Q1. Describe Pharynx. (4M)

The pharynx is 12-14cm long tube that lie behind the nasal and mouth cavity and larynx.

This is common passage for respiratory and digestive systems.

During swallowing of food epiglottis cover the larynx completely.

During breathing epiglottis stands up and oesophagus is closed. Air pass into respiratory tract.

Pharynx is divided into three parts: Naso, Oro, Laryngo.

(i) Nasopharynx:- Nasal part of pharynx.
- lie behind nose
- On lateral wall opening of pharyngotympanic tube.
- It consist of Pharyngeal tonsils.

(ii) Oropharynx - Oral part of pharynx
- Behind mouth
- Lateral wall, there is collection of tonsils called, Palatine tonsil.

(iii) Laryngopharyx - Laryngeal part of pharynx.
- Extend from oropharynx to oesophagus.

Functions (Pharyx): 1. Act as common pathway for both wind pipe & food pipe.
2. Useful in warming & humidifying air.

- Pharyngotympanic tube helpin hearing.
- Pharyngeal and Laryngeal tonsils produce anti-bodies and helpin protecting from invading micro-organisms.

Q Describe Larynx ? (4M)

The Larynx, commonly called voice box or glottis, passageway for air between pharynx and trachea.

It extends from 4th to 6th vertebral levels.

Larynx is formed by nine cartilages that are connected to each other by muscles and ligaments.

Larynx plays an essential role in human speech.

Types of cartilage in Larynx:

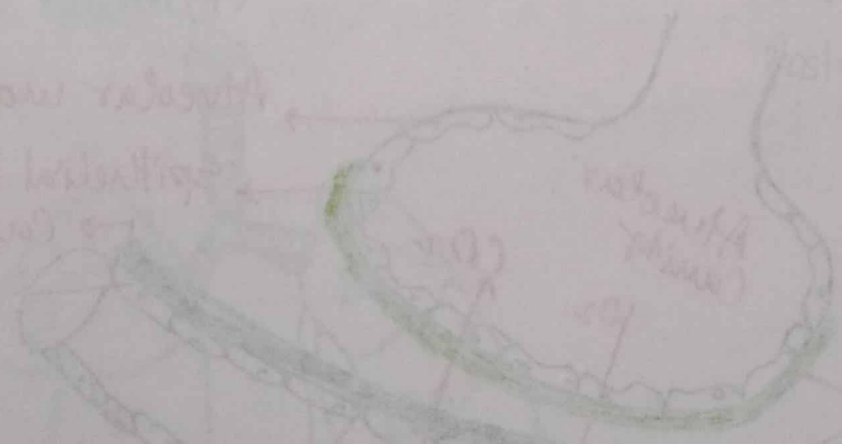
1. Thyroid cartilage (1) Adam apple, hyaline, anterior attachment of vocal cords.
2. Cricoid cartilage (1) ring shape, hyaline cartilage.
3. Arytenoid cartilage (2) hyaline, posterior attatchment to vocal folds
4. Cuneiform Cartilage (2) hyaline
5. Corniculate cartilage (2) hyaline
6. Epiglottis (1) Elastic cartilage

Q Describe respiratory tree? (2.5M-3M)

The respiratory tree or Tracheo-Bronchial tree is whole respiratory passage i.e branching network of trachea

Respiratory tree = Trachea + Two 1° bronchi

Trachea
↓
Main Bronchi
↓
Lobar Bronchi
↓
Segmental Bronchi
↓
Bronchioles
↓
Tertiary Bronchioles



Q (4m) Describe "Alveoli of lungs" ? (Main site for Exchange of Gases)

The terminal dilation of an alveolar duct is called an "alveolar sac".

