
BREATHING AND
EXCHANGE OF GASES
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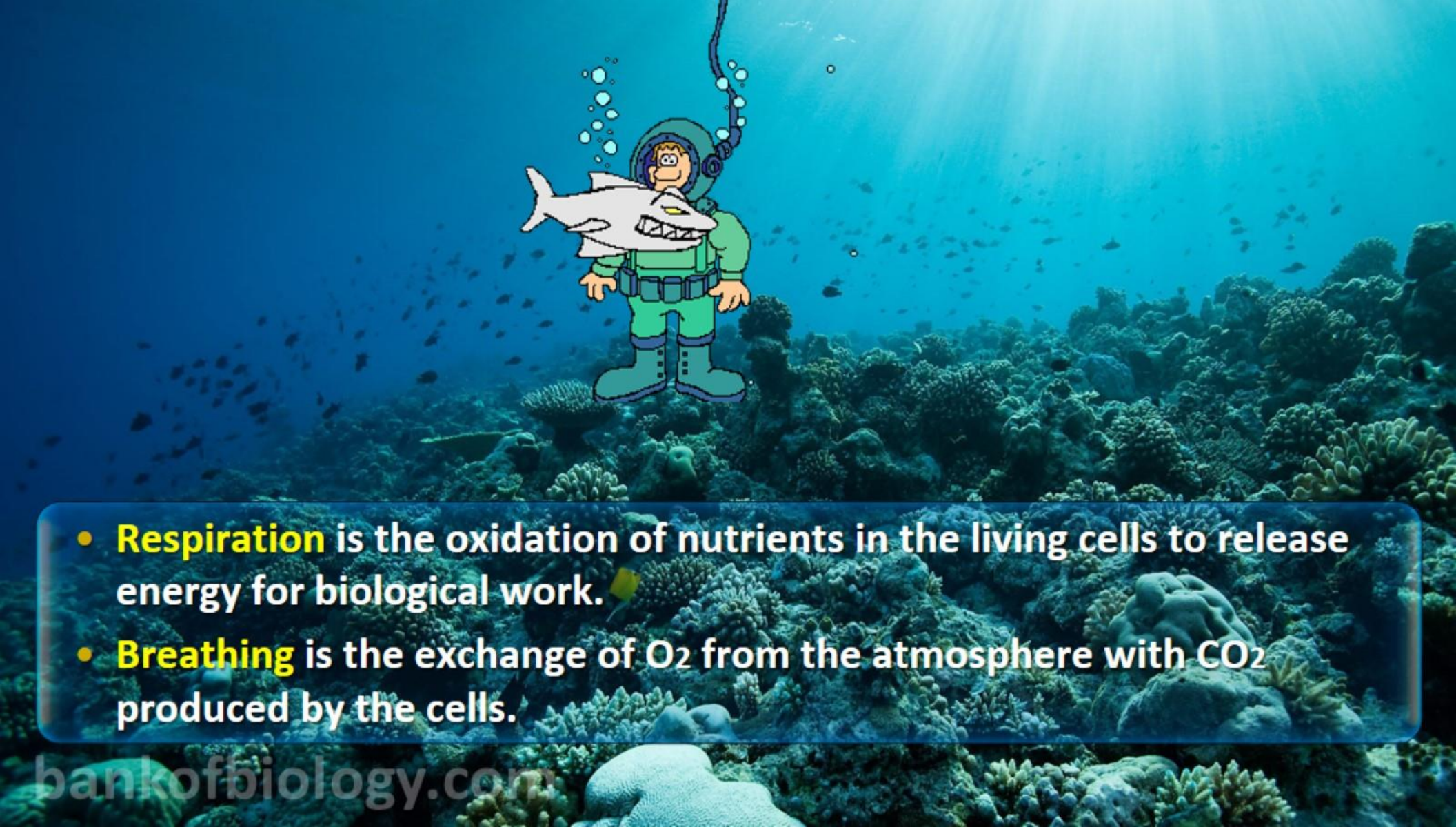


- **Respiration** is the oxidation of nutrients in the living cells to release energy for biological work.
- **Breathing** is the exchange of O_2 from the atmosphere with CO_2 produced by the cells.

RESPIRATORY ORGANS

General body surface

E.g. lower invertebrates (sponges, coelenterates, flatworms etc).

RESPIRATORY ORGANS

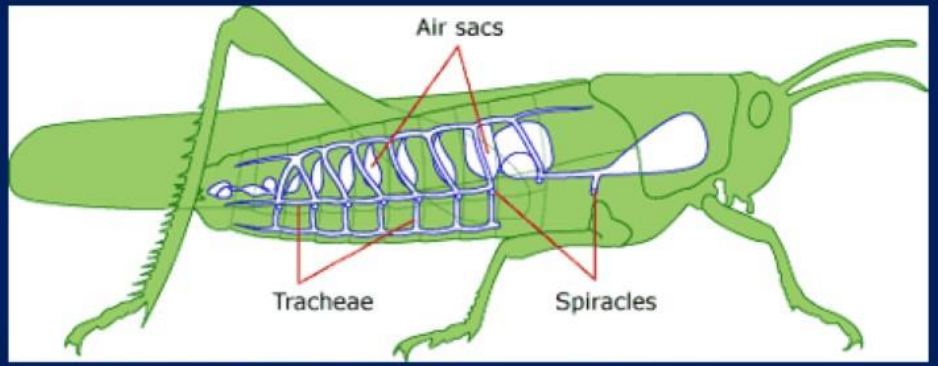
Skin or moist cuticle (cutaneous respiration)

E.g. earthworms, leech, amphibians etc.

