

YAKEEN NEET 2.0

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Breathing & Exchange of Gases

ZOOLOGY

Lecture – 1

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Topics to be covered

1

INTRODUCTION, RESPIRATORY ORGANS, HUMAN RESPIRATORY SYSTEM-1 ✓

2

3

4



Breathing & Exchange of Gases:



Food we ingest
↓

Carbohydrates,
Protein,
Fat

DIGESTION
↓
Breakdown

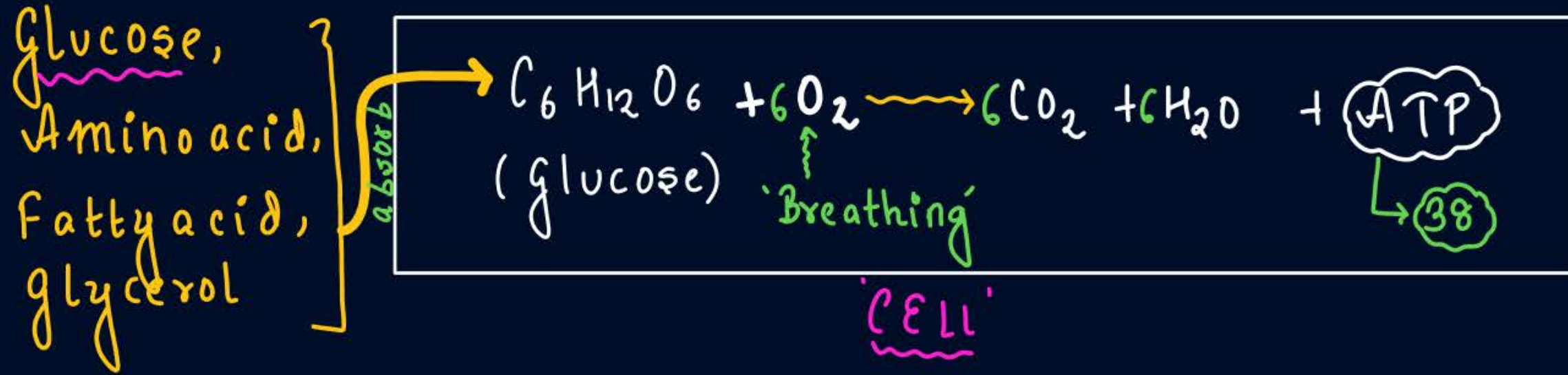
GLUCOSE,
AMINO-ACID,
FATTY ACID + GLYCEROL

Complex Food

SIMPLE FORM

→ Absorbable form.

→ Cells absorb these simple form, utilise them to produce ENERGY.



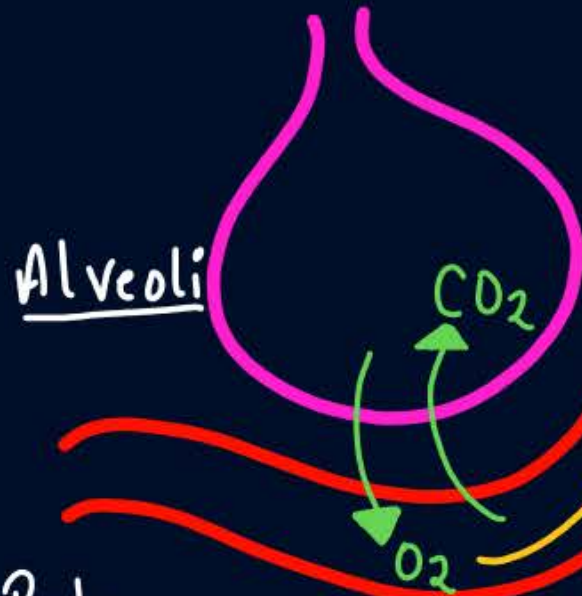
Catabolic rxn
↓
Cvt: Breakdown

Breathing / Pulmonary Ventilation: Simple intake of air (inhalation) & exhaling of air (Exhalation).

