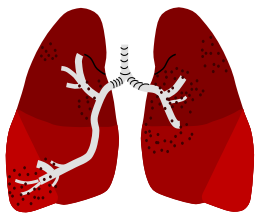
Sistem Respiratori

Tonang Dwi Ardyanto

Structures of Respiratory System

- upper respiratory tract
  - nose, mouth, pharynx, epiglottis, larynx and trachea
- lower respiratory tract
  - bronchial tree and lungs



RESPIRATORY FUNCTIONS

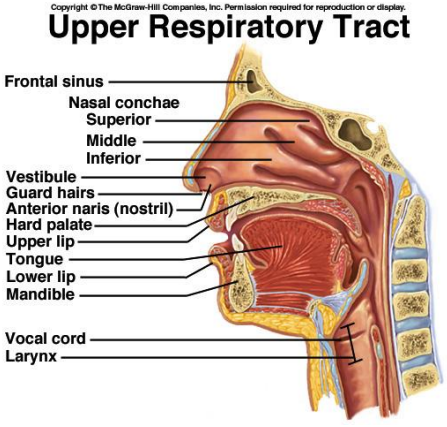
PRIMARY

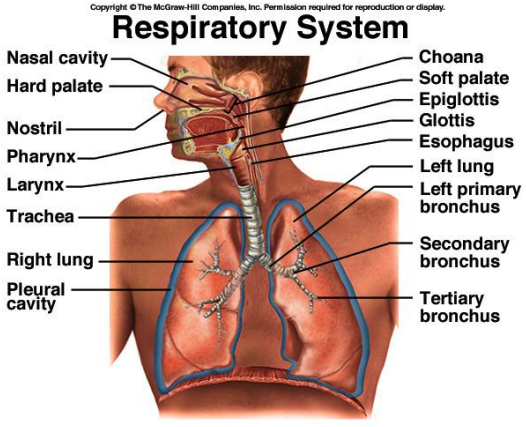
- SUPPLY BODY WITH OXYGEN
- DISPOSE OF CARBON DIOXIDE

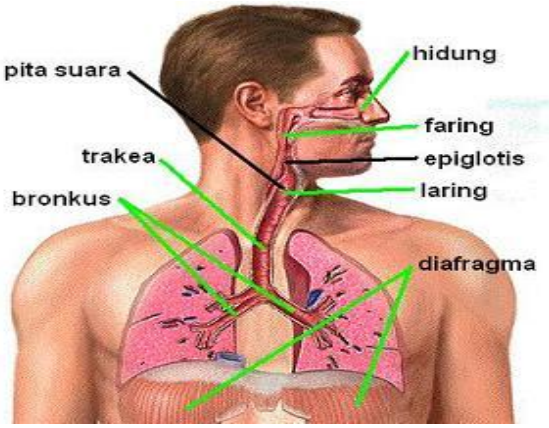
SECONDARY

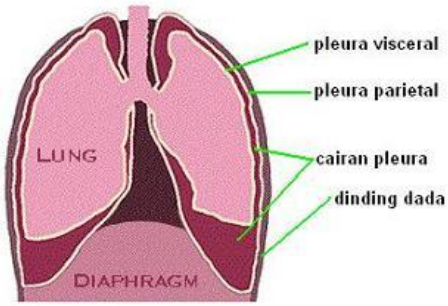