RESPIRATORY ORGANS

Tracheal tubes

E.g. Insects, centipede, millipede, spider.



RESPIRATORY ORGANS

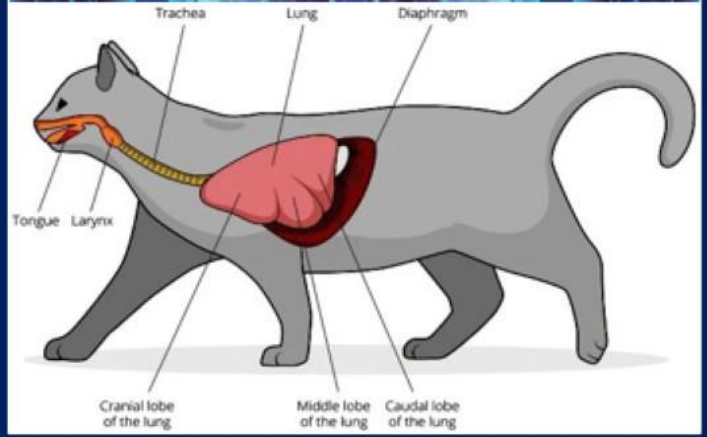
Gills (Branchial respiration)

E.g. fishes, tadpoles, prawn.

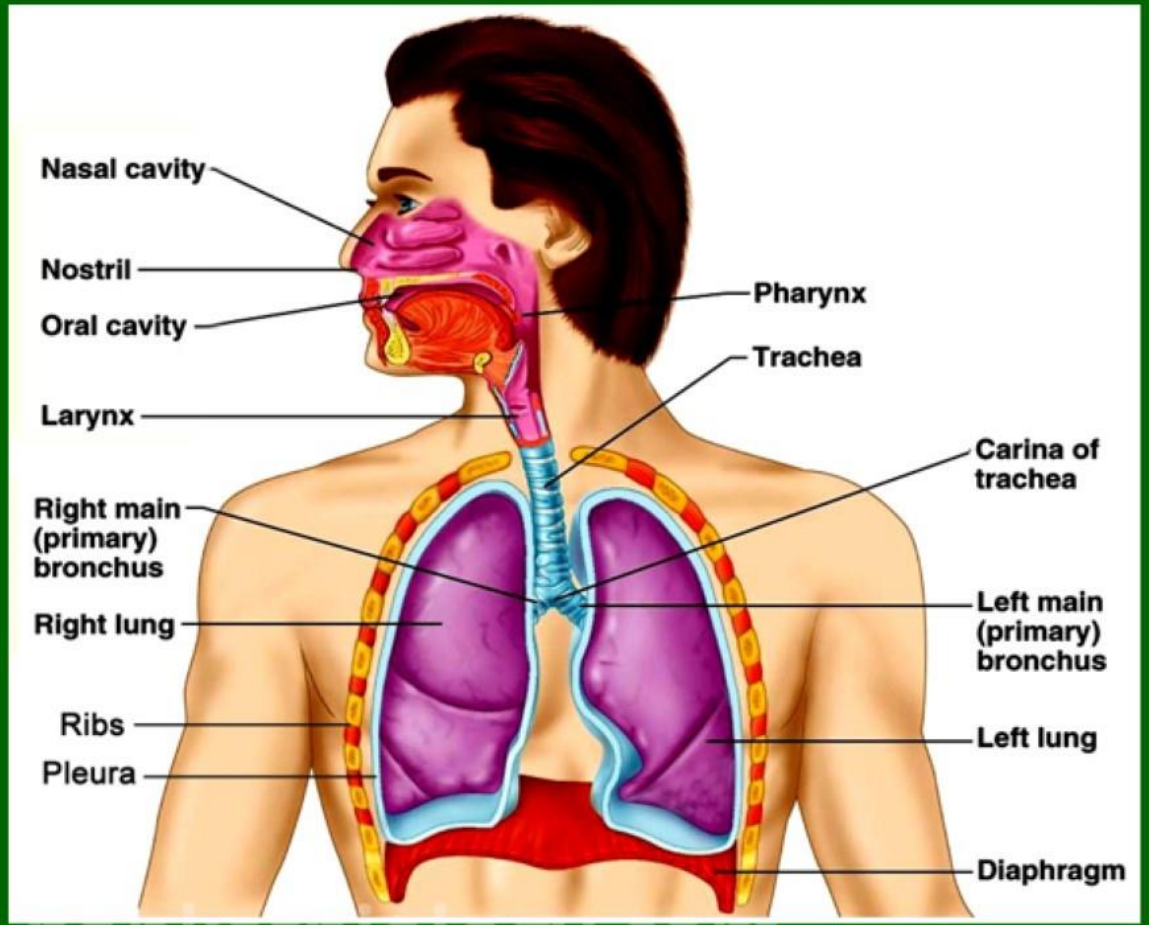
RESPIRATORY ORGANS

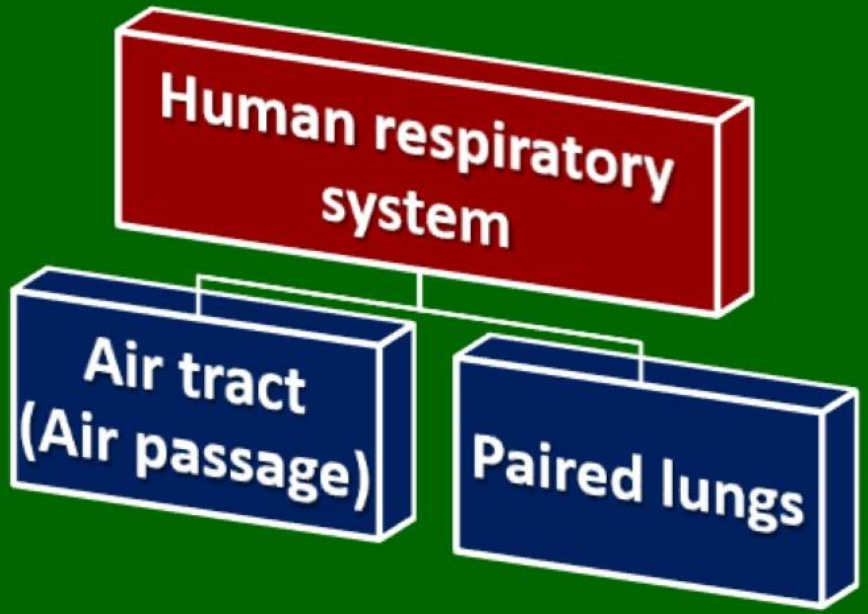
Lungs (Pulmonary respiration)

E.g. most vertebrates.



