

Physiology of respiration

B.Sc Second year Zoology (Subsidiary) Paper - 2

- Lecture-1

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Physiology of respiration

Mechanism of Breathing

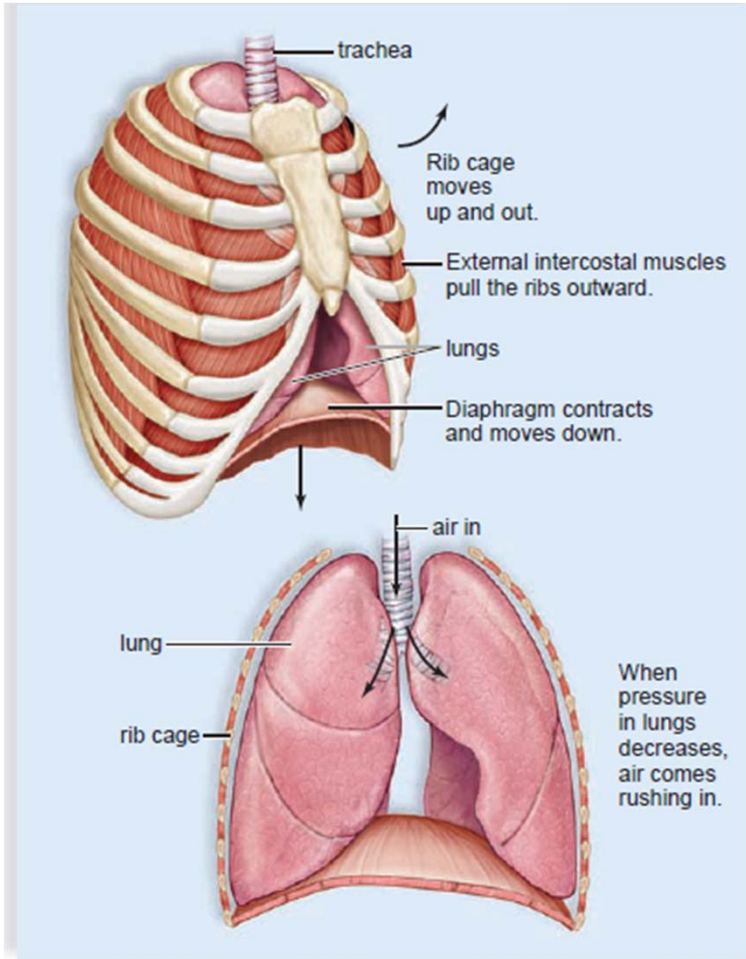
- Ventilation, or breathing, has two phases. The process of inspiration, also called inhalation, moves air into the lungs; the process of expiration, also called exhalation, moves air out of the lungs.
- To understand ventilation (the manner in which air enters and exits the lungs) it is necessary to remember the following facts:
 1. Normally, there is a continuous column of air from the pharynx to the alveoli of the lungs.
 2. The lungs lie within the sealed thoracic cavity. The rib cage, consisting of the ribs joined to the vertebral column posteriorly and to the sternum anteriorly, forms the top and sides of the thoracic cavity. The intercostal muscles lie between the ribs. The diaphragm and connective tissue form the floor of the thoracic cavity.

3. The lungs adhere to the thoracic wall by way of the pleura. Any space between the two pleurae is minimal due to the surface tension of the fluid between them.