- SOUND PRODUCTION
- ACID-BASE BALANCE
- OLFACTORY RECEPTION

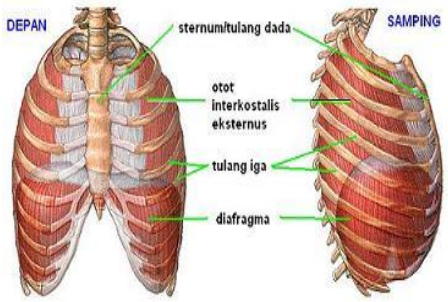
ANATOMI

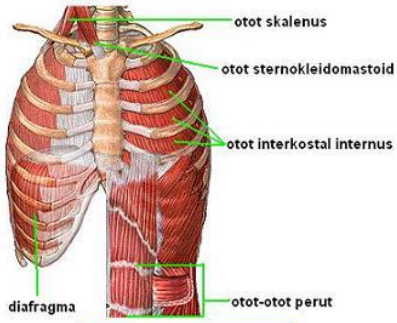




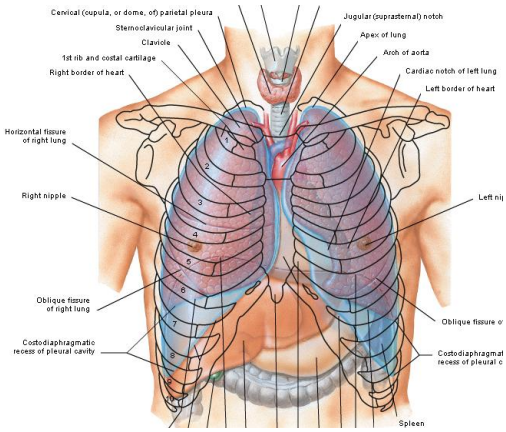

pita suara
hidung
faring
trakea
epiglotis
laring
bronkus
diafragma

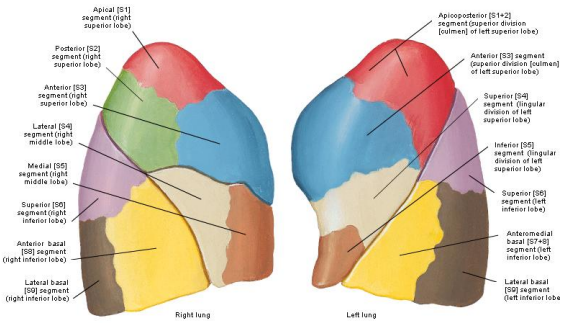

pleura visceral
pleura parietal
LUNG
cairan pleura
dinding dada
DIAPHRAGM

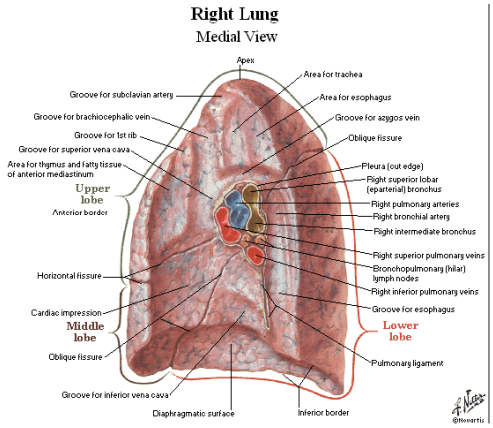

DEPAN
sternum/tulang dada
SAMPING
otot
interkostalis
eksternus
tulang iga
diafragma

