RESPIRATORY SYSTEM
TERM IN RESPIRATION

- **Ventilation** --> inhale oxygen, exhale carbon dioxide
- **External respiration** --> gas exchange from air to blood
- **Internal respiration** --> gas exchange from blood to body tissue
RESPIRATORY ORGANS

A. NASAL CAVITIES: as entrance for oxygen and exit for carbon dioxide and water

Components of NASAL CAVITIES:

1. Fine hairs: filters for air that enter through nostril
2. Olfaction Sensory
3. Mucous membrane: trap for foreign things
4. Nasal Concha: adapt humidity and temperature of air to body temperature
B. PHARYNX

- Intersection of food and air path
- Head of nasopharynx and oropharynx
C. LARYNX

- Have epiglottis → muscular flap that closes trachea when food is swallowed

- Consist of cartilaginous ring that form Adam’s apple
  → A voice box = contain vocal chords
D. TRACHEA

- Elongated pipe from neck to chest
- Stiff, + 10 cm
- Consist of cartilage rings and smooth muscles
- Covered by mucous membrane with cilia
- When dirt enters, cilia wall beat upward with strong air blown to exhale it
- Branches into bronchus
E. BRONCHUS

- Cartilage by turns with muscle
- Right bronchus is shorter and larger than left bronchus.
- Branches into small tracts called bronchioles
- Each bronchioles terminate into passages enclosed by multitude sacs called alveoli
F. BRONCHIOLES
End of bronchioles = alveoli (us)
F. ALVEOLI

has very thin and elastic wall

composed of one layer cell

covered by capillary vessel

there is diffusion or gas exchange

Surface area = 100m$^2$

→ the absorption of oxygen is **efficient**
Gas Exchange

- CO₂ and O₂ → diffusion
- Depend on partial pressure
- \( PO_2 \) and \( PCO_2 \)
- Different in each organ
  - To Lungs: \( PO_2 < PCO_2 \)
  - From lungs: \( PO_2 < PCO_2 \) (to the tissue)

Each minutes = absorbed 250 ml O₂ + excrete 200 ml CO₂
G. LUNGS (PULMO)

- Located in chest cavity
- Right lung (3 lobes) \( \rightarrow \) pulmo dexter and left lung (2 lobes) \( \rightarrow \) pulmo sinister
- Left lung is smaller because ??
- Protected by thin and elastic layer called pleura
  - consist of lymph fluid
  - Protect lungs from friction
- Contain 300 million of alveoli
The lungs contain millions of tiny alveoli. Oxygen (O₂) from air breathed in goes into the red blood cells via alveoli. Carbon dioxide (CO₂) goes from the red blood cells into alveoli and breathed out.

Lung showing alveoli
LUNG CAPACITY
Lungs Capacity

- **Breathing/Tidal (500ml)**
  - the amount of air normally inhaled or exhaled
- **Complementary (1500ml)**
  - the amount of additional air that could be inhaled in order to completely fill up the lungs
- **Supplementary (1500ml)**
  - the amount of additional air that can be expelled after a normal exhale
- **Total lungs capacity (6000ml)**
  - TV+CV+SV+RV
- **Vital lungs capacity (5000ml)**
  - Inhale and exhale in maximum power
- **Residual (1000ml)**
EXCHANGE MECHANISM IN ALVEOLUS

Nasal Cavities $\rightarrow$ lungs
O$_2$ from air $\rightarrow$ enter alveolus & diffused
CO$_2$ and O$_2$ are carried by Haemoglobin
HbCO$_2$ $\rightarrow$ Hb + CO$_2$

$4$Hb$+ 2$O$_2 \rightarrow 4$ HbO$_2$
<table>
<thead>
<tr>
<th>Features of Alveoli</th>
<th>How they help gaseous exchange</th>
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<tbody>
<tr>
<td>A large number of alveoli in the lungs</td>
<td>Increases surface area for exchange of gases</td>
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<tr>
<td>Walls are made of a single layer of cells</td>
<td>Gases can diffuse easily across the thin walls</td>
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<tr>
<td>Walls secrete a thin lining of moisture</td>
<td>Gases can dissolve in moisture and diffuse easily across walls</td>
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<tr>
<td>Surrounded by a network of blood capillaries</td>
<td>Can transport oxygen to and carbon dioxide away from the cells</td>
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BREATHING MECHANISM