- Acc. to NCERT, Breathing commonly k/a 'Respiration'

Steps involved in Respiration:

① Breathing

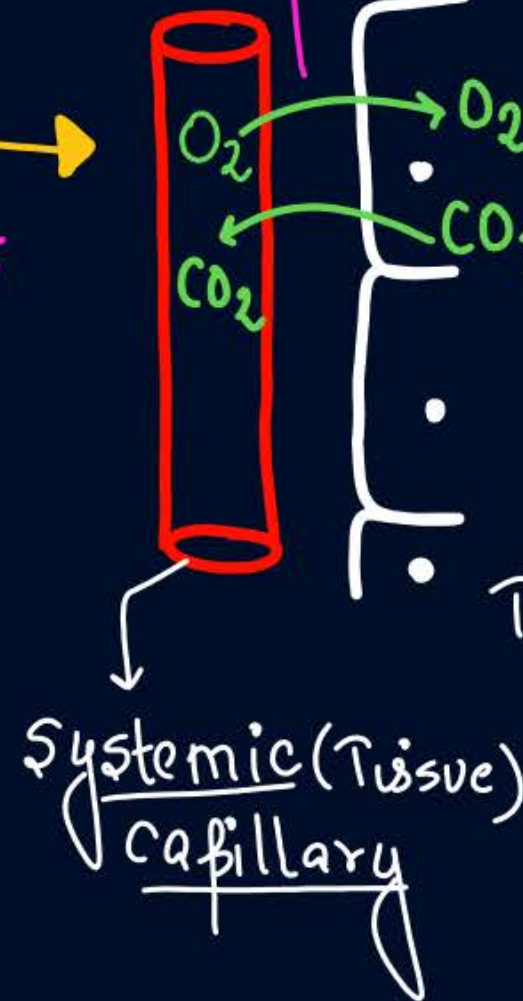


Alveoli
Pulmonary capillary

② External respiration

Exchange/Diffusion of gases b/w Alveoli & p. capillary

③ Transport of gases



④ Internal respiration

Exchange/Diffusion of gases b/w systemic capillary & tissue

⑤ Cellular Respiration

Utilisation of O_2 by cell to produce energy.

As you have read earlier, oxygen (O_2) is utilised by the organisms to indirectly break down simple molecules like glucose, amino acids, fatty acids, etc., to derive energy to perform various activities. Carbon dioxide (CO_2) which is harmful is also released during the above catabolic reactions. It is, therefore, evident that O_2 has to be continuously provided to the cells and CO_2 produced by the cells have to be released out. This process of exchange of O_2 from the atmosphere with CO_2 produced by the cells is called **breathing**, commonly known as **respiration**. Place your hands on your chest; you can feel the chest moving up and down. You know that it is due to breathing. How do we breathe? The respiratory organs and the mechanism of breathing are described in the following sections of this chapter.

