**IQRA NATIONAL UNIVERSITY**

**DEPARTMENT OF ALLIED HEALTH SCIENCES**

**Final-Term Examination**

**DPT 2nd Semester**

**Course Title: Human Physiology II Instructor: Dr Sara Naeem**

**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.**

**Given Data:**

*Expiratory reserve volume (ERV)= 1000 ml*

*Residual Volume (RV)=1200ml.*

*Respiratory Capacity (IC)=3000 ml*

***Required:***

*Total lung capacity (TLC)=?*

***Solution:***

*As, TLC= FRC + IC*

*SO, FRC = ERV + RV*

*= 1000 + 1200*

*= 2200*

*TLC = FRC + IC*

*TLC = 2200 + 3000*

*TLC = 5,200 ml.*

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

***Pulmonary edema:***

* *Pulmonary edema is a condition in which the lung is filled with fluid.*
* *It is also known as lung congestion, lung water and pulmonary congestion,*
* *When pulmonary edema occurs, the body struggles to get enough oxygen and you start to have shortness of breath.*

***Congestive heart failure:***

* *The most common cause of pulmonary edema is congestive heart failure.*
* *Heart failure happens when the heart can no longer pump blood properly throughout the body.*
* *This creates a backup of pressure in the small vessels of the lungs, which causes the vessels to leak fluid.*

***Muscles of inspiration:***

*The diaphragm is the primary muscle involved in the breathing how ever several other muscles play a role in certain circumstances.*

*These muscles are referred to as accessory muscles of inhalation.*

1. ***External intercostal muscles:***

* *Muscles located between the ribs that help the thoracic cavity and pleural cavity expand during quiet and forced inspiration.*

1. ***Scalene muscles:***

* *Muscles in the neck that lifts the upper ribs ( and thoracic cavity around the ribs) to help breathing.*
* *They provide a mechanism for inspiration when the diaphragmis injured and cant contract.*

1. ***Sternocleidomastoid Muscles:***

* *Muscles that connects the sternum to the neck and allow for rotation and turning of head.*
* *They can lift the upper ribs like the scalene muscles can.*

1. ***Trapezius:***

* *Muscles in the shoulders that retract the scapula and expand the upper part of the thoracic cavity.*

***Muscles of Expiration:***

*While expiration is generally a passive process. It can also be active and forced process.*

*There are two group of muscles that are involved in forced exhalation:*

***1.Internal intercostal Muscles:***

* *Muscles of the ribcage that help lower the ribcage, which pushes down on the thoracic cavity, causing forced exhalation.*

*Note that these are not the same as external intercostal muscles involved in inspiration.*

***2.Abdominal recti:***

* *Main powerful effect.*

***3.Abdominal Muscles:***

* *Any number of muscles in the abdominal that exert pressure on the diaphragm from below to expand it.*
* *Which in turn contracts the thoracic cavity. Causing forced exhalation.*

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

***Blood Types:***

* *A blood group is defined as the classification of blood based on the presence or absence of inherited antigenic substances on the surface of red blood cell (RBCs).*
* *A series of related blood group system, such as Rh or ABO system,*
* The frequencies of ABO and Rh blood types vary from population to population.
* There are 4 main blood groups A, B, AB and O.
* Each group can be either RhD positive or RhD negative which mean in total there are 8 blood groups,

**The ABO System:**

*There are 4 main blood groups defined by the ABO system:*

|  |  |
| --- | --- |
| ***Blood group***  ***A*** | *Has A antigens on the red blood cells with anti-B antibodies in the plasma.* |
| ***Blood group***  ***B*** | *Has B antigen, with anti- A antibodies in the plasma* |
| ***Blood group***  ***O*** | *Has no antigens, but both anti- A and anti- B antibodies in the plasma.* |
| ***Blood group***  ***AB*** | *Has both A and B antigens, but no antibodies.* |

***The Rh System:***

* *Red blood cells sometimes have another antigen, a protein known as the RhD antigen.*
* *If this is present, your blood group is RhD positive,*
* *If its absent, your blood group is RhD negative.*
* *This means you can be 1 of 8 blood groups:*

|  |
| --- |
| * *A RhD positive (A+)* |
| * *A RhD negative (A-)* |
| * *B RhD positive (B+)* |
| * *B RhD negative (B-)* |
| * *O RhD positive (O+)* |
| * *O RhD negative (O-)* |
| * *AB RhD positive (AB+)* |
| * *AB RhD negative (AB-)* |

***Universal Donor:***

* *Blood group type O- is the variety of blood that has the lowest risk of causing serious reactions for most people who receive it.*
* *Because of this, its sometimes called the universal blood donor type.*