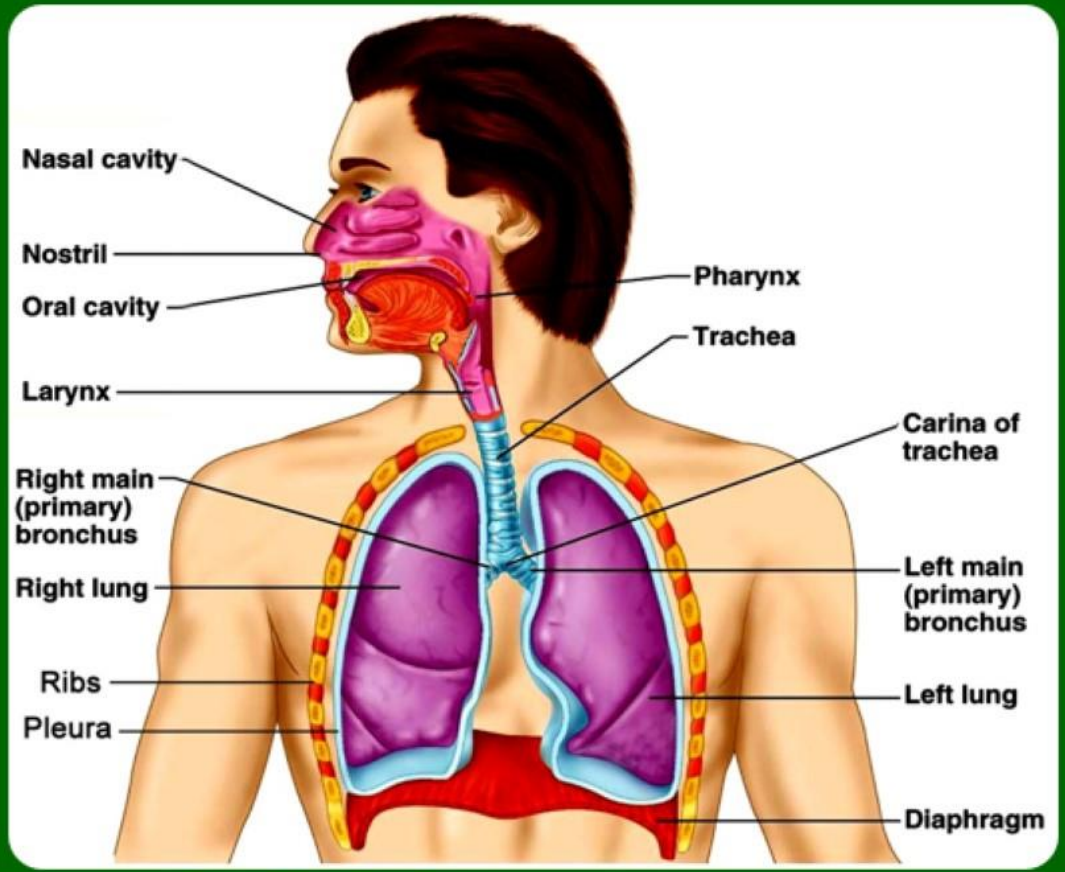
HUMAN RESPIRATORY SYSTEM





HUMAN RESPIRATORY SYSTEM

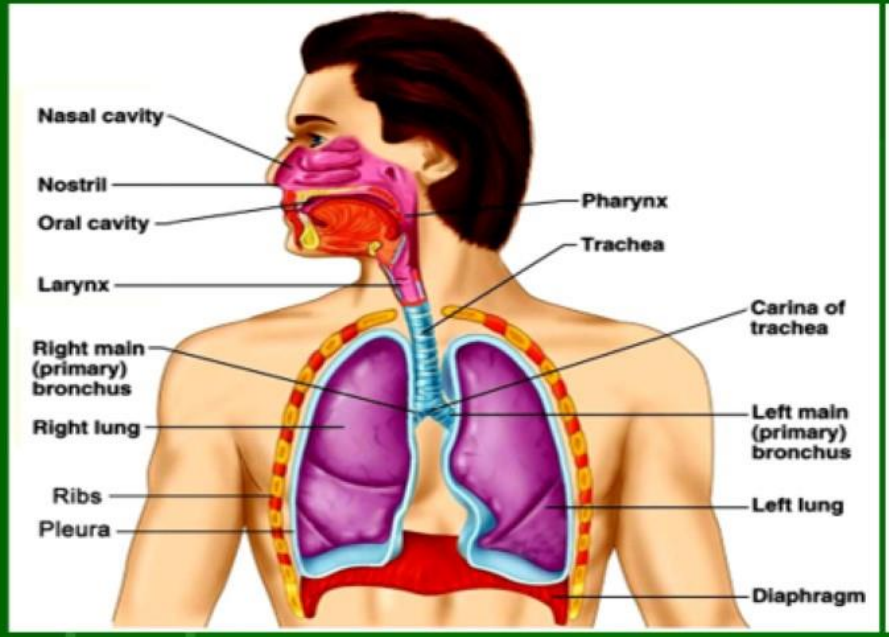
AIR PASSAGE (AIR TRACT)

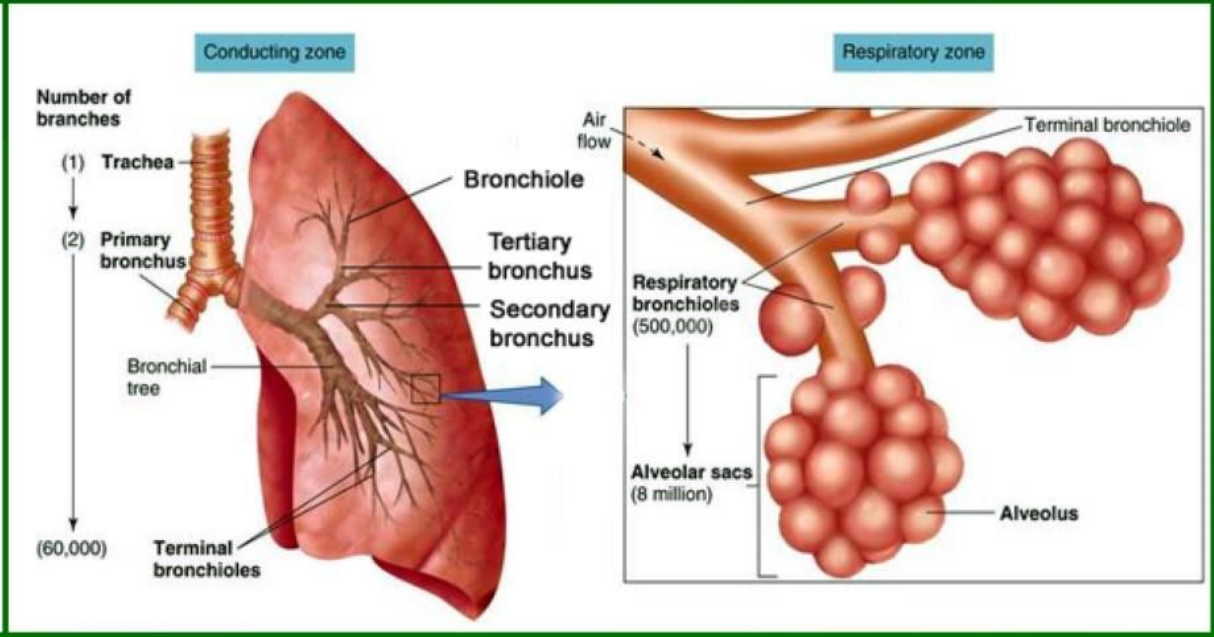


- *Conducting part.*
- It transports atmospheric air into the alveoli.
- It clears air from foreign particles.
- It humidifies and brings the air to body temperature.

HUMAN RESPIRATORY SYSTEM

AIR PASSAGE (AIR TRACT)





External nostrils → nasal passage → nasal chamber (nasal cavities) → nasopharynx → glottis → larynx → trachea → primary bronchi → sec. bronchi → tertiary bronchi → bronchioles → terminal bronchioles → respiratory bronchiole → alveolar duct.

