouthpiece in your mouth. At the end of a normal tidal expiration, exhale all of the air you can from your lungs through the spirometer.
c. Repeat 3 times and calculate an average.

ERV 1_____ ERV 2_____ ERV 3 _____

Average ERV _____

9. Measure Vital Capacity (VC): Is the maximum volume of air that can be exchanged by the lungs.

a. Breathe normally for a few moments. Set spirometer needle to zero.
b. Inhale and exhale as deeply as possible three times.
c. Inhale as deeply as possible and place the mouthpiece between your lips and exhale all the air out of your lungs through the spirometer.
d. Record results below and compare your results to the value in the tables provided for someone your age and height.

Measured VC _____

Standardized VC from table _____

How do these two values compare?

10. Calculate Inspiratory Reserve Volume (IRV): IRV is the volume of air in addition to a tidal volume that enters your lungs during a forced inspiration. IRV can not be measured by the spirometer. It can be calculate with the following equation.

IRV = VC – (TV + ERV) Your !RV: _____

11. Calculate Inspiratory Capacity (IC): IC is the maximum volume of air you can inhale following exhalation of a normal tidal volume. IC can not be measured by the spirometer. It can be calculate with the following equation.

IC = (TV + IRV) Your IC: _____

12. Residual Volume (RV): RV is the volume of dead air that can not be exchanged from the lungs. Why do your lungs have this volume??

Clinical terms

Anoxia: The absence or reduced supply of oxygen in inspired gases, arterial blood, or tissues

Asthma: Condition marked by recurrent attacks of dyspnea, with wheezing due to spasmodic constriction of the bronchi. It is also known as *bronchial asthma.* Attacks vary greatly from occasional periods of wheezing and slight dyspnea to severe attacks that almost cause suffocation.

Atelectasis: The absence of gas from all or a part of the lungs, due to failure of expansion or resorption of gas from the alveoli.

Bronchitis: Inflammation of the mucous membrane of the bronchial tubes.

Bronchogenic carcinoma: Squamous cell or oat cell carcinoma that develops in the mucosa of the large bronchi and produces a persistent productive cough or hemoptysis.

Bronchoscopy: inspection of the interior of the tracheobronchial tree through a bronchoscope

Cystic fibrosis: A hereditary metabolic disorder of the exocrine glands, usually developing during early childhood and affecting mainly the pancreas, respiratory system, and sweat glands. It is marked by the production of abnormally viscous mucus by the affected glands, usually resulting in chronic respiratory infections and impaired pancreatic function.

Dyspnea: Labored or difficult breathing, often associated with lung or heart disease and resulting in shortness of breath.

Emphysema: A pathological condition of the lungs marked by an abnormal increase in the size of the air spaces, resulting in labored breathing and an increased susceptibility to infection. It can be caused by irreversible expansion of the alveoli or by the destruction of alveolar walls.

Hypercapnia: Excess of carbon dioxide in the blood, indicated by an elevated Pco_2 as determined by blood gas analysis, and resulting in respiratory acidosis.

Hyperventilation: Abnormally fast or deep respiration resulting in the loss of carbon dioxide from the blood, thereby causing a decrease in blood pressure and sometimes fainting.

Hypocapnia: The presence of abnormally low levels of carbon dioxide in blood, indicated by an low Pco_2 as determined by blood gas analysis, and resulting in respiratory alkalosis.

Hypoventilation: Abnormally slow or shollow respiration resulting in increase of carbon dioxide and characterized by cyanosis, polycythemia, increased carbon dioxide arterial tension, and generalized decreased respiratory function.

Hypoxia: Deficiency in the amount of oxygen reaching body tissues.

Pleurisy: An inflammation of the pleura, usually occurring because of complications of a disease such as pneumonia, and accompanied by accumulation of fluid in the pleural cavity, chills, fever, and painful breathing and coughing.

Pneumonia: An acute or chronic disease marked by inflammation of the lungs and caused by viruses, bacteria, or other microorganisms and sometimes by physical and chemical irritants

Pulmonary embolism: the blockage of a pulmonary artery by foreign matter such as fat, air, tumor tissue, or a thrombus (detached fragments of a clot from a leg or pelvic vein).

Tracheostomy: Surgical construction of a respiratory opening in the trachea, with insertion of an indwelling tube to facilitate passage of air or evacuation of secretions.

Tuberculosis: An infectious disease of humans, birds, cattle, and other animals caused by a group of bacteria in the genus *Mycobacteria*, which includes *Mycobacteria tuberculosis*, *M. bovis* and *M. avium*., and characterized by the formation of tubercles on the lungs and other tissues of the body, often developing long after the initial infection.