(XVII.) PNEUMOGRAPHY

Anatomy of respiratory system

Respiratory system

- *Airways*
  - Upper airways
  - Lower airways

- *Lungs*

Respiratory muscles

- *Inspiratory muscles*
  - Diaphragm
  - External intercostal muscles

- *Accessory inspiratory muscles*
  - Scalene and sternocleidomastoid muscles

- *Expiratory muscles*
  - Internal intercostal muscles; abdominal muscles

Changes of intrapleural and intraalveolar pressure (related to atmospheric pressure) during inspiration and expiration
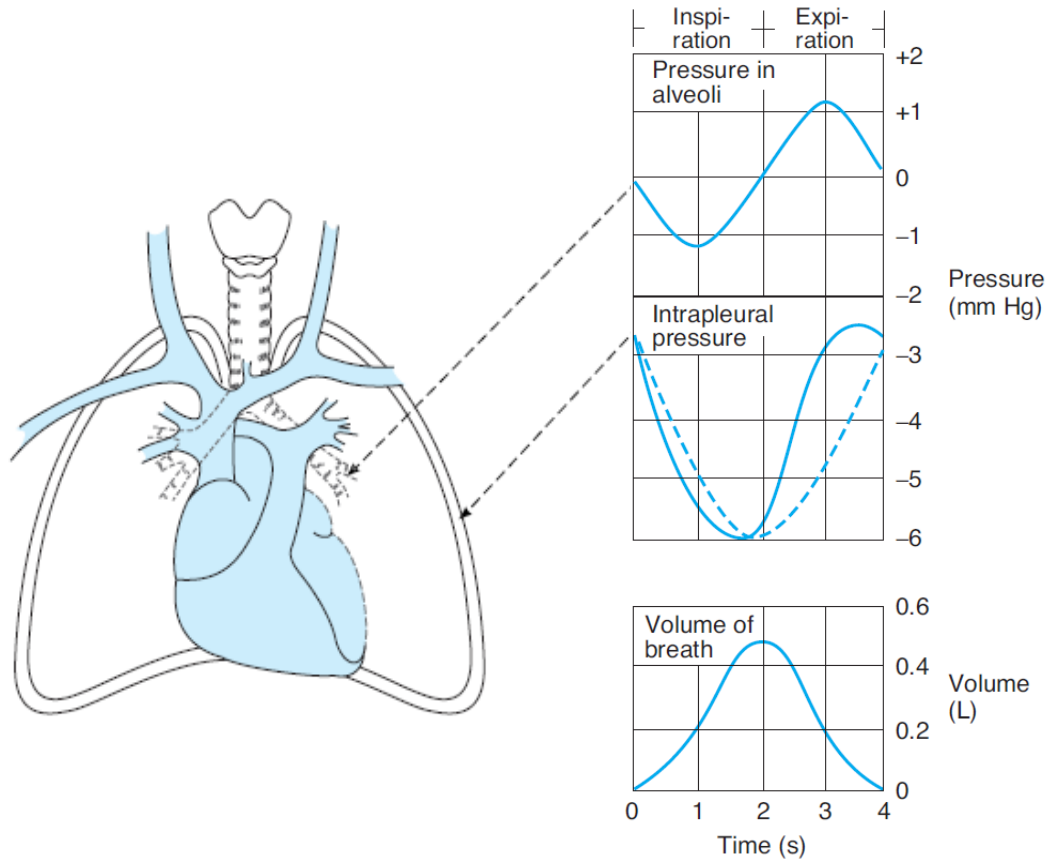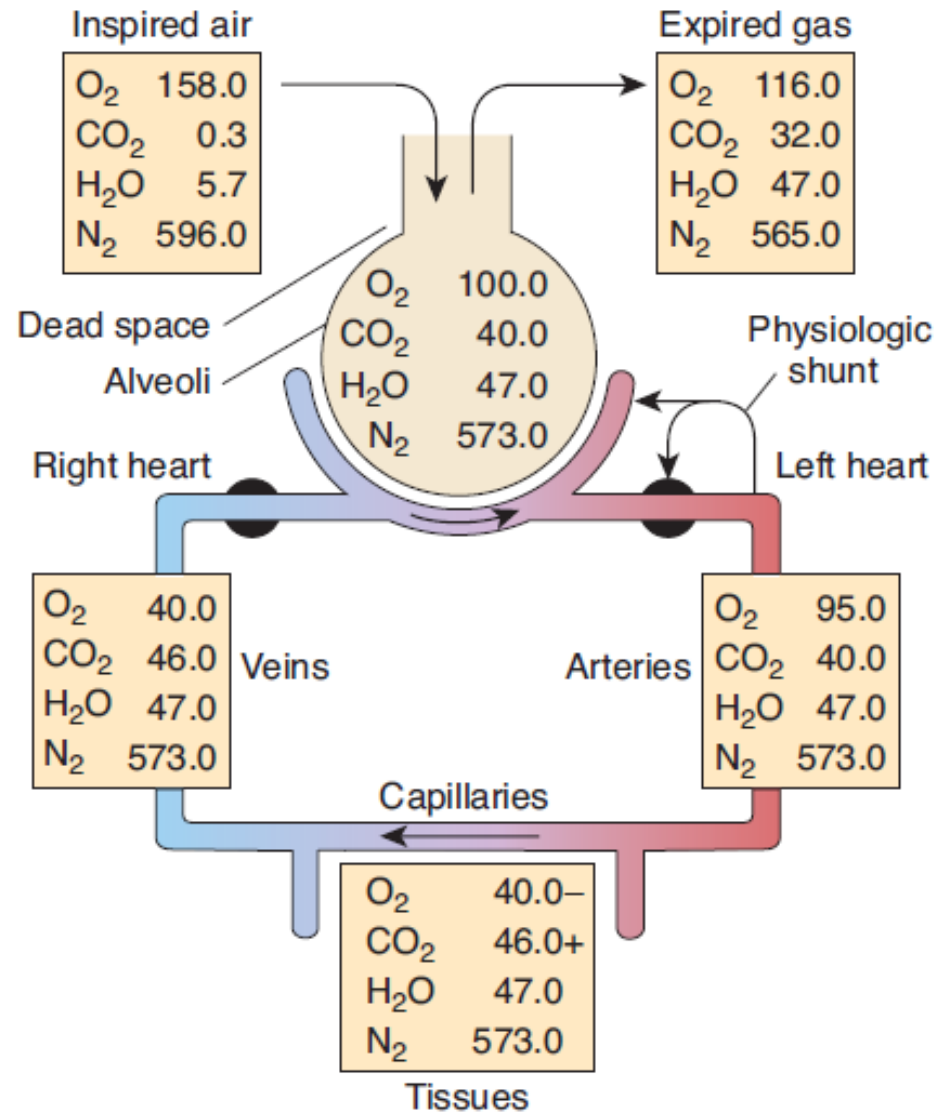