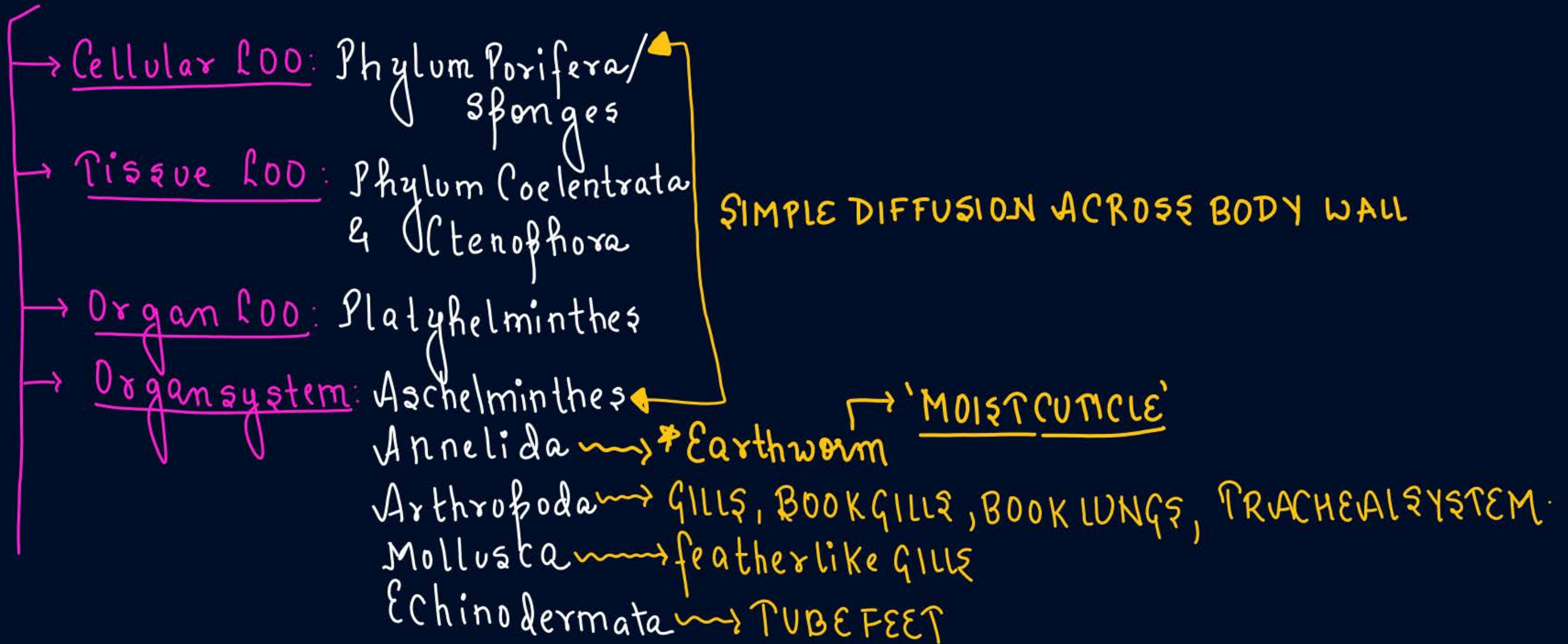
Respiration involves the following steps:

- (i) Breathing or pulmonary ventilation by which atmospheric air is drawn in and CO_2 rich alveolar air is released out.
- (ii) Diffusion of gases (O_2 and CO_2) across alveolar membrane.
- (iii) Transport of gases by the blood.
- (iv) Diffusion of O_2 and CO_2 between blood and tissues.
- (v) Utilisation of O_2 by the cells for catabolic reactions and resultant release of CO_2 (cellular respiration as dealt in the Chapter 12).

Respiratory Organs: Will depend on: ① Level of organisation (LOO)
② Habitat



① LOO:



Phylum Hemichordate → Gills

Phylum Chordata → Sub Phylum Vertebrata

C
L
A
S
S
E
S
 { Fish → Gills
 Amphibia → Gills, Buccal cavity, Skin, Lungs
 Reptiles
 Aves
 Mammal } → Lungs

② On the Basis of Habitat

① In Water / Aquatic

Mostly Gills: When Gills used for respⁿ → BRANCHIAL Respⁿ
 eg: Fish, aquatic Arthropod/Mollusc/Amphibia

② On Land / Terrestrial

• uses LUNGS: PULMONARY RESPIRATION
 eg: Amphibia, Reptile, Ave, Mammal

14.1 RESPIRATORY ORGANS

Mechanisms of breathing vary among different groups of animals depending mainly on their habitats and levels of organisation. Lower invertebrates like sponges, coelenterates, flatworms, etc., exchange O_2 with CO_2 by simple diffusion over their entire body surface. Earthworms use their moist cuticle and insects have a network of tubes (tracheal tubes) to transport atmospheric air within the body. Special vascularised structures called **gills** (branchial respiration) are used by most of the aquatic arthropods and molluscs whereas vascularised bags called **lungs** (pulmonary respiration) are used by the terrestrial forms for the exchange of gases. Among vertebrates, fishes use gills whereas amphibians, reptiles, birds and mammals respire through lungs. Amphibians like frogs can respire through their moist skin (cutaneous respiration) also.

Blood vessel

Human respiratory system:

- ① External nostril / Nares : 1 pair, present above upper lip

leads to Nasal Chamber via nasal passage

- ② Nasal Chamber / Cavity → has fine hair, mucus.