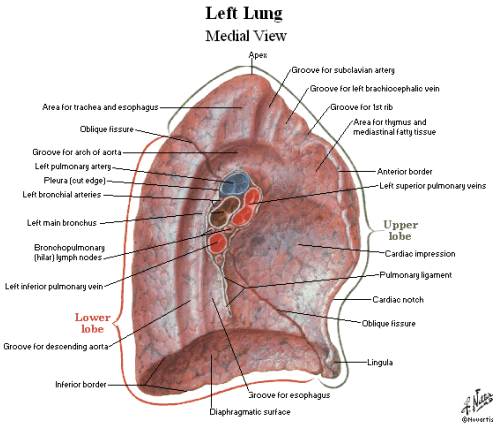


OTOT-OTOT PERNAFASAN

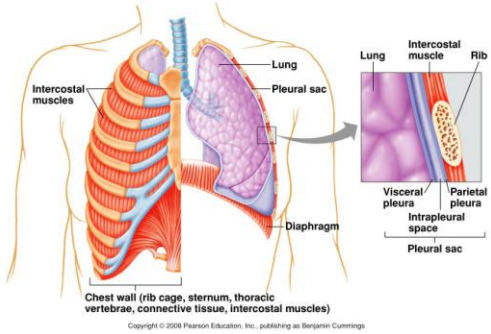




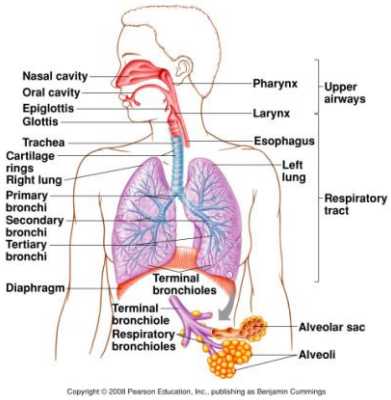


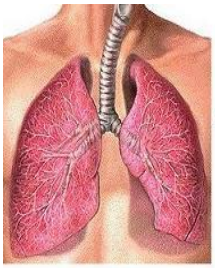


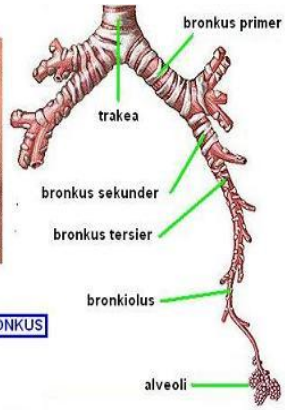
Structure of the thoracic cavity



Airways





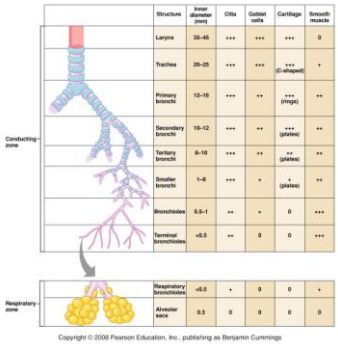


PERCABANGAN BRONKUS

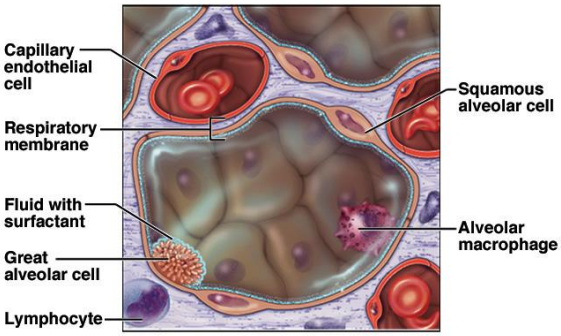
Airways

- Upper airways:
  - nose to pharynx
- Lower airways:
  - Conducting airway: larynx → bronchioles
  - Respiratory airway: alveoli

Due to the wall structure of the airway: one cell layer (SSE) allows for gas exchange

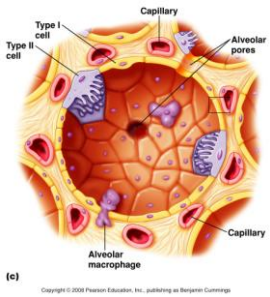


Structure of an Alveolus

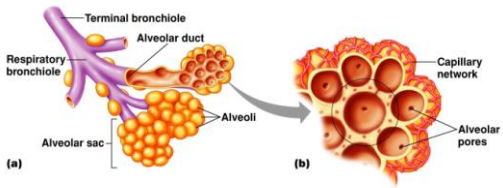


Alveolar structure

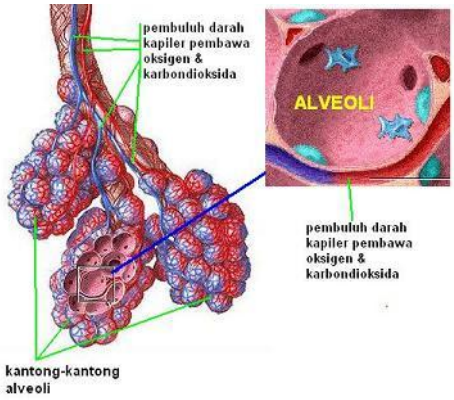
- Type I cells → gas exchange
- Type II cells → secrete surfactant (lipoproteins) → decrease surface tension → allowing for easier alveoli inflation
- Surfactants start to be secreted by the 7th month of pregnancy → risk of lung disease in premature babies
- Presence of macrophages in alveoli



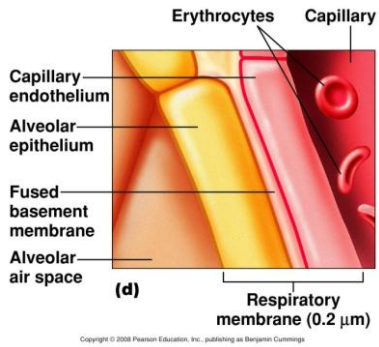
Respiratory airway: Alveoli



- Alveolar wall is formed by simple squamous epithelium = type I cells (SSE) → gas exchange
- Respiratory membrane: membrane separating alveolus from blood capillary.
- Large surface area from the numerous alveoli → better gas exchange
- Presence of elastic fibers between alveoli



