



# IQRA NATIONAL UNIVERSITY

## DEPARTMENT OF ALLIED HEALTH SCIENCES

Final-Term Examination  
DPT 2<sup>nd</sup> Semester

Course Title: Human Physiology II

Instructor: Dr Sara Naem

Time: 6 Hours

Max Marks:50

**Q1. What would be the total lung capacity (TLC) if expiratory reserve volume ( ERV) is 1000 ml , (RV) residual volume is 1200 ml keeping the inspiratory capacity ( IC) as 3000 ml.**

**Answer:**

**Given Data:**

- Expiratory reserve volume (ERV) =1000ml
- Residual volume (RV) =1200ml
- Respiratory capacity(IC) = 3000ml
- Tidal volume (TV/VT) =500ml

➤ **Required:**

Total lung capacity =?

➤ **Solution:**

As we know that;

➤ **Formula:**

- $TLC = FRC + IC + TV$
- And  $FRC = ERV + RV$

Putting values in the above equation;

- $FRC = 1000 + 1200$
- $FRC = 2200$
- $TLC = FRC + IC + TV$
- $TLC = 2200 + 3000 + 500 = 5700$

➤ **Result:**

SO total lung capacity would be **5700**.

**Q2. What is pulmonary edema . Enlist the muscles of inspiration and muscles of expiration.**

**Answer:**

➤ **Pulmonary edema:**

Pulmonary edema is a condition caused by the excess of fluid in lungs. This fluids collects in the numerous air sacs in the lungs, making it difficult to breathe. In most cases, heart problems cause pulmonary edema. But fluid can accumulate for other reasons including:

- Pneumonia.
- Exposure to certain toxins and medications.
- Trauma to the chest wall.
- Visiting or exercising at high elevations.

➤ **Causes:**

Following are the causes of pulmonary edema:

- Pulmonary edema may be caused by a number of cardiac or non-cardiac conditions.
- Breathing difficulty is the main manifestation of pulmonary edema.

➤ **Symptoms:**

Following are the symptoms of pulmonary edema:

- Anxiety
- Wheezing
- Coughing up blood or bloody froth.
- Difficulty in breathing when lying down.
- Feeling of "air hunger" or "drowning". This feeling is called "**paroxysmal nocturnal dyspnea**".

➤ **Treatment:**

- Doctors recommend **Lasix** to decrease the pressure caused by excess fluid in your heart and lungs.
- It is also treated by blood pressure medications.

➤ **Muscles of inspiration:**

Inspiration of muscles include:

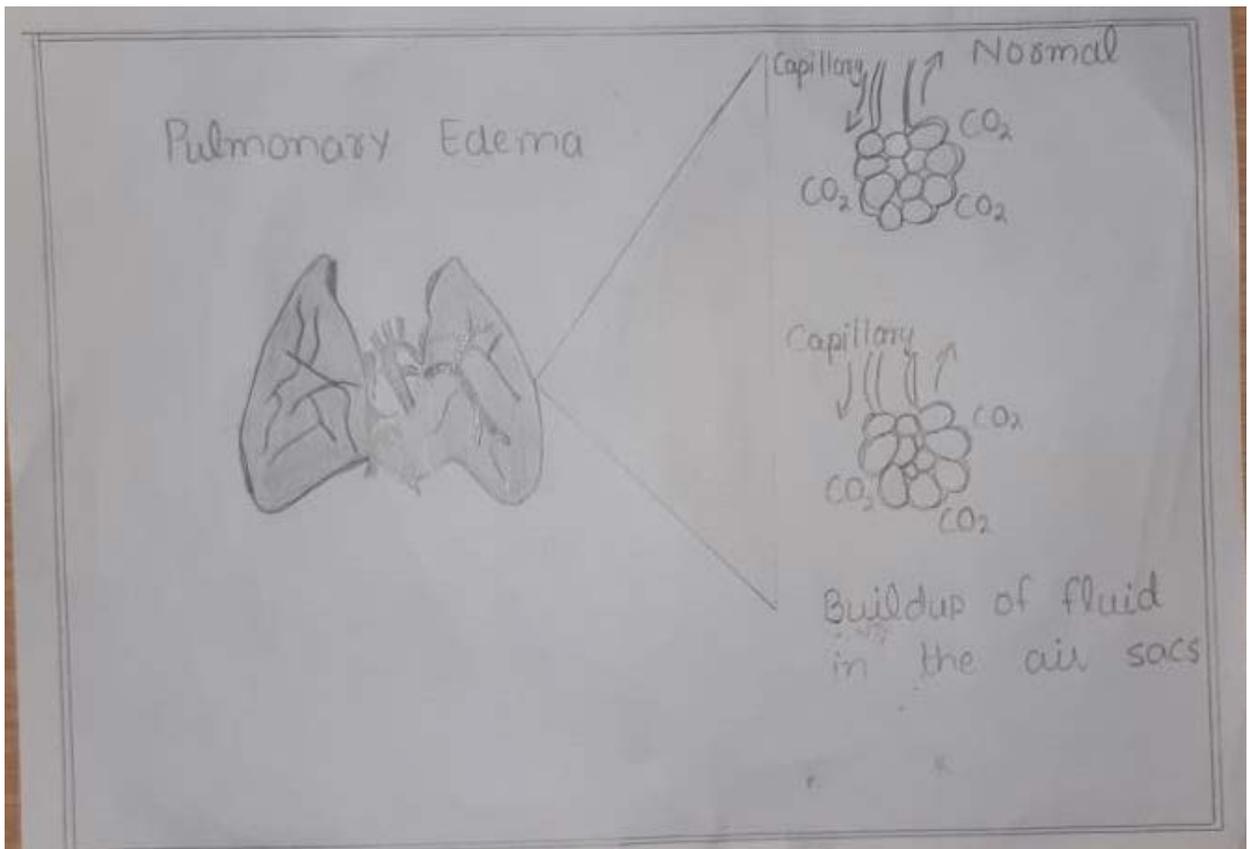
- Parasternal portion
- Diaphragm

- Both the external intercostal muscles and parasternal intercostal muscles elevates the ribs.
- **Muscles of expiration:**

Expiration is active process and these muscles include:

- Internal obliques
- Rectus abdominus
- Transverse abdominus
- External obliques

**Diagram of pulmonary edema:**



**Q3. Compare the properties of different blood groups. Also mark universal donor and universal recipient.**

**Answer:**

➤ **Blood Group:**

A blood type blood group is defined as the classification of blood based on the presence and absence of inherited antigenic substances on the surface of red blood cells.

- There are 8 common blood types, as determined by the presence or absence of certain antigens substances that can trigger an immune response if they are foreign to the human body
- The presence or absence of A or B antigens gives us four main blood types:

➤ **Four main blood types:**

1. **A** type blood has only **A** antigens on red blood cells.
2. **B** type blood has only **b** antigens on red blood cells.
3. **AB** has both **A and B** antigens on red blood cells.
4. **O** has neither **A and B** antigens on red blood cells.

➤ **Comparison Of Properties Of Different Blood Group:**

Through table I have been mentioned properties of blood below;

CHARACTERISTIC	Blood type			
	A	B	AB	O
Agglutino-gen (antigen) on RBCs	A	Anti-A	Both A & B	Neither A nor B
Agglutinin (antibody) in plasma	Anti-B	B-O	Neither anti-A nor anti-B	Both anti-A & B
Compatible donor blood type (no hemolysis)	A-O	B-O	A-B-AB-O	O
Incompatible donor blood types (hemolysis)	B-AB	A-AB	-	A-B-AB

**Antigen & Antibody present in ABO Blood Group**

➤ **Universal Donor:**

A person who is type O in the ABO blood group system and negative for RhD blood group antigen and so they can donate the blood to all recipients, and the people with this blood group are called, **universal donors**.

➤ **Universal Recipient:**

A person who has group AB blood and is therefore able to receive blood from any other group in the ABO system, the people with this blood group is called, **universal recipients**.

**Q4. Explain respiratory membrane. What are the factors that affect diffusion of gases across the membrane**

**Answer:**

➤ **Respiratory Membrane:**

The membrane separating air within the alveoli from the blood within pulmonary capillaries, is called **respiratory membrane**.

- It consist of the alveolar wall, the capillary wall, and their basement membrane.
- Respiratory membrane is very thin less than 0.5 mm.

➤ **Layers Of Respiratory Membrane:**

The respiratory membrane consists of four tissue layers:

- Alveolar wall type 1 and type 11 alveolar cells and alveolar macrophages.
- Epithelial basement **membrane**-under the alveolar wall.
- Capillary basement **membrane**-fused to the epithelial basement membrane.
- Capillary epithelium.