- ③ Internal nostril / nares : 1 pair

- ④ Pharynx : Common passage for food & air

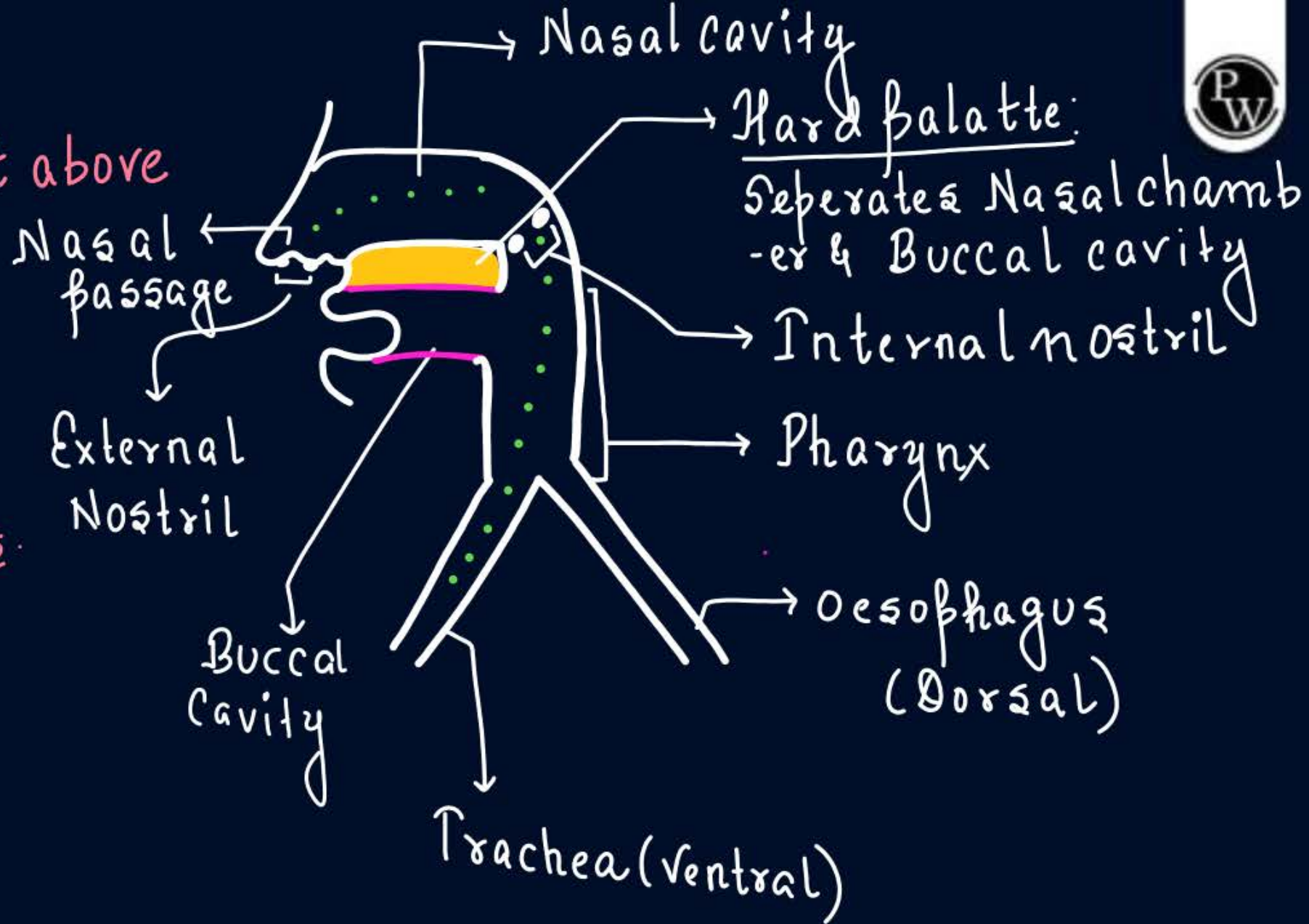
3 parts

Nasopharynx

Oropharynx

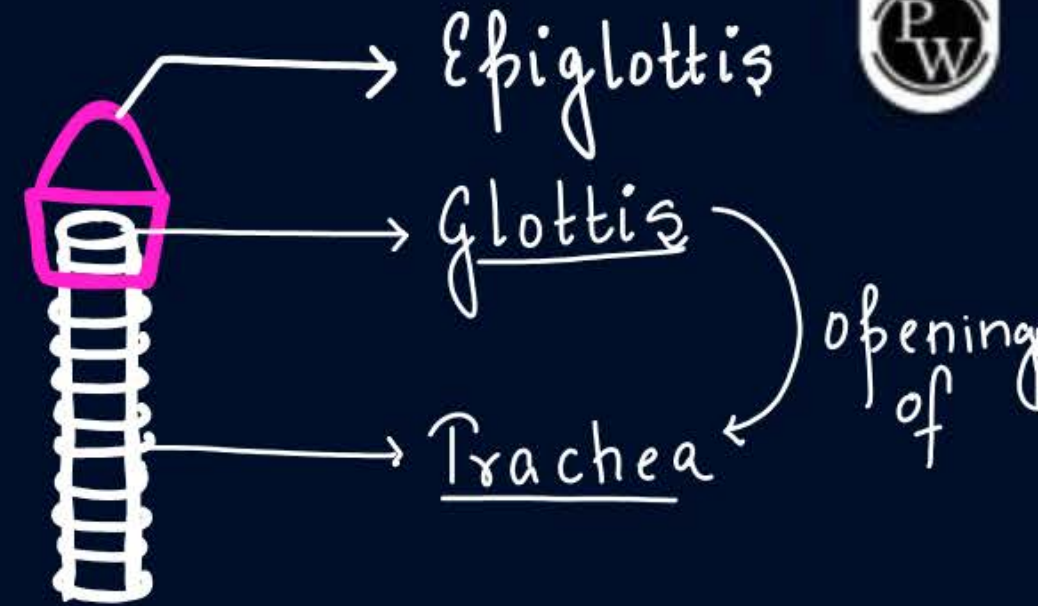
Laryngopharynx

(अतिरिक्त Gyaan)



- ⑤ Larynx: Sound/Voice Box: has vocal cords for sound production
- made up of 9 cartilage
 - one of its cartilage is 'EPIGLOTTIS'

- ⑥ Trachea: wind pipe
- covers the glottis during swallowing of food to prevent its entry into Trachea
 - has incomplete 'C' shaped cartilaginous Rings (Dorsally incomplete): prevents its collapse



14.1.1 Human Respiratory System

We have a pair of external nostrils opening out above the upper lips. It leads to a nasal chamber through the nasal passage. The nasal chamber opens into the **pharynx**, a portion of which is the common passage for food and air. The pharynx opens through the larynx region into the **trachea**. Larynx is a cartilaginous box which helps in sound production and hence called the **sound box**. During swallowing glottis can be covered by a thin elastic cartilaginous flap called epiglottis to prevent the entry of food into the larynx. Trachea is a straight tube extending up to the mid-thoracic cavity, which divides at the level of 5th thoracic vertebra into a right and left primary **bronchi**. Each bronchi undergoes repeated divisions to form the secondary and tertiary bronchi and bronchioles ending up in very thin terminal **bronchioles**. The tracheae, primary, secondary and tertiary bronchi, and initial bronchioles