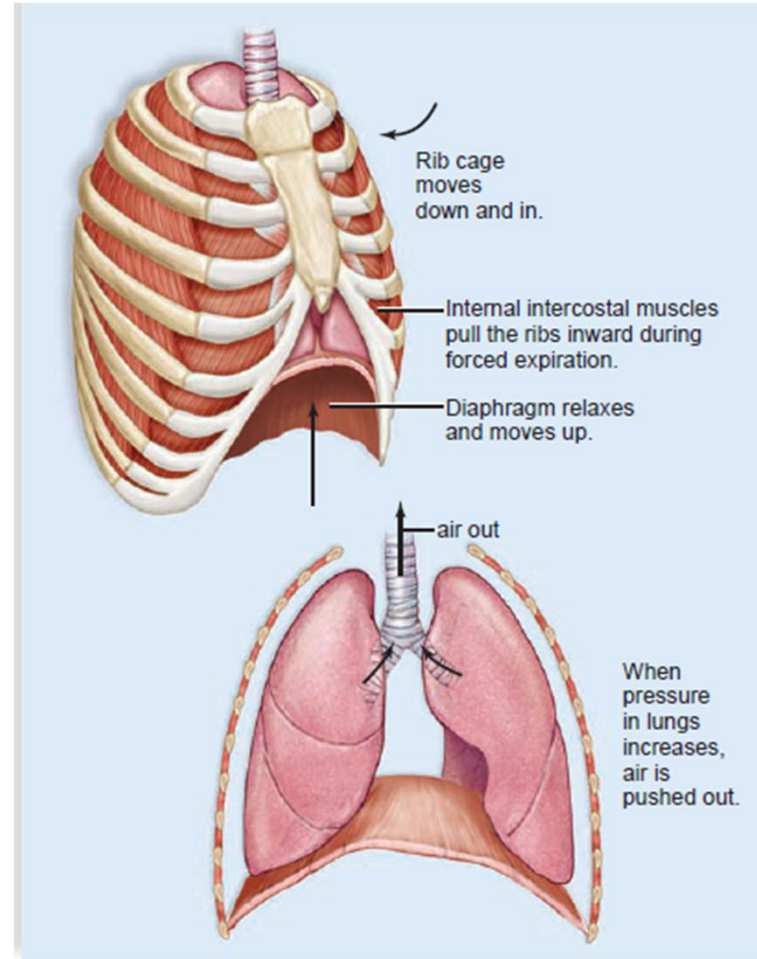
Inspiration

- Inspiration is the active phase of ventilation because this is the phase in which the diaphragm and the external intercostal muscles contract.
- In its relaxed state, **the diaphragm** is dome-shaped. During inspiration, it contracts and becomes a flattened sheet of muscle.
- Also, the external intercostal muscles contract, causing the rib cage to move upward and outward.
- Following contraction of the diaphragm and the external intercostal muscles, the volume of the thoracic cavity is larger than it was before.
- As the thoracic volume increases, the lungs increase in volume as well because the lung adheres to the wall of the thoracic cavity.

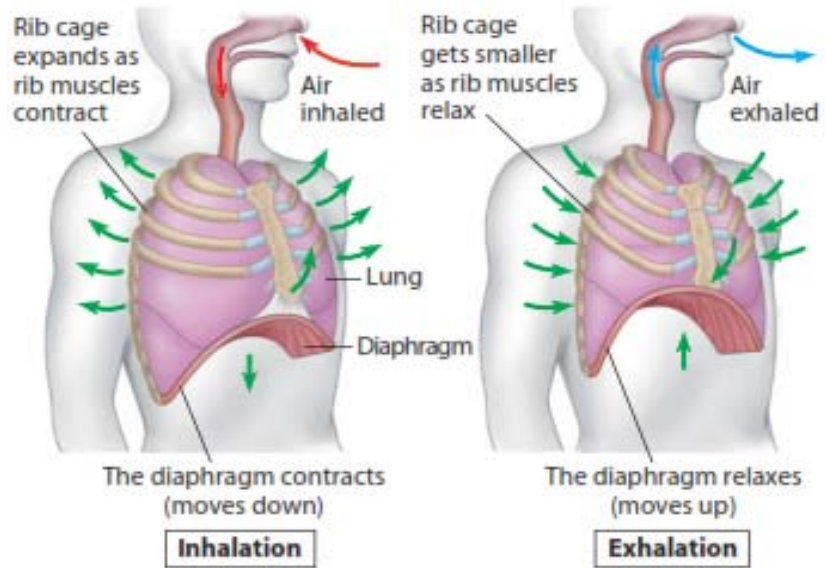
- As the lung volume increases, the air pressure within the alveoli decreases, creating a partial vacuum .
- In other words, alveolar pressure is now less than atmospheric pressure (air pressure outside the lungs).
- Air will naturally flow from outside the body into the respiratory passages and into the alveoli, because a continuous column of air reaches into the lungs.
- Air comes into the lungs because they have already opened up; air does not force the lungs open.
- This is why it is sometimes said that *humans inhale by negative pressure*.
- The creation of a partial vacuum in the alveoli causes air to enter the lungs.
- Whereas inspiration is the active phase of breathing, the actual flow of air into the alveoli is passive.



a. Inspiration



b. Expiration



Expiration

- Usually, expiration is the passive phase of breathing, and no effort is required to bring it about.
- During expiration, the diaphragm and external intercostal muscles relax.
- The rib cage returns to its resting position, moving down and inward.
- *The elastic properties of the thoracic wall and lung tissue help them to recoil .*