***Universal Recipient:***

* *AB+ is the universal recipient blood type.*
* *Patients with AB+ can receive blood from donors of any blood type if they require a transfusion.*

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

***Respiratory Membrane:***

* *The membrane separating air within the alveoli from the blood within pulmonary capillaries.*
* *It consists of the alveolar wall, the capillary wall, and their basement membranes.*
* *The respiratory membrane is very thin (less than 0.5mm).*

***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.*

***Factors that Affects the Rate of Gas Diffusion Through the Respiratory Membrane:***

1. *Thickness of the membrane.*
2. *Surface area of the membrane.*
3. *Diffusion coefficient of the gas in substance of the membrane, and*
4. *Partial pressure differences of the gas between the two sides of the membrane.*

***Diffusing capacity of the Respiratory Membrane:***

***Definition:***

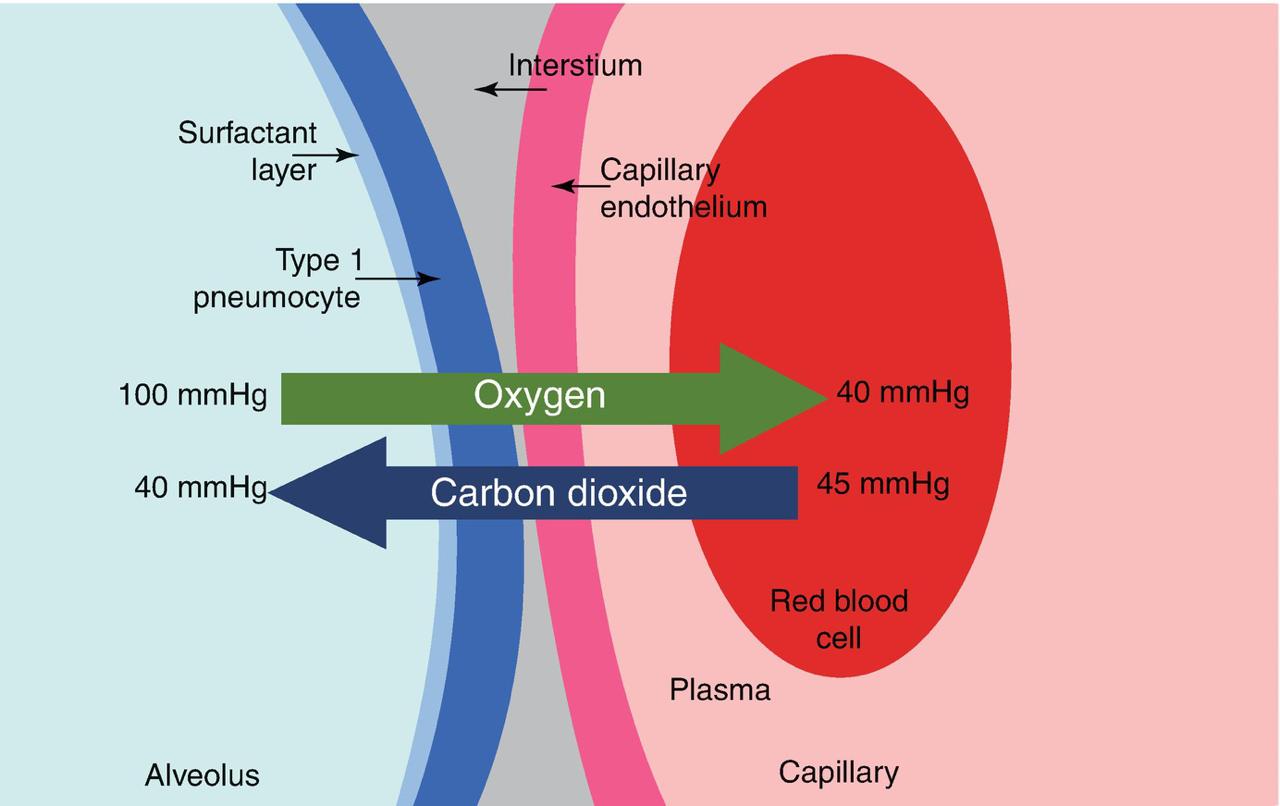
* *Volume of gas that will diffuse through the membrane each minute for a partial pressure difference of 1 mm Hg.*
* *All the factors discussed earlier that affect diffusion through the respiratory membrane can effect this diffusing capacity.*

***Diffusing capacity for Oxygen***

* ***21ml/min/mm Hg.***
* *Oxygen pressure differences across the respiratory membrane during normal, quiet breathing is about 11 mmHg.*
* *Multiplication of the pressure by the diffusing capacity(11 multiply 21) gives a total of about 230 milli liters of oxygen.*

***Diffusing capacity for Carbon Dioxide:***