Blood supply to the lungs

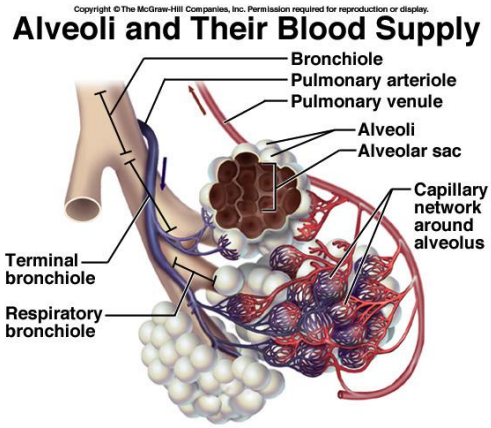


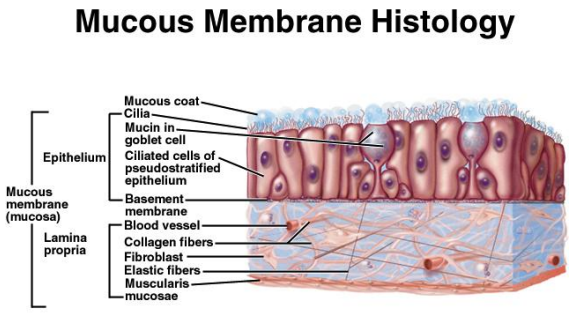
FISIOLOGI

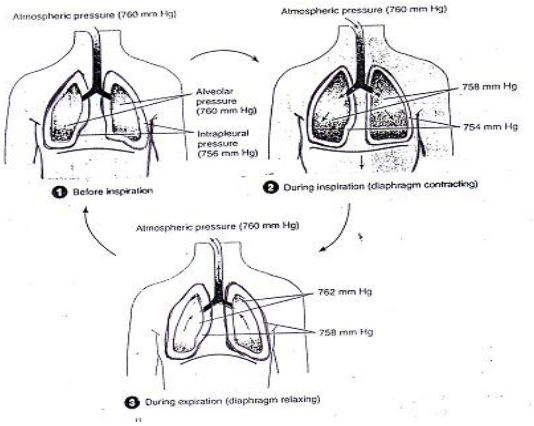
RESPIRATORY ORGANS

BRONCHIAL TREE

- TRACHEA (1)
- PRIMARY BRONCHI (2)
- SECONDARY BRONCHI (1 PER LOBE)
- TERTIARY BRONCHI (8 L & 10 R)
- BRONCHIOLES (MANY)
- TERMINAL BRONCHIOLES (x 50 - 80)
- RESPIRATORY BRONCHIOLES (x 2+)
- ALVEOLAR DUCTS (x 2 – 10)
- ALVEOLAR SACS