Alveoli is consist of two types of cells

Type I

Squamous Pulmonary epithilial
('Simple Squamous cells)

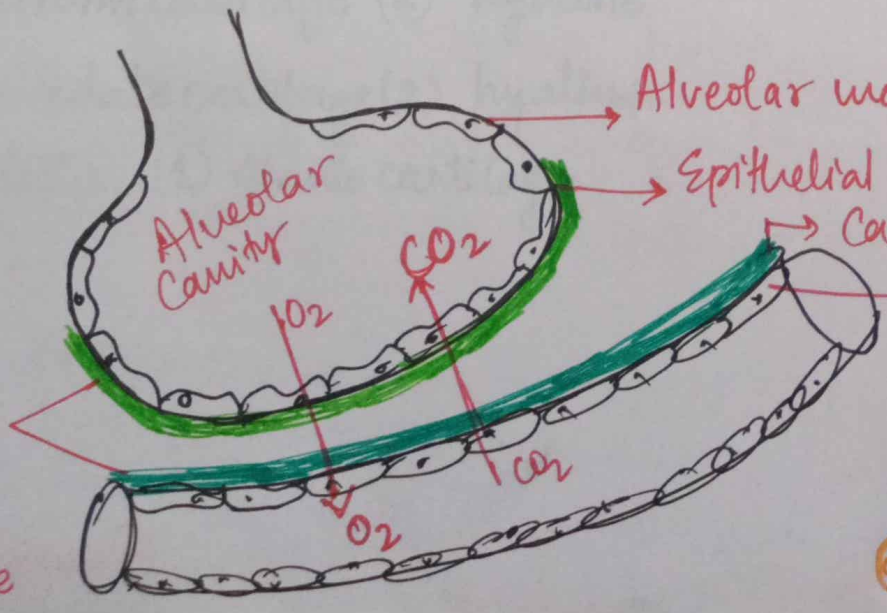
- form continue lining of the alveolar walls.
- Main sites of exchange of gases

Type II

Septal Cells
(found b/w type 1 cells)

- Rounded cuboidal epithelial cells with microvilli.
- It secrete alveolar fluid i.e Surfactant.

Alveolar macrophages are also present in alveolar wall.
A layer of type I and type II with alveolar macrophages that constitute alveolar wall.
An epithelial basement membrane under alveolar wall
A capillary basement membrane fuse to epithelial basement membrane.
The capillary membrane.



Q Bronchopulmonary segments of left (5M) and Right (5M) lungs? lobes of lungs? (5M)

Bronchopulmonary Segments: A subdivision of lobe of lung — based on connection to the segmental bronchus.

For e.g There are 10 segments present in right lung and in the left lung.

- Each segment functions independently and supply by its own testiary bronchus artery, lymph vessels and autonomic nerves.
- Thus if one segment infected or damaged other in the same lobe may not be affected.

Right lung

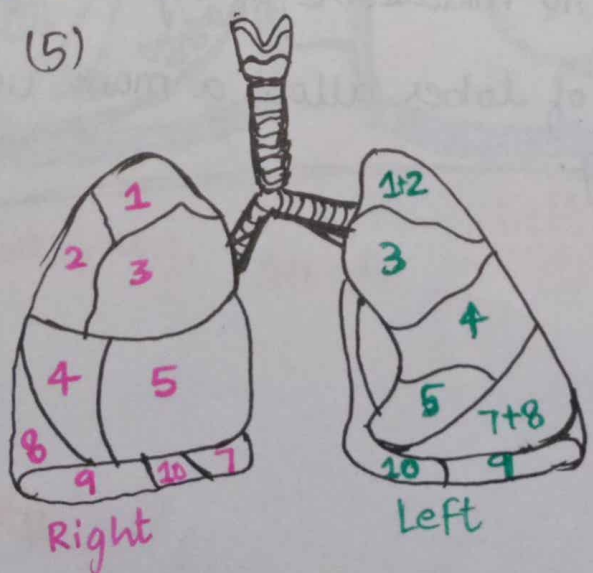
The right lung have 3 lobes. These 3 lobes contain 10 segments.

Superior lobe segment
- Apical (1)
- Posterior (2)
- Anterior (3)
- Middle lobe lateral (4)
- Medial (5)

Middle lobe segment
- Lateral (4)
- Medial (5)

Inferior lobe Segment
- Superior (6)
- Medial baseal (7)
- Anterior basal (8)
- Lateral basal (9)
- Posterior basal (10)

Segment #6 or Posterior



Left lung

The left lung have 2 lobes. These two lobes contain (8-10) segments.