• Based on structure that causes breathing, there are 2 types of respiration:
  1. Chest respiration: intercostal muscle (rib muscle)
  2. Diaphragm respiration: diaphragm
Inspiration

- Thoracic cavity expands
- External intercostal muscles contract
- Diaphragm contracts

Expiration

- Thoracic cavity reduces
- External intercostal muscles relax
- Diaphragm relaxes
1. Inhalation: Diaphragm contracts (moves down).

2. Exhalation: Diaphragm relaxes (moves up).
RESPIRATORY DISEASES AND DISORDER
Some disorders of the respiratory tract, lung and chest

- Asthma
- Bornholm disease
- Bronchiectasis
- Cancer of the lung
- Chronic obstructive pulmonary disease
- Cystic fibrosis
- Hiccups (hiccoughs)
- Idiopathic pulmonary fibrosis
- Pleural effusion
- Pleurisy
- Pneumothorax
- Pulmonary embolism
- Sarcoidosis
- Sleep apnoea
Some infections of the respiratory tract

- Bronchiolitis
- Bronchitis
- Colds
- Cough
- Epiglottitis
- Laryngitis
- Legionnaires' disease
- Pneumonia
- Sinusitis
- Sore throat
- Tonsillitis
- Tuberculosis
- Upper respiratory tract infections
- Whooping cough
• **Asthma**: narrowed air passages because of allergic or being blocked
• recurrent
• **Bronchitis**: inflammation in bronchi caused by virus, bacteria.

• Non recurrent
Pleuritis: inflammation in pleura, if acute can cause pneumonia
Pneumonia: Lung inflammation caused by **bacterial** or **viral** infection, in which the air sacs fill with **pus** and may become solid.
Laryngitis: inflammation in larynx

Renitis: inflammation in nasal cavity
Sinusitis: inflammation above nasal cavity
Tonsilitis: inflammation in tonsil. Severe syndrome: sore throat, fever, bad breath and nasal congestion.

**Bacterial**

- Swollen uvula
- Whitish spots
- Red swollen tonsils
- Throat redness
- Gray furry tongue

**Viral**

- Red swollen tonsils
- Throat redness
Infections of the respiratory tract

- Sinusitis (infection of the sinuses)
- Tonsillitis (infection of the tonsils)
- Pharyngitis ("sore throat" - infection of the pharynx)
- Tracheitis (infection of the trachea)
- Bronchiolitis (infection of the small airways - the bronchioles)
- Bronchitis (infection of the large airways - the bronchi)
- Pneumonia (infection of the alveoli and surrounding lung)
- Pleurisy (inflammation of the pleura often caused by an infection)
Diftery: blockage of upper air passage by bacteria infection (happens in children) → Corynebacterium diphtheriae
• TBC: tuberculosis infection on alveolus wall so will make oxygen diffusion disorder
asphyxia

- a condition arising when the body is deprived of oxygen, causing unconsciousness or death; suffocation.
- Hb binds another poisonous gases (Cyanide /CN and carbon monoxide/CO)
Emphysema

- Alveolar walls break down.
- The alveoli become larger but fewer in number. It will reduce surface area for gaseous exchange.
- Caused by irritants in smoke
LUNG CANCER

- Irritation in the lung cells. These lung cells start to multiply uncontrollably so that abnormal masses and lumps of tissues are formed.
DEADLY SMOKE

Nicotine
- Makes blood clot easily
- Causes heart diseases
- Causes inflammation and narrowing of air passages

Tar
- Induces uncontrolled cell multiplication
- Causes lung cancer
- Paralyses cilia in air passages
- Causes bad coughs

Carbon monoxide gas
- Decreases the ability of red blood cells to transport oxygen
- Increases fatty deposits on walls of arteries
- Causes heart diseases

Irritants
- Paralyses cilia in air passages
- Induces phlegm
- Causes bad coughs
- Causes walls of alveoli to burst