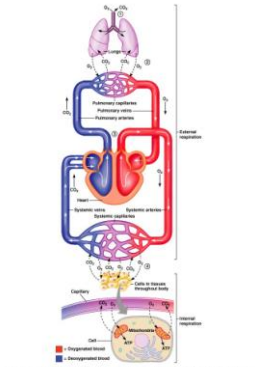


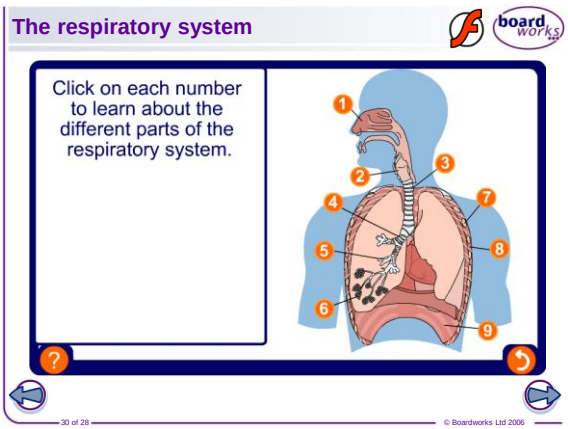


Overview

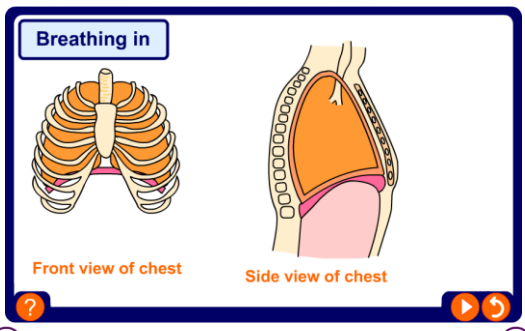
- Respiration = gas exchange -- Occurs at the levels of the lungs and tissues (external respiration) and cell (internal or cellular respiration).

- External respiration:
  - Pulmonary ventilation: movement of air in and out of the lungs
  - Gas exchange in the alveoli
  - Gas transport in the blood
  - Gas exchanges between blood and tissues

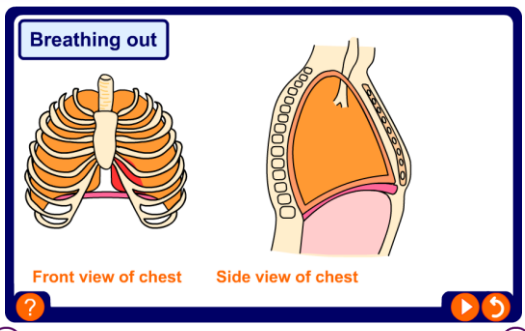




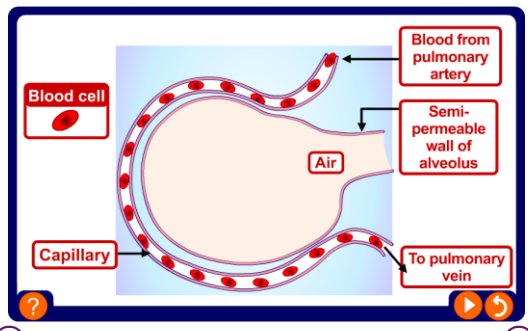
Mechanisms of breathing – inspiration

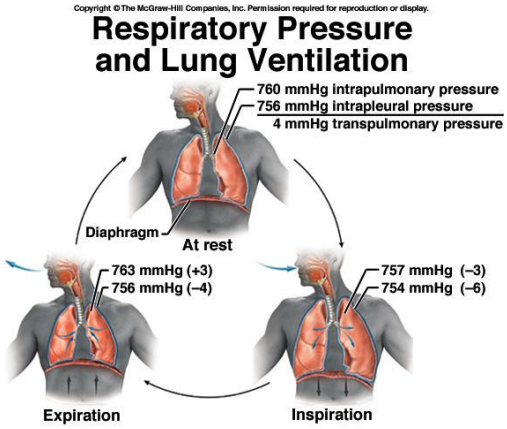


Mechanisms of breathing – expiration



Gas exchange at the alveoli



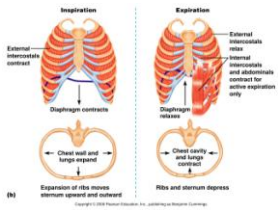


Inspiration and expiration

- Inspiration: chest wall expands due to muscle contraction (diaphragm and/or other muscles)

→Pressure in alveoli ↓ → air moves toward alveoli

- Expiration: passive process → muscle relax → chest wall return to resting state → alveoli become compressed → ↑ alveolar pressure → move moves out



Composition of inhaled and exhaled air

Gas	Amount in inhaled air	Amount in exhaled air
Oxygen	21%	17%
Carbon dioxide	Very small amount	3%
Nitrogen	~~79%~~ Small amount	~~79%~~ Large amount
Water vapour		

What are the main differences between inhaled and exhaled air?

Why does mouth-to-mouth resuscitation work?

Measuring breathing

Tidal volume is the amount you breathe in and out in one normal breath.

Respiratory rate is how many breaths you take per minute.

Minute volume is the volume of air you breathe in one minute.

Vital capacity is the maximum volume of air you can breathe out after breathing in as much as you can.

Residual volume is the amount of air left in your lungs after you have breathed out as hard as you can.