Each terminal bronchiole gives rise to many thin and vascularised *alveoli.*

HUMAN RESPIRATORY SYSTEM

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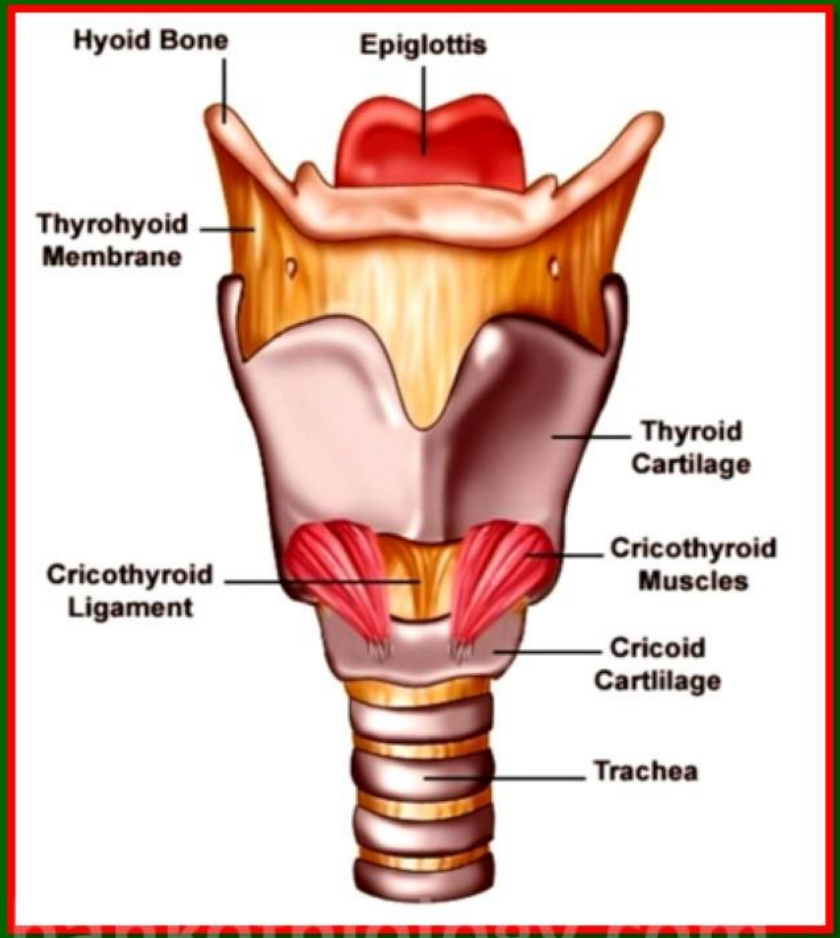
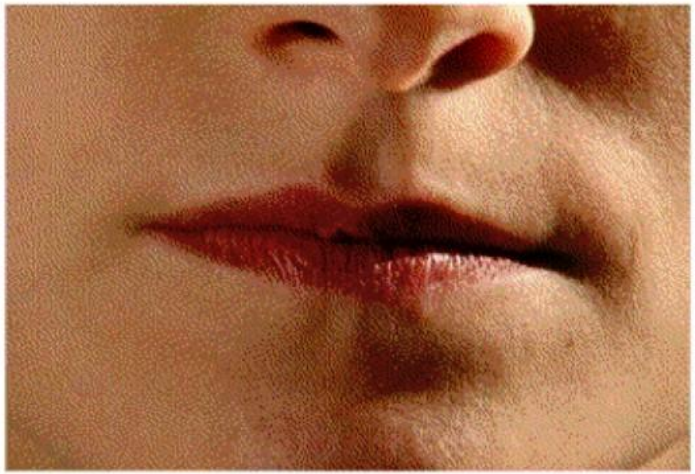


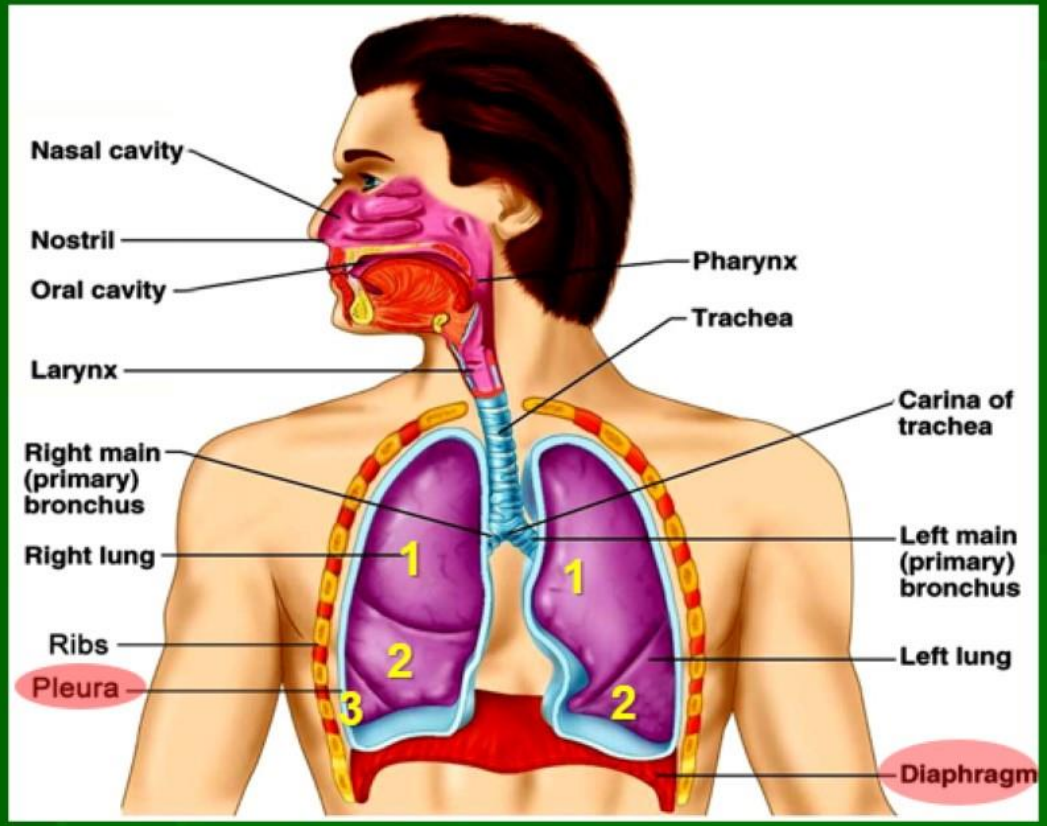
- **Larynx (sound box or voice box)** is a cartilaginous box which helps in sound production.
- During swallowing, ***glottis*** is closed by ***epiglottis*** (a thin elastic cartilaginous flap) to prevent the entry of food into larynx.
- Trachea, all bronchi and initial bronchioles are supported by incomplete **cartilaginous half rings.**