Inspiration

- Active process – contraction of respiratory muscles
- Decrease of intrapleural pressure
- Decrease of intraalveolar pressure
- Due to pressure gradient, air flows into lungs

Expiration

- Passive process (quiet expiration) – elasticity of thoracic wall and lungs
- Increase of intrapleural and intraalveolar pressure
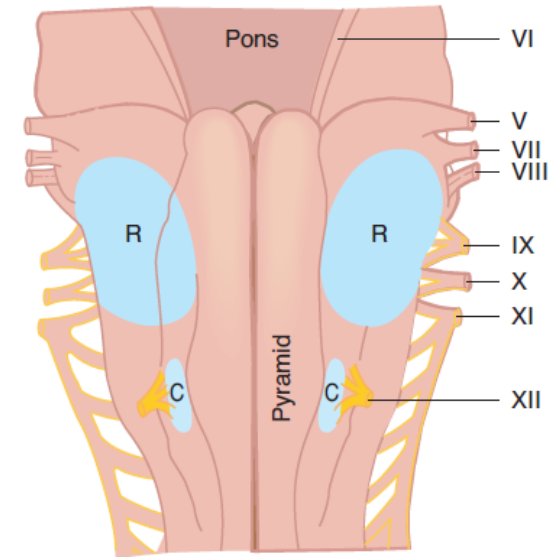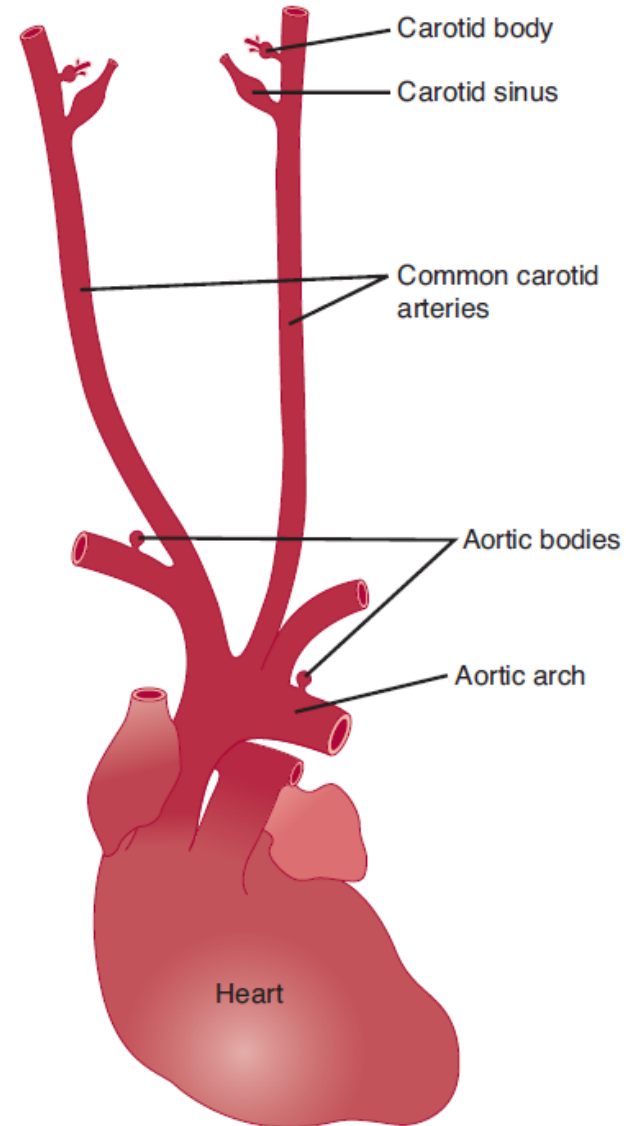- Air flows out of lungs