are supported by incomplete cartilaginous rings. Each terminal bronchiole gives rise to a number of very thin, irregular-walled and vascularised bag-like structures called **alveoli**. The branching network of bronchi, bronchioles and alveoli comprise the lungs (Figure 14.1). We have two lungs which are covered by a double layered pleura, with pleural fluid between them. It reduces friction on the lung-surface. The outer pleural membrane is in close contact with the thoracic

lining whereas the inner pleural membrane is in contact with the lung surface. The part starting with the external nostrils up to the terminal bronchioles constitute the conducting part whereas the alveoli and their ducts form the respiratory or exchange part of the respiratory system. The conducting part transports the atmospheric air to the alveoli, clears it from foreign particles, humidifies and also brings the air to body temperature. Exchange part is the site of actual diffusion of O_2 and CO_2 between blood and atmospheric air.

The lungs are situated in the thoracic chamber which is anatomically an air-tight chamber. The thoracic chamber is formed dorsally by the vertebral column, ventrally by the sternum, laterally by the ribs and on the lower side by the dome-shaped diaphragm. The anatomical setup of lungs in thorax is such that any change in the volume of the thoracic cavity will be reflected in the lung (pulmonary) cavity. Such an arrangement is essential for breathing, as we cannot directly alter the pulmonary volume.

