AIRFLOW (path of air)

Naris / Nostri
↓
Nasal Cavity (meatuses)
  ↓
Nasopharynx
  ↓
Larynx
  ↓
Trachea
  ↓
Bronchi
  ↓ Main (primary)
  ↓ Lobar (secondary)
  ↓ Segmental (tertiary)
Bronchioles
  ↓ Terminal
  ↓ Respiratory
Alveolar duct
  ↓
Alveolus
CARTILAGES (anterior view)

Hyoid

Thyroid

Cricoid

laryngeal prominence

Hyaline Cartilage(s)

16 to 20 'C' rings / Tracheal Cartilage
CARTILAGES (posterior view)

- Hyoid
- Epiglottis
- Corniculate
- Arytenoid
**Ventilation (mechanical)**

Inhalation $\rightarrow$ $\text{O}_2 \rightarrow \text{CO}_2$ Exhalation

Quiet (normal, involuntary)

Forced (exercise, voluntary)

**Muscles**

- External intercostals
- Internal

**Diaphragm**

**Respiration (physiological)**

Inspiration $\text{O}_2 \rightarrow \text{CO}_2$ Expiration

Gas Exchange is based on coupled chemical reactions

- External alveolus $\times$ blood $\text{O}_2 \overset{\text{Load}}{\rightarrow} \text{CO}_2$

- Internal tissue/cell $\times$ blood $\text{CO}_2 \overset{\text{Unload}}{\rightarrow} \text{O}_2$
How to Control

Breathing (Ventilation)

Centers for regulation of respiration @ Pons medulla
Neural groups / Respiratory Groups (RG)

Sets pace

PRG

VRG DRG

Directs (coordinates)
PRG = Pontine RG (pace)
VRG = Ventral RG (velocity)
DRG = Dorsal RG (directs)

Modifies rhythm

Sensors

Chemoreceptors (chemical change: CO₂, O₂)

Stretch receptors (mechanical, stretch in muscle expansion of rib cage)

Irritant receptors (dust, ...)

Baroreceptors (pressure change)
Laws underlying respiration

Boyle's

Charles'

Dalton's

\[ P = p_{O_2} + p_{N_2} + p_{CO_2} \]

... partial pressure

Henry's

Solubility = gas pressure

Atmospheric Pressure

1 atm = 760 mm Hg

\[ \frac{759}{760} \text{ in.} \to \frac{760}{761} \text{ out} \text{ Ex} \]
Air Volumes

Spirometer / Spirometry (tool) (technique)

Normal in/out = Tidal Volume TV

Excess air that can be inspired = Inspiratory Reserve IRV

Excess air that can be expired = Expiratory Reserve ERV

Maximum air that can be inspired expiratory = Vital Capacity VC

Air left behind = Residual Volume

\[ VC = TV + IRV + ERV \]

Air that never reaches alveoli = Anatomical Dead space

Air that never goes through gas exchange = Physiological Dead space