Partial pressures of gases (mm Hg) in various parts of the respiratory system and in the circulatory system

Inspired air

O_2	158.0
CO_2	0.3
H_2O	5.7
N_2	596.0

Expired gas

O_2	116.0
CO_2	32.0
H_2O	47.0
N_2	565.0

Dead space

Alveoli

O_2	100.0
CO_2	40.0
H_2O	47.0
N_2	573.0

Physiologic shunt

Right heart

Left heart

Veins

O_2	40.0
CO_2	46.0
H_2O	47.0
N_2	573.0

Arteries

O_2	95.0
CO_2	40.0
H_2O	47.0
N_2	573.0

Capillaries

O_2	40.0−
CO_2	46.0+
H_2O	47.0
N_2	573.0

Tissues

Chemical control of breathing

Chemoreceptors

- Peripheral

- Central

Carotid body

Carotid sinus

Common carotid arteries

Aortic bodies

Aortic arch

Heart

Pons

VI

V

VII

VIII

R

R

IX

X

XI

Pyramid

C

C

XII

Equipment

- two respiratory belts for registration of respiratory movements
- nose clip
- sterile mouthpiece
- Krogh respirometer
- PowerLab system

Procedure

Record:

- Resting respiration (1 min)

- Respiration after a mild exertion (5 squats – 10 breathing cycles)

- Respiration after an intensive exertion (30 squats – 10 BC)

- Respiration after re-breathing of the expired air from Krogh respirometer (2-3 min + recovery)

Evaluation

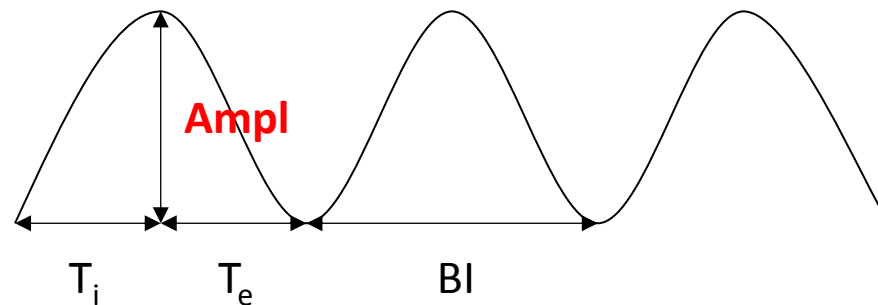Following parameters in 6 chosen breathing cycles in each recorded situation

T_i - duration of inspiration
T_e - duration of expiration
BI   - duration of whole breathing cycle (breathing interval)
Ampl   - amplitude of breathing movements

Create a table, calculate arithmetic means and standard deviations

Statistical analysis of obtained data

Choose two sets of data which will be analyzed

Follow the procedure in textbook