VOCAL CORDS IN ACTION



HUMAN RESPIRATORY SYSTEM

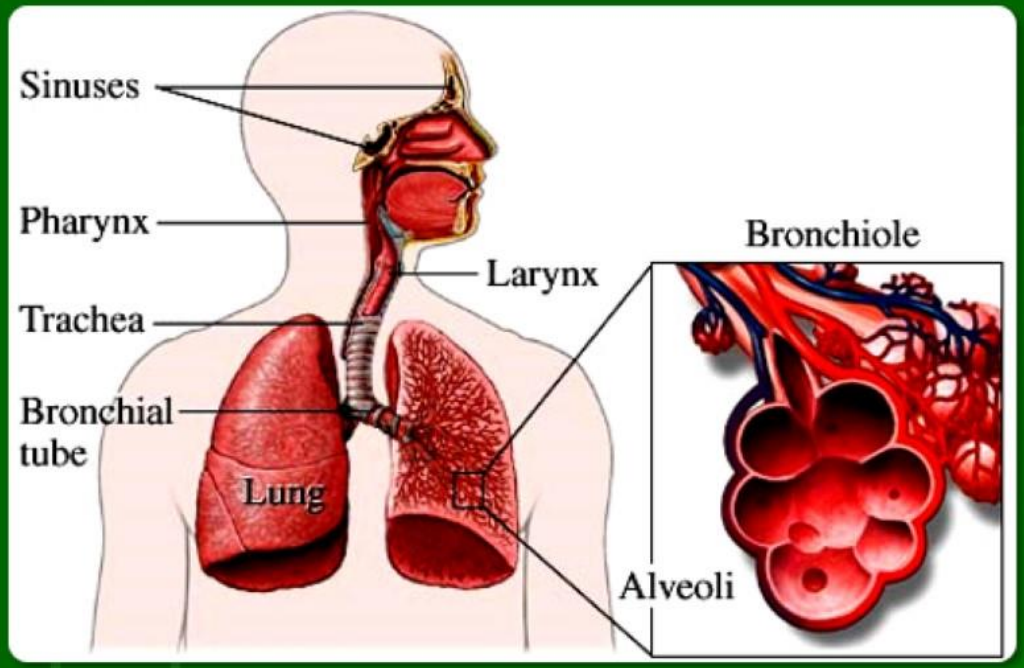
LUNGS

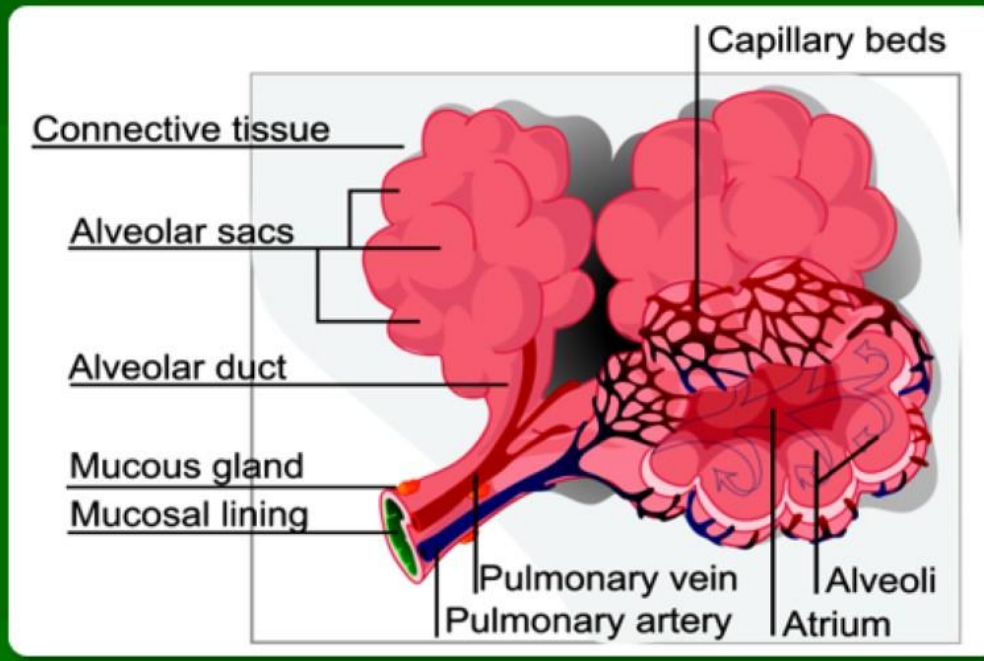


- Lungs are situated in *thoracic chamber* and rest on *diaphragm*.
- Right lung has 3 lobes. Left lung has 2 lobes.
- Each lung is covered by double-layered *pleura* (outer parietal pleura & inner visceral pleura).
- The pleural fluid present in between these 2 layers lubricates the surface of the lungs and prevents friction between the membranes.