Inferior lobe	Superior lobe
Posterior Superior (6)	Apico-posterior (1,2)
Antero-medial basal (7,8)	Anterior (3)
Lateral basal (9)	Superior-lingual (4)
Posterior basal (10)	Inferior lingual (5)

Lobes of Lung

The right lung is divided into three lobes by two fissures, oblique fissure and horizontal/transverse fissure.

The left lung is divided into two lobes by oblique fissure.

→ The oblique fissure cuts into whole thickness of lung, except at hilum.

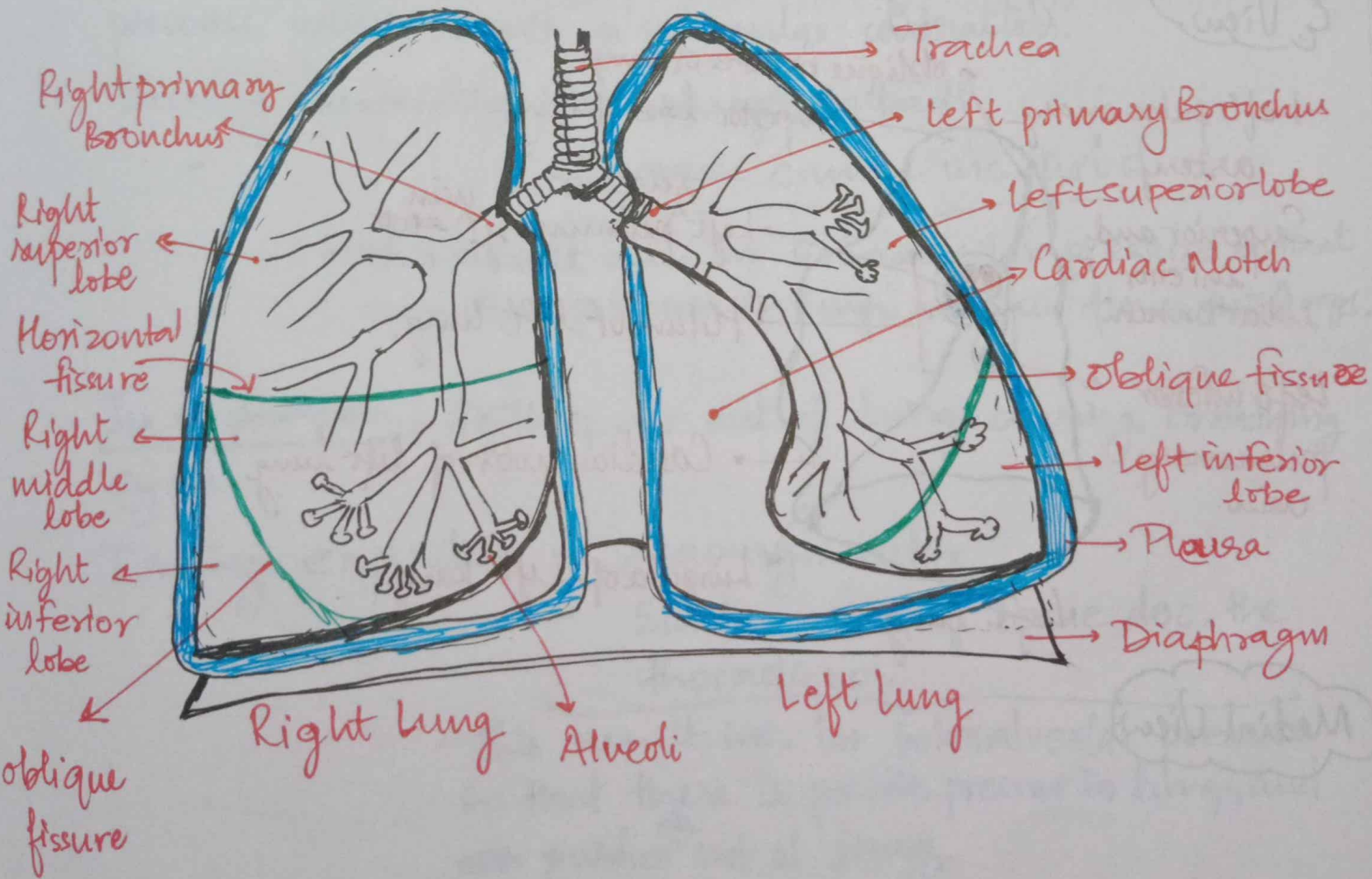
→ In right lung, horizontal fissure passes from the anterior border upto oblique fissure and seprate ~~the~~ middle-lobe ~~from~~ upper lobe.

