Respiration:

- 4 components:
  - Ventilation
  - Diffusion
  - O2 and CO2 transport
  - Utilization of O2 and generation of CO2
Ventilation:

- Respiratory center in brainstem
- Motoric neurons
- Peripheral nerve: Phrenic nerves
- Diaphragm
- Chest wall
- Airways
- Alveoli
Lung volumes:

- 4

- **Tidal volume**: the volume of air moving into and out of the lungs during a normal, relaxed ventilatory effort. (500 ml)

- **Inspiratory reserve volume**: the volume of air that can be inspired during a maximal inspiratory effort in excess of the tidal volume. (2L)
- **Expiratory reserve volume**: volume of air expelled after a maximal expiratory effort in excess of the tidal volume. (1L)

- **Residual volume**: volume of air remaining in the lungs after a maximal expiratory effort. Can`t be expelled. (1L)
Lung capacities:

• **Total lung capacity:** $TV + IRV + ERV + RV.$

• **Inspiratory capacity:** $TV + IRV$

• **Vital capacity:** $IRV + TV + ERV$

• **Functional residual capacity:** $ERV + RV$
FRC:

- Amount of air remaining in the lungs after a normal, relaxed expiratory effort.

- At FRC the respiratory system is in equilibrium. The tendency of the lungs to collapse are balanced by the tendency of the thoracic wall to expand.
Physiological disturbances affecting ventilation:

- **Brainstem**: Respiratory center. Bleeding, tumor, raised intracranial pressure with herniation.

- **Motoric neurons in spinal cord**: Poliomyelitis, motor neuron disease, trauma etc.

- **Peripheral nerve**: Phrenic nerves.
• **Diaphragm**: Myopathy

• **Chest wall**: Rib fractures, pleural effusion, pneumothorax, hemothorax, mesothelioma.

• **Airways**: Asthma, COPD, upper airway obstruction.

• **Alveoli**: Filled by blood, fluid, pus, tumor, protein etc..
Physiological lung function tests:

- **Ventilatory function:** Assess flow via flow-volume loop - FEV1. Assess adequacy of ventilation with PaCO2.
- **Diffusion:** Assess with CO-diffusion test: DLCO.
- **Pulmonary perfusion:** Ventilation-perfusion scan. Inhaled radioactive xenon matched with technetium.
- **Structure of lung:** CT
- **Ciliary function tests**
- **Arterial blood gas analysis**