

# AIR VOLUMES DURING RESPIRATION

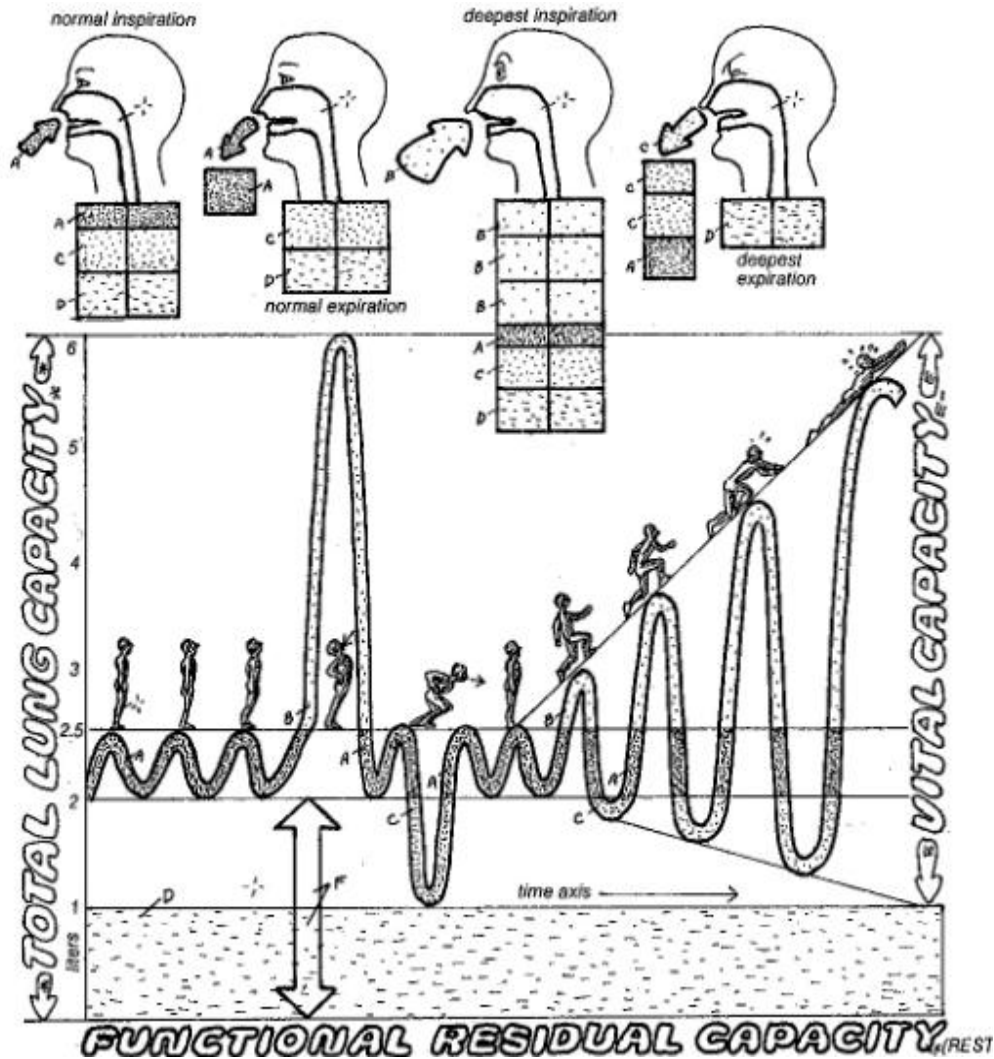
**TIDAL VOLUME** <sup>A</sup> 500 ml

**INSPIRATORY RESERVE VOLUME** <sup>B</sup> (IRV) 2500-3000 ml

**EXPIRATORY RESERVE VOLUME** <sup>C</sup> (ERV) 1000 ml

**RESIDUAL VOLUME** <sup>D</sup> 1000 ml

The volume of air (500 mL) that moves in (or out) of the lungs with each inspiration (or expiration) during quiet breathing is called the tidal volume. During strenuous breathing, the amount of air moving with each breath increases. The maximum amount of additional air that can be inspired above the tidal volume is called the inspiratory reserve volume; the maximal volume of additional air that can be expired is called the expiratory reserve volume. The maximal amount of air that can be moved with each breath, the vital capacity, equals the sum of the inspiratory reserve, tidal, and expiratory reserve volumes. However, the lungs never empty completely; the volume of remaining air following a maximal expiration is called the residual volume. Finally the total lung capacity equals the sum of all these volumes.



## ALVEOLAR AIR AFTER RESPIRATION

ANATOMIC DEAD SPACE: 150 mL  
 FRESH AIR: 350 mL  
 TIDAL VOLUME: 500 mL

During inspiration, some stale air reaches the alveoli. Close to 1/3 of the tidal volume is nonfunctional and is required simply to fill the air passages of the head, neck, bronchi, etc. The total volume of these passageways (about 150 mL) is called the anatomical dead space. Each time 500 mL of air is drawn into the lungs, the first 150 mL comes from the dead space, with the following 350 mL arising from fresh atmospheric air. If your tidal volume were only 150 mL, you would never get any fresh air! You would simply exchange the 150 mL back and forth between dead space and alveoli. Similarly, if you use a snorkel tube with a 350 mL volume, then you will increase your dead space to 500 mL. In this case, normal tidal volume of 500 mL will be useless. Dogs lose heat by fluid evaporating from their dead space during panting. By restricting the amount of air moved, they bring fresh dry air to the dead space without allowing it to reach the alveoli. Thus, their rapid breathing movements do not interfere with normal respiration; they do not over-ventilate.