→ The tongue shape projectn of left lung below the cardiac notch is called lingula.
It correspond to middle lobe of right lung.

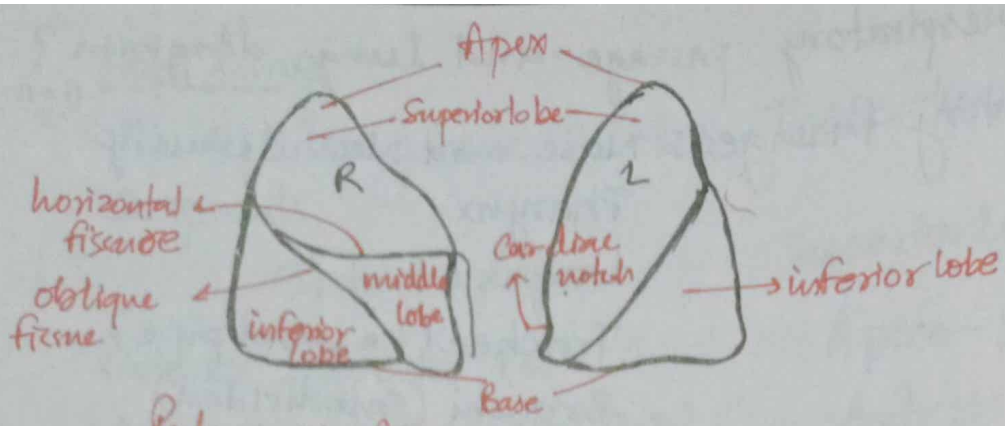
→ Oblique fissure of lobes allow a more uniform expansion of whole lung.