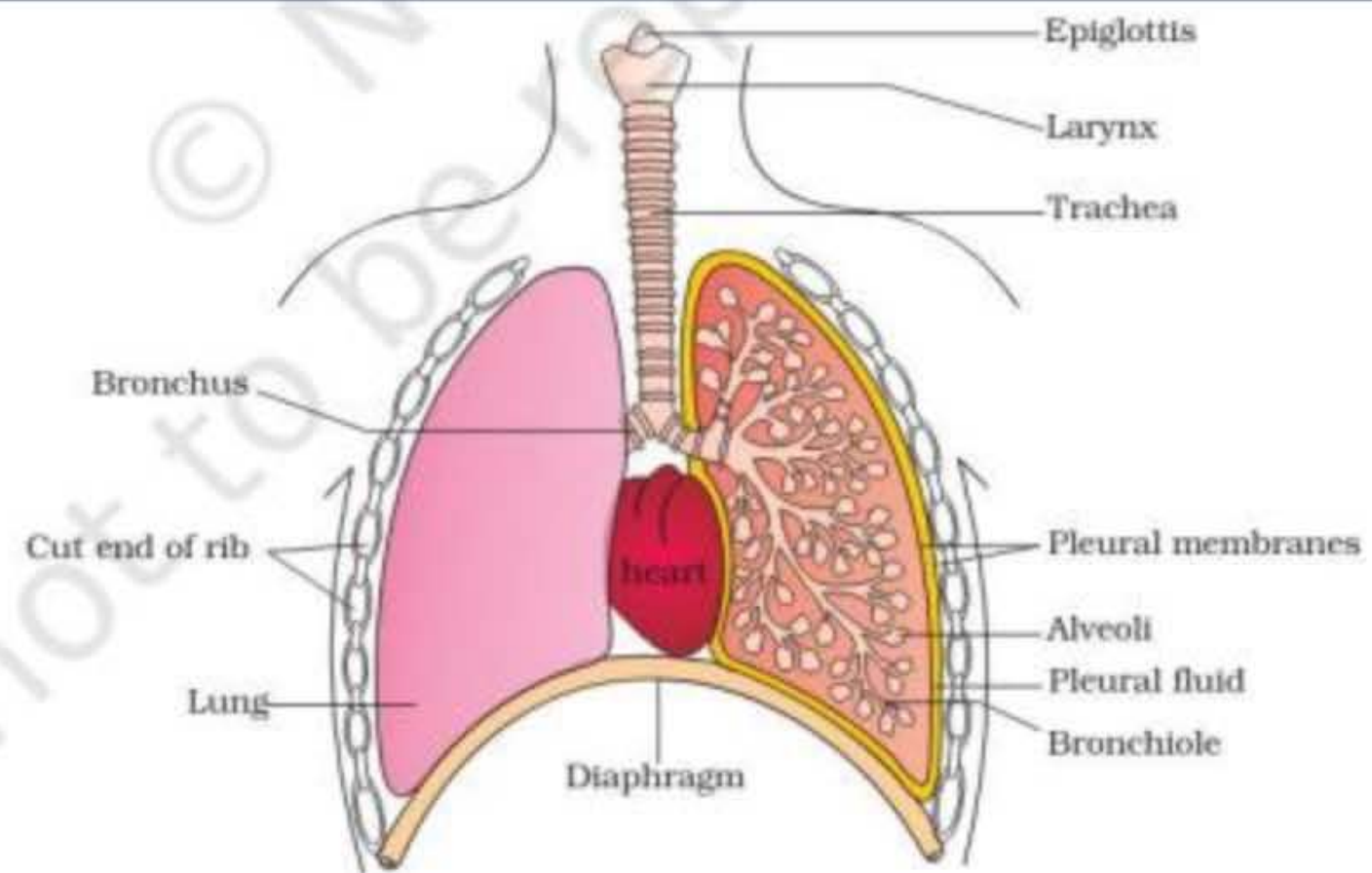


Figure 14.1 Diagrammatic view of human respiratory system (sectional view of the left lung is also shown)



Homework

- REVISE CLAASNOTES / ZOOLOGY MED EASY

MODULE HW

Module -2

Prarambh exercise 1- 1-6

Parikshit ex 3- 1-2,8

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