LESSON 43

The Respiratory System

Function:
1) External respiration is the exchange of O₂ and CO₂ between the air and blood, occurring in the lungs.
2) Internal respiration is the exchange of O₂ and CO₂ between the blood and the tissue fluid, occurring in the capillaries.

The Path of Air:
→ Breathing begins when the diaphragm is contracted, forming a circular band of muscle just below the rib cage and above the abdomen.

→ Air is brought into the mouth and nasal cavity.
→ Passes through the pharynx.
→ Passes the larynx (voice box) "Adam's apple".
→ Larynx contains the vocal chords.
→ Increased larynx size is one effect testosterone has on human development.

→ Air now enters the trachea.

→ The trachea is surrounded by tough rings of cartilage.
   → Branches into 2 bronchi (bronchus, singular)
   → Lined with hair-like structures and coated in mucus.

→ Mucus traps air particles, preventing them from moving down into the lungs.

→ The cilia beat upwards towards the trachea, moving the mucus to the back of the throat to be swallowed or spit out.

**NOTE:** Inhaling smoke can kill the cilia lining the bronchi and prevents mucus from being removed.
Comprehension Questions:

1) Describe the difference between internal & external respiration.
   Internal - exchange of O₂ and CO₂ between air & blood in lungs.
   External - exchange of O₂ & CO₂ between blood & tissue fluid in capillaries.

2) How is the diaphragm important to breathing?
   Breathing begins when diaphragm contracts.
LESSON 44

The Path of Air... cont

→ the 2 bronchi each branch into smaller tubes called bronchioles.
* Bronchioles—highly branched ending in an alveoli (alveolus—sing) air sac covered in capillaries.

→ structure of alveoli is like a cluster of grapes.
→ gas exchange occurs here.

Structure
i) clustering shape increases the surface area for gas exchange.
ii) alveoli have thin walls (1 cell thick), this allows fast diffusion of O₂ and CO₂.
iii) covered in capillaries; greater blood volume exposed to O₂.
iv) inner wall is covered in surfactant. prevents alveoli walls from sticking together.

v) inner walls are moist; diffusion of O₂ and CO₂ happen faster in the presence of H₂O.
vi) alveoli walls contain stretch receptors, prevents walls from bursting.

Expiration
→ relaxing the diaphragm returns the lungs to resting volume.
→ the lungs are contained in a sealed unit called the thoracic cavity.
→ sealed around the lungs by the pleural membranes and underneath by the diaphragm.
Complete the Questions Below:
1. Complete the following table by outlining the structures of the alveoli that make it well suited to its function.

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<thead>
<tr>
<th>Structural Component</th>
<th>Functional Benefit</th>
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2. Describe how debris and particles in the air are removed from the lungs by mucus and cilia.

3. Draw a flow chart that describes the flow of air from the nose to the alveoli.
LESSON 45

Tidal Volume: the normal amount of air inhaled and exhaled while a person is resting.
- minimum amount of O₂ the body requires
- when O₂ requirements increase, tidal volume increases.

Vital Capacity: maximum volume of air a person can inhale and exhale.
  average 3.5L

* depends on: 1) body mass
  2) gender (10-20% lower in females)
  3) fitness (20-30% greater in athletes)

• Tour de France can have a vital capacity of 7L.

Residual Volume: amount of air remaining in lungs after exhalation
  average 1L