Class : Zoology
Class : XI

Kannada

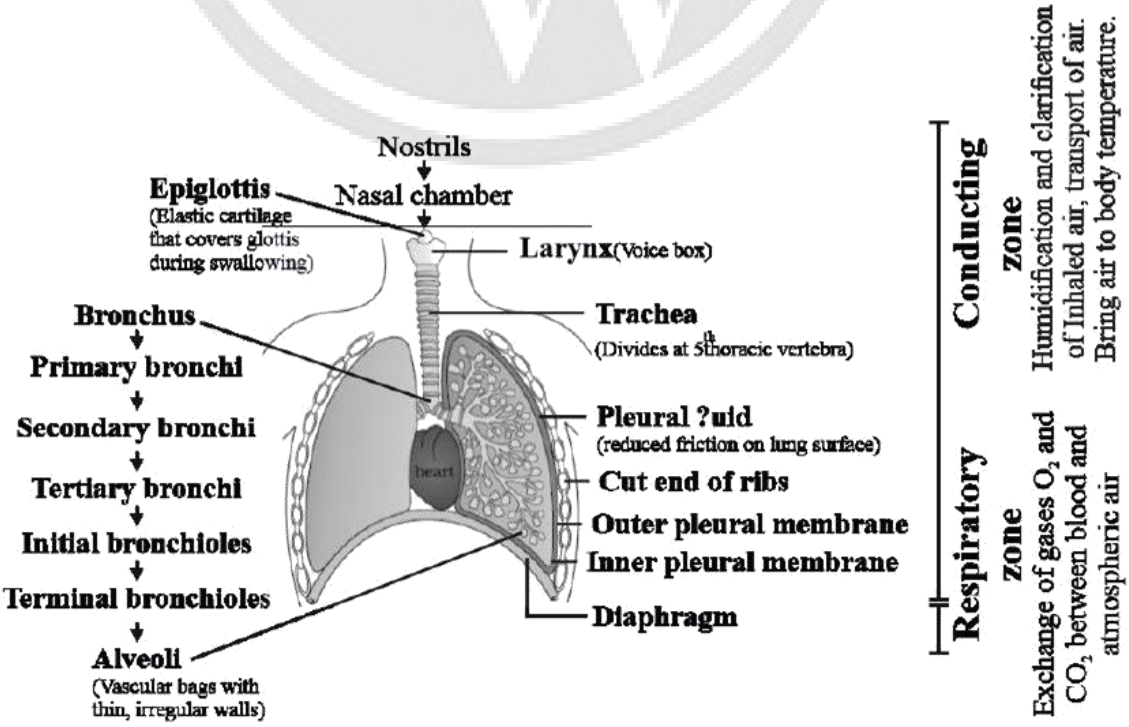
BREATHING AND EXCHANGE OF GASES

Breathing/Respiration

Atmospheric oxygen $\xrightleftharpoons{\text{Exchange}}$ CO_2 produced by cells

RESPIRATORY ORGANS (Based on: Level of Organisation and Habitats)	
Organism	Mechanism
Sponges, coelenterates flatworms	Simple diffusion
Earthworm, Frog	Moist skin (Cutaneous)
Insects	Tracheal tubes
Aquatic arthropods, molluscs, fish	Branchial/Gills
Amphibians, reptiles, mammals	Pulmonary/lungs

Human Respiratory System



- Thoracic Chamber attached
  - Dorsally by the vertebral column
  - Ventrally by the sternum
  - Laterally by ribs
  - Lower side by dome shaped diaphragm

- Any change in the volume of the thoracic cavity will be reflected in the lung (Pulmonary cavity).
- Forceful expiration →

achieved → Internal intercostal muscle, Abdominal muscle → Contracts → Volume decreases → Pressure increased → Air forcefully exhaled

Mechanism of Breathing

Inspiration	Expiration
Diaphragm contracts (Flat-shapes) Diaphragm relaxed Dome shape	Diaphragm contracts (Flat-shapes) Diaphragm relaxed Dome shape
External Inter Costal Muscle contracts External intercostal muscle relax	External Inter Costal Muscle contracts External intercostal muscle relax
Ribs and sternum moves outward and inward Ribs and sternum moves lower and inward	Ribs and sternum moves outward and inward Ribs and sternum moves lower and inward
Volume inside increase and pressure decrease Volume inside decrease	Volume inside increase and pressure decrease Volume inside decrease
Active process Pressure increase	Active process Pressure increase

Exchange of Gases

- Partial pressure drives respiration
- Site of exchange:
  - Alveoli (Primary)
  - Between blood and tissues

Diffusion membrane comprises of 3 layers
- This squamous epithelium of Aveoli
- Endothelium of capillaries
- Basement substance in between

Respiratory gas	Atmos-pheric air	Alveoli	Blood (Deoxygenated)	Blood (Oxygenated)	Tissue
O_2	159	104	40	95	40
W_2	0.3	40	45	40	45