➤ **Importance Of Respiratory Membrane:**

The respiratory membrane allows gases to be exchanged between:

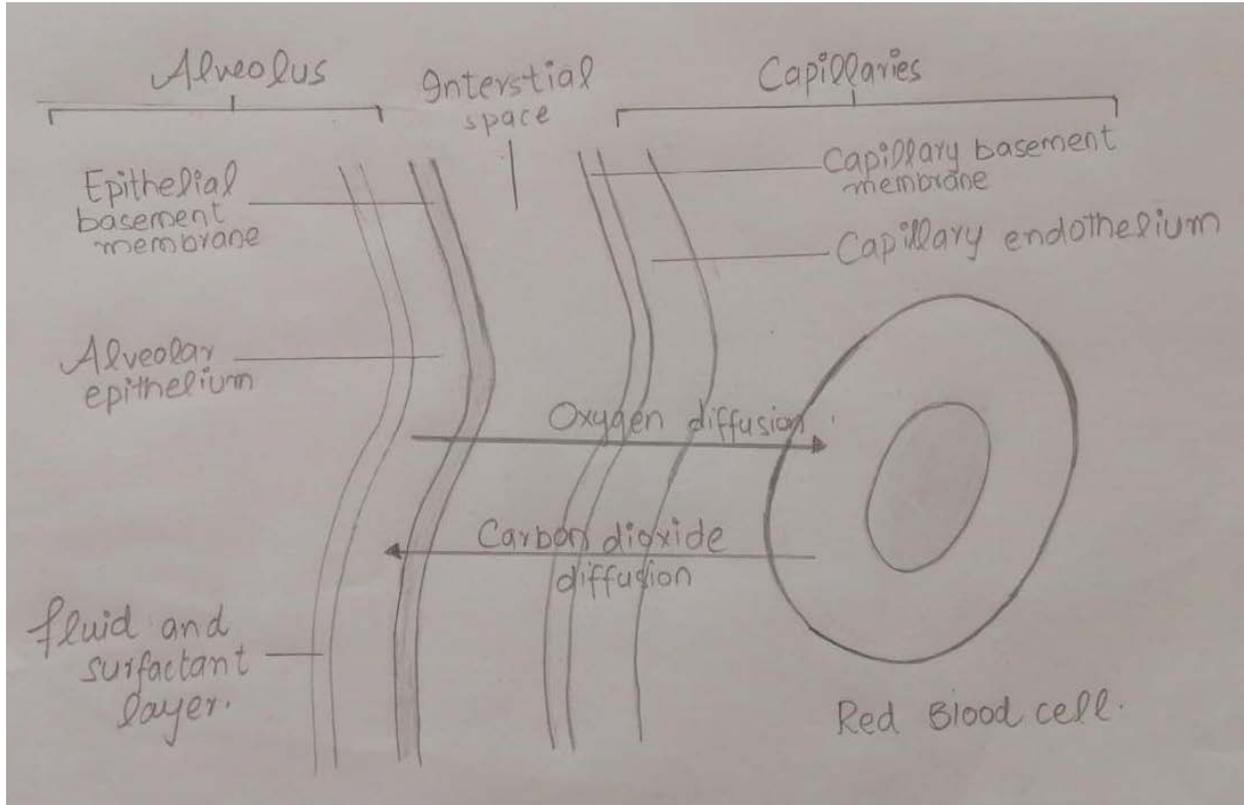
- Pulmonary capillaries
- Blood vessels
- Respiratory units of lungs (which consist of bronchioles, alveolar ducts, atria and alveoli.)

➤ **Factors That Affect The Rate Of Gas Diffusion Through The Respiratory Membrane:**

Following are the factors which affect the rate of exchange of gas diffusion through the respiratory membrane.

- The **thickness** of membrane.
- **Surface area** of membrane.
- The **diffusion** coefficient of the gas in the substance of the membrane.
- The **partial** pressure difference of the gas between the two sides Of the membrane.

**Diagram:**



**Q5. What is the difference between anatomical dead space and physiological dead space. What are the clinical manifestations of pulmonary effusion.**

**Answer:**

➤ **Anatomical Dead Space:**

- Anatomical dead space is the air filled in conducting airways that does not participate in the gas exchange.
- It does not penetrate the gas exchange regions of the lungs.
- Average value of anatomical dead space is **150 ml**.
- In anatomical dead space nose, pharynx, trachea, and bronchi are involved.
- Clinically it is not important.

➤ **Physiological Dead Space:**

- Physiological dead space is the sum of all parts of the tidal volume that's does not participate in gas exchange.
- Physiological dead space penetrates the gas exchange of lungs.
- Normal value is **150 ml** but become larger under decrease condition.
- In Physiological dead space nose, pharynx, trachea, bronchi, bronchioles, and alveoli are involved.
- Clinically it is very important.

➤ **Clinical Manifestation Of Pulmonary Effusion:**

Clinically manifestation of pulmonary effusion are given below:

- Chest pain
- Dry cough
- Dyspnea
- Orthopnea (the inability to breathe easily unless the person is sitting up straight or standing erect).