HUMAN RESPIRATORY SYSTEM

LUNGS



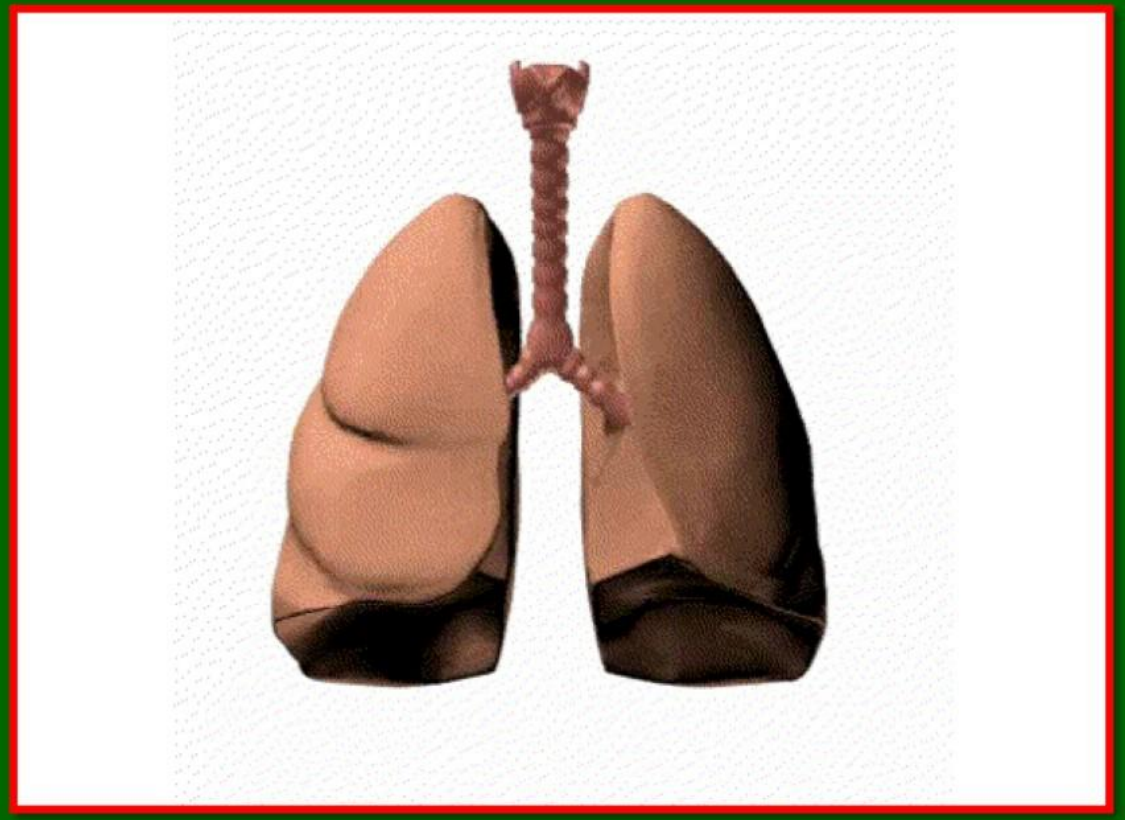


- *Lungs= Bronchi + bronchioles + alveoli*
- Alveoli & their ducts form *respiratory* or *exchange part* of respiratory system.
- *Alveoli are the structural and functional units of lungs.*

HUMAN RESPIRATORY SYSTEM

LUNGS

Internal structure of lungs



STEPS OF RESPIRATION

Pulmonary ventilation (breathing)

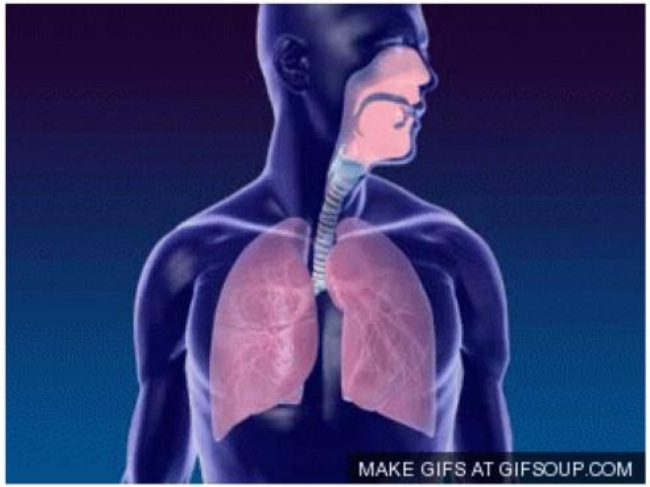
Gas exchange between lung alveoli and blood.

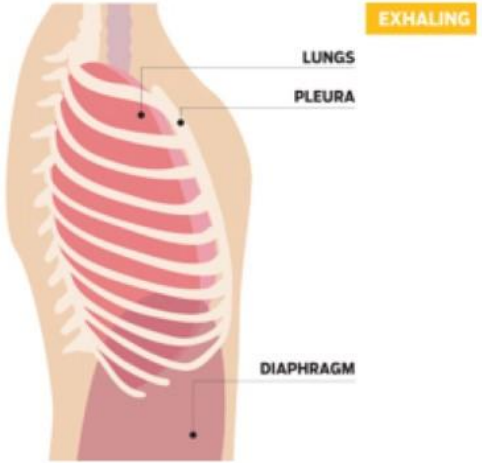
Gas transport (O_2 transport and CO_2 transport)

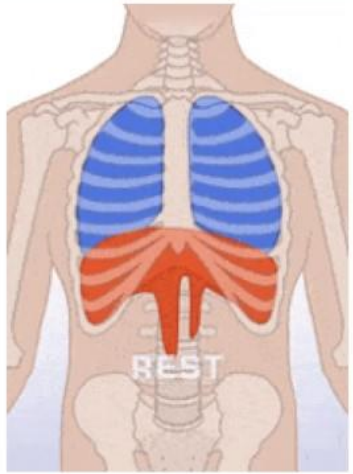
Gas exchange between blood and tissues.