Respiratory Volume and Capacities

- Instrument – Spirometer
- Significance - Clinical assessment of pulmonary functions
- Residual volume cannot be measured by Spirometer

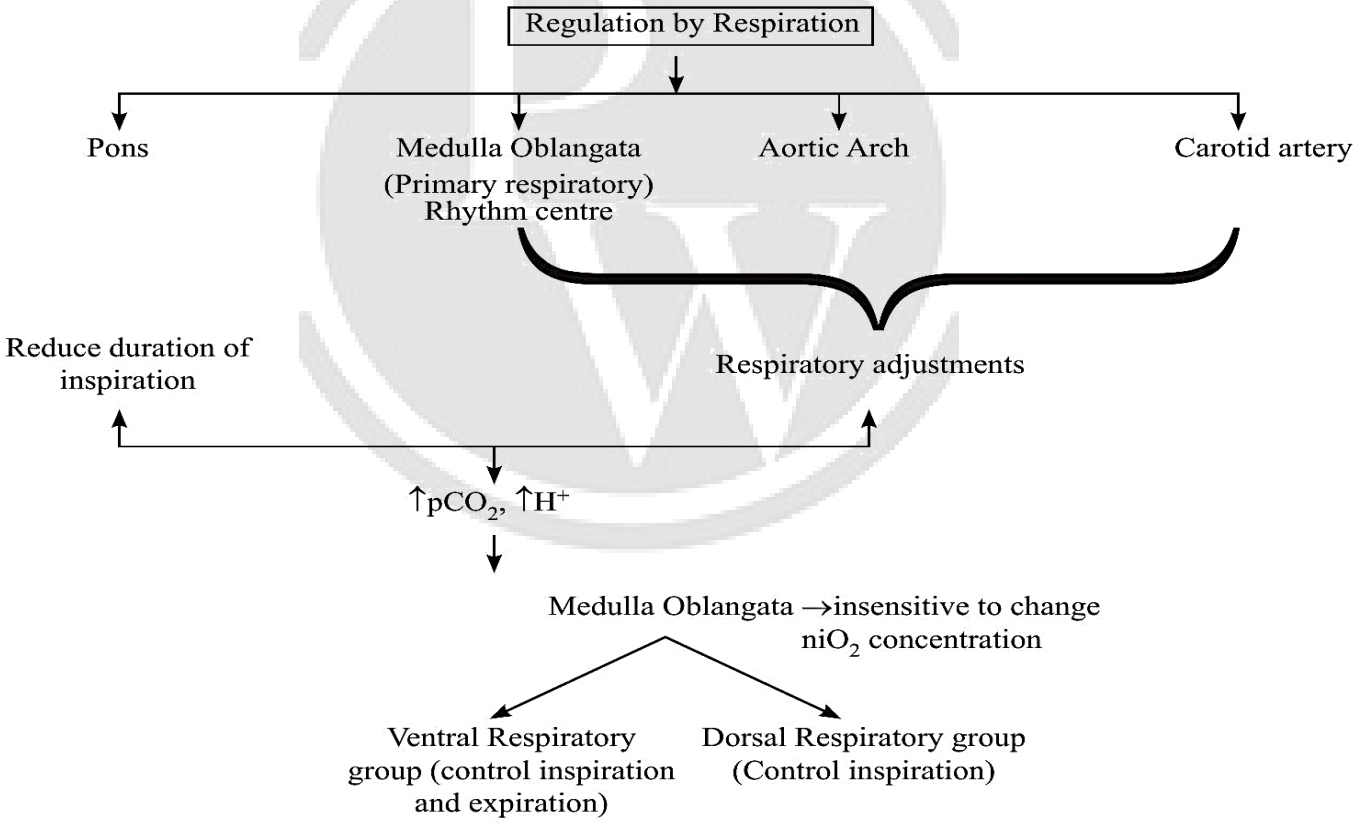
Standard volumes	Value in ml	Standard capacities	
1. Tidal volume (TV)/ air inhaled or exhaled per breath.	500	IC = TV + IRV	TLC = TV + IRV + ERV + RV VC + RV
2. Inspiratory reserve volume (IRV)/forceful inhalation.	2500-3000	VC = TV + IRV + ERV	
3. Expiratory reserve volume (ERV)/forceful exhalation	1000-1100	FRC = ERV + RV	
4. Residual volume (RV)/air left in lungs after forceful exhalation	1100-1200	EC = TV + ERV	

- Minute volume: TV × respiratory rate i.e.
- 500 × 12 = 6000 – 8000 ml

Transport of Gases

$$\left(\text{Lungs} \underset{CO_2}{\overset{O_2}{\rightleftharpoons}} \text{Blood} \underset{CO_2}{\overset{O_2}{\rightleftharpoons}} \text{Tissues}\right)$$

Asthma, Emphysema, Occupational Respiratory Disorders Regulation by respiration (eg. silicosis, Asbestosis)





PW Web/App - https://smart.link/7wwosivoicgd4
Library- https://smart.link/sdfez8ejd80if