

## Respiratory System: BREATHING

### Why Breathe?

- oxygen is necessary for aerobic cellular respiration to generate ATP
- carbon dioxide is a waste product of cellular respiration and must be removed from the body

### 3-Step Process (see Fig. 2, pg. 282)

- (ER) 1. Breathing - muscular actions that move air into/out of respiratory passages
- (ER) 2. Gas Exchange - movement of gases ( $O_2$  and  $CO_2$ ) by diffusion across cell membranes of alveoli (air sacs)
- (IR) 3. Cellular Respiration - use of  $O_2$  to produce ATP from glucose; production of  $CO_2$  waste gas

*(ER: External Respiration - occurs outside of cells)*  
*(IR: Internal Respiration - occurs inside cells)*

### Mechanics of Breathing (see Fig. 3 and 4, pg. 288)

- intercostal muscles attach from rib above to rib below
- lungs are connected to rib cage and diaphragm by pleural membranes
- between pleural membranes is pleural fluid (water-like fluid)

#### Inspiration (Inhalation)

- intercostal muscles contract pulling rib cage up and out
- diaphragm contracts pulling downwards
- both actions pull on pleural membranes which therefore pull the lungs open
- increased volume in lungs means pressure is reduced (below atmospheric pressure)
- air enters lungs (down pressure gradient)

#### Expiration (Exhalation)

- intercostal muscles and diaphragm relax allowing rib cage to lower and lungs to decrease in size
- reduced volume in lungs means pressure is increased (above atmospheric pressure)
- air is forced out of lungs (down pressure gradient)

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#### Homework: Comparative Respiratory Systems

Make your own notes from pp. 282-284. Include reference to the following in your notes:

- importance of size/surface area in breathing
- earthworm breathing (skin)
- fish breathing (gills and countercurrent exchange)
- insect breathing
- frog breathing
- sketch Fig. 3 (a, b) on pg. 283 and Fig. 5 (blow-up only) on pg. 284