Cellular or tissue respiration.

MECHANISM OF BREATHING







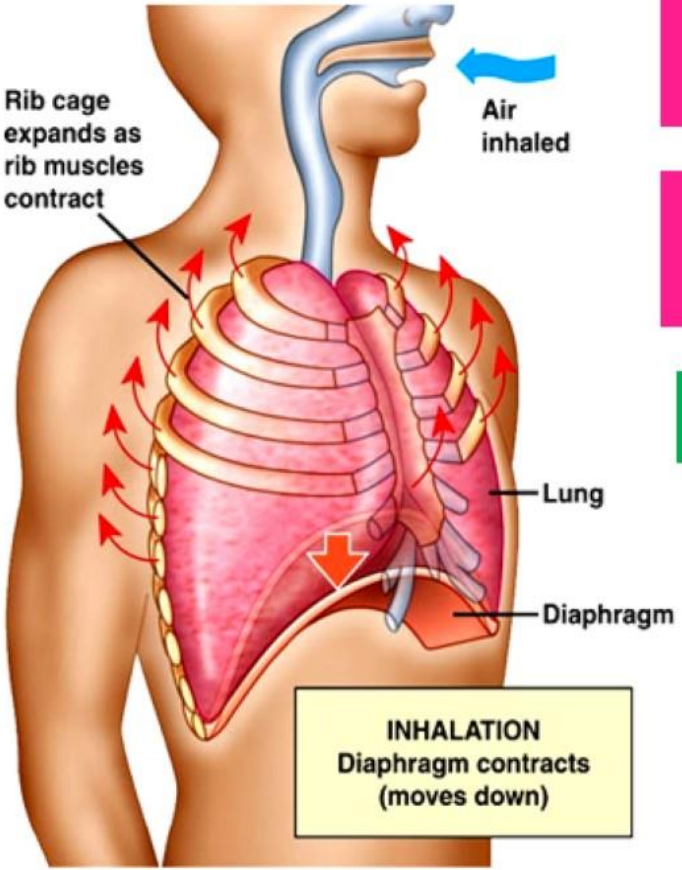
Breathing

Inspiration:
Active intake **of air from atmosphere into lungs.**

Expiration:
Passive expelling **of air from the lungs.**

MECHANISM OF BREATHING

INSPIRATION



Diaphragm contracts (flattens).

↓

Vertical volume (antero-posterior axis) increases.

↓

External inter-costal muscles contracts.

↓

Ribs & sternum lift up. Volume in dorso-ventral axis increases.

↓

Thoracic volume increases. Thoracic pressure decreases.

↓

Lungs expand and Pulmonary volume increases.

↓

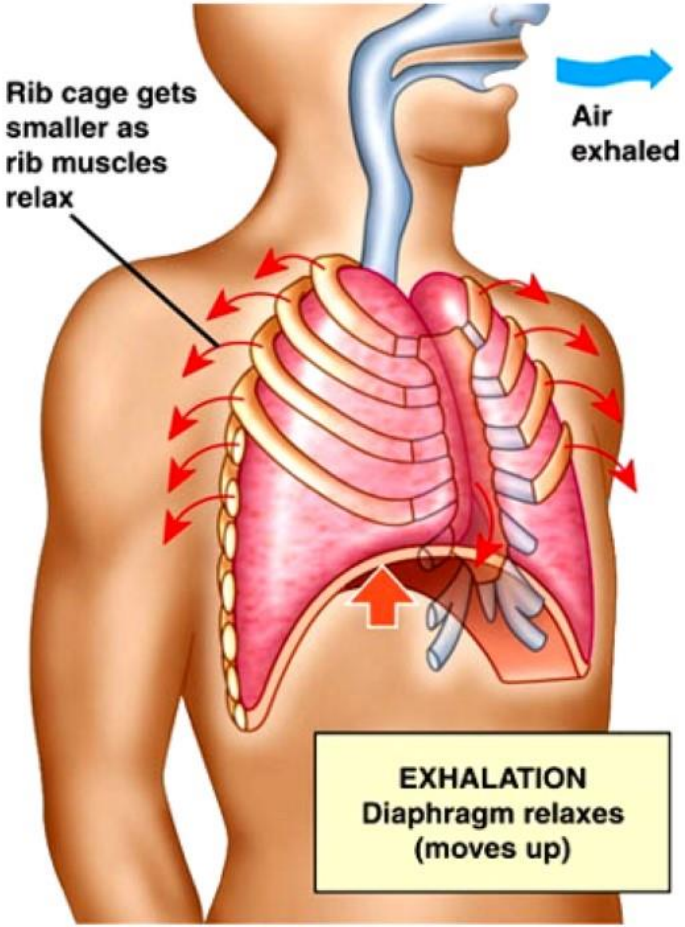
Intra-pulmonary pressure decreases.

↓

Air moves from outside into the lungs.

MECHANISM OF BREATHING

EXPIRATION



Inter-costal muscles & diaphragm relax.

↓

Thorax regains its original position.

↓

Thoracic volume decreases.

↓

Pulmonary volume decreases.

↓

Air moves out.

During forceful expiration, abdominal muscles and internal inter-costal muscles contract.

MECHANISM OF BREATHING