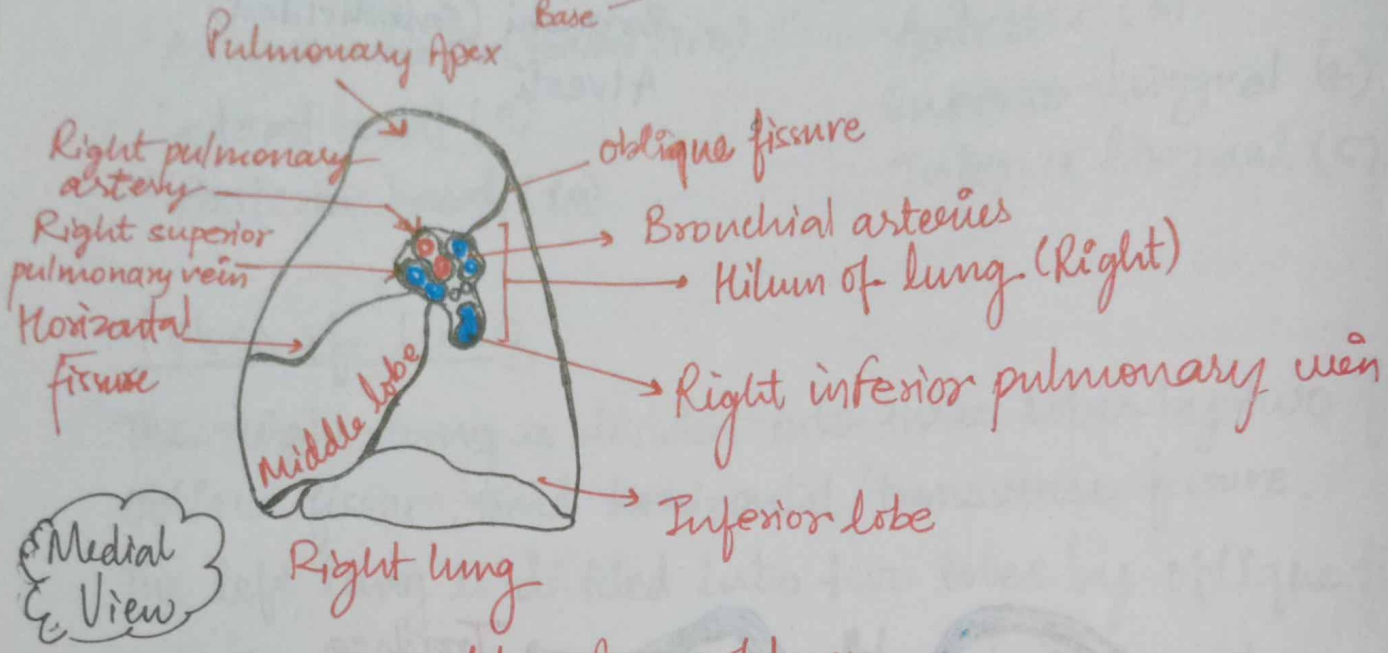
Q. Name parts of respiratory passage and lungs diagram? (10m)

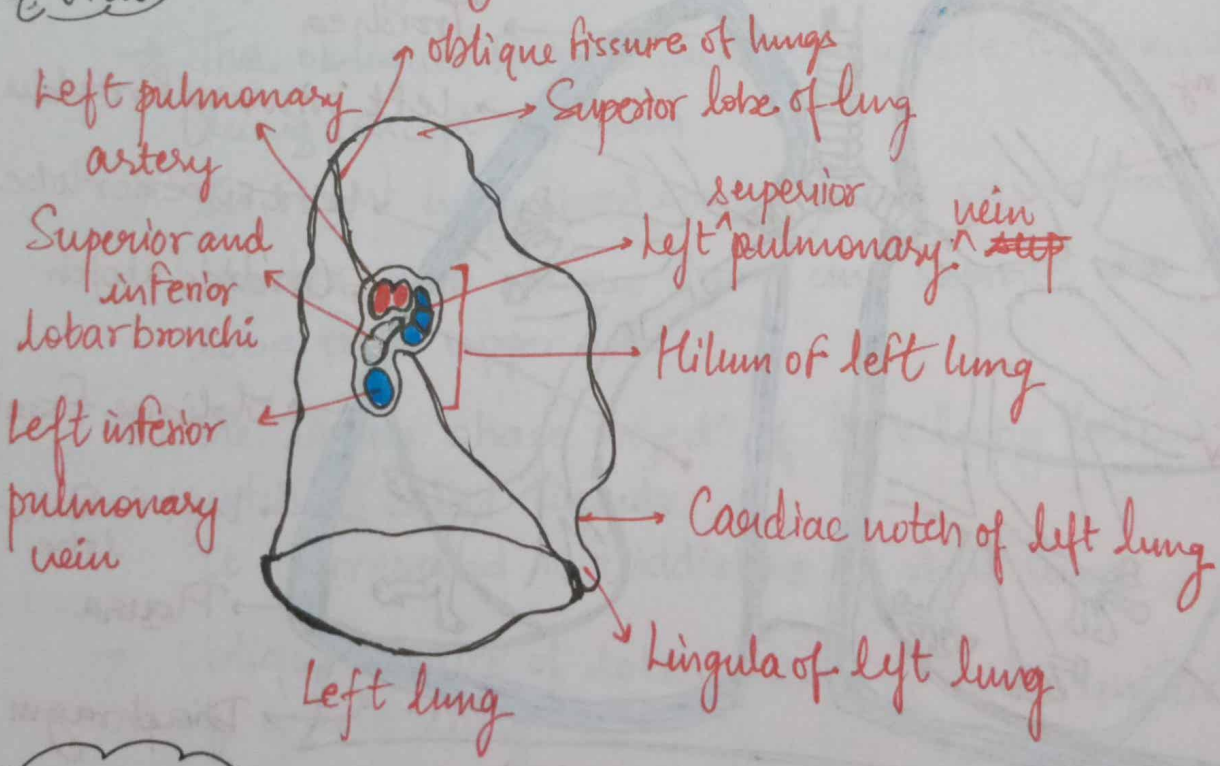
Parts of Respiratory Passage: Nose and Nasal cavity
Pharynx
Larynx
Trachea (i.e wind pipe)
Bronchi (subdivided)
Alveoli



Lateral view of Right and left lungs.







Q Describe physiology of respiration? (5M)

The entire respiration can be divided into three divisions:

1. External respiration or Ventilation or breathing.
2. Transport of gases (O_2 and CO_2) in blood
3. Internal respiration or cellular respiration.

External Respiration = (Inspiration + Expiration)

It commonly reffered as breathing. It is proces of air flowing into lungs during inspiration (inhalation) out of lungs during (exhalation) expiration.

Air flows because of pressure differences between the atmosphere and gases inside lungs.

In inspiration, taking air into lungs through active process which result in muscular contraction.

During inspiration - diaphragm contracts
- Thoracic cavity inc. in vol.

This result dec. in intraalveolar pressure so that negative pressure in lungs and air flows into lungs.

In expiration, letting air out of lungs during breathing cycle

During expiration - diapragm relax
- Elastic recoil of tissue dec. the thoracic vol.

This result inc. in intraalveolar pressure so that there is positive pressur in lungs and air pushes out of lungs.

Transport of gases

Transport of O_2

- Combine with Hb (97%)
- As simple solution (3%)
  - (dissolve in plasma)

Transport of CO_2

- as dissolve form (7%)
- as carbonic acid (–)
- as bicarbonate → 60–70%
- as carbamino compound (20–30%)

Internal respiration or Cellular Respiration (4M)

It is the process of diffusing oxygen from the blood capillaries (in response to oxygen concentration in the capillaries of blood vessels is really low), into interstitial fluid and into the cells and product^{n} of CO_2 by cells.

This enable exchange of gases and other solutes during internal respiration.

Cellular respiration refers to process of converting O_2 with glucose into ATP (energy form)

Q Describe Pulmonary Ventilation? (5M)

Pulmonary ventilation, or breathing, is the exchange of air between the atmosphere and the lungs.

It is process of air flowing into the lungs during inspiration (inhalation) and air flowing out of the lungs during expiration (exhalation).

Air flows b/w atmosphere and lungs due to the differences in pressure.

Pulmonary ventilation involve three different pressures:
(i) Atmospheric pressure (pressure outside body)
(ii) Intraalveolar (pulmonary) pressure (pressure in alveoli)
(iii) Intrapleural pressure (pressure within pleural cavity)

Inspiration

It is process of taking air into the lungs through active process.

During inspiration – Diaphragm contracts
- Ribs move upwards due to contract^{n} of external intercoastal muscles to increase space/volume in chest.
- Thoracic cavity increases in volume.
- This decreases intraalveolar pressure so that air flows into lungs.

Inspiration draws air into the lungs.

Expiration

It is the process of letting air out of lungs through passive process.

During expiration - Diaphragm Relaxes
Ribs moves backward due to relaxation of external intercoastal muscles to release out the air.
The elastic recoil of thoracic wall and intraalveolar pressure increases and pushes air out of lungs.

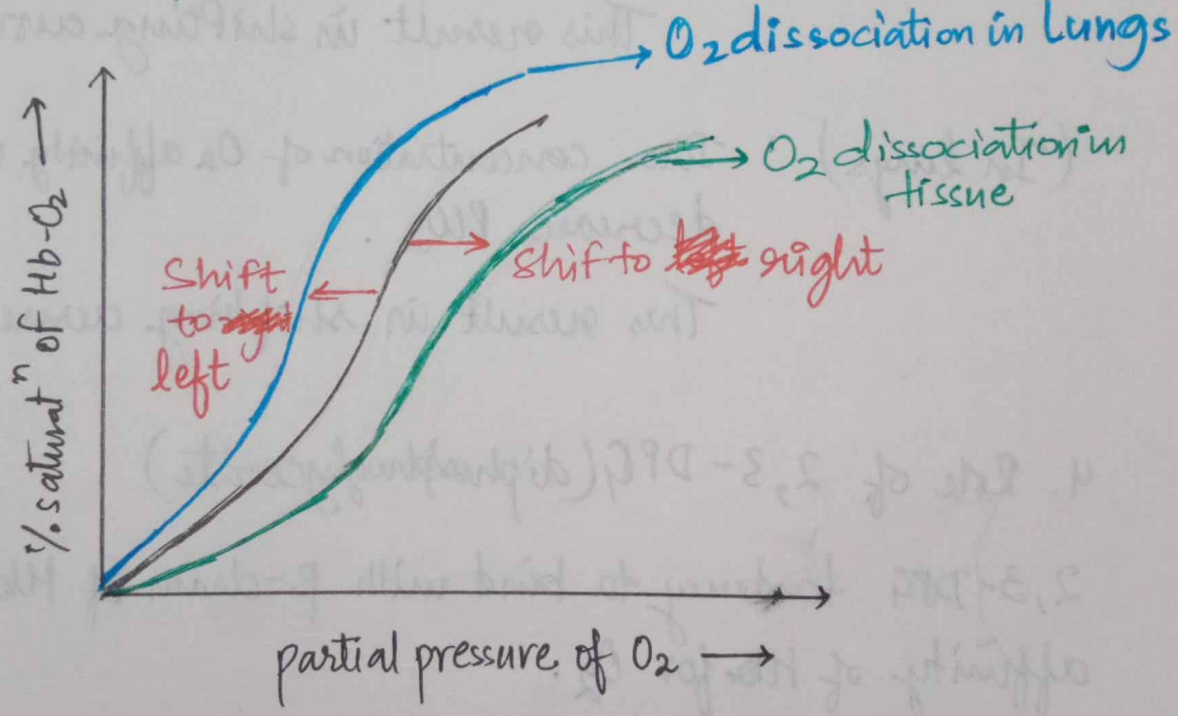
Q Oxy-Haemoglobin dissociation curve and factors causing its shift? (3-5 marks)

The oxygen dissociation curve is a graph with oxygen partial pressure along the horizontal axis and oxygen-saturation on vertical axis.

Graph shape: S-shaped graph

This graph related b/w the % of Oxygen carrying capacity of haemoglobin and partial pressure of oxygen.

Initially all Hb not ready to take all the oxygen. But when one O_2 attach to Hb then slowly all other 3 site for O_2 bind open.



Factors affecting this shift :-

1. Carbon monoxide : Binding capacity of Carbon monoxide with Haemoglobin is 240 times than the Binding capacity of Oxygen with

Haemoglobin.

Hence, it decrease O_2 concentration. Result in Oxy-Hb dissociation curve shift to left, favour uploading of oxygen.

2. Temperature

Increase in temperature shift curve to right.

3. Carbon dioxide

Bohr effect: Inc. concentration of CO_2 and H^+ ions, dec. affinity of Hb for O_2.

(In tissue) Uploading of O_2 occur

This result in shifting curve to right

(In lungs): Inc. concentration of O_2 affinity with Hb, decrease PCO_2.

This result in shifting curve to left.

4. Role of 2,3-DPG (diphosphoglycerate)

2,3-DPG tendency to bind with β-chain of Hb and dec. affinity of Hb for O_2.

This result in right shift and unloading of O_2 at tissue.

This shift is longer in duration than that of $[H^+]$ or $[PCO_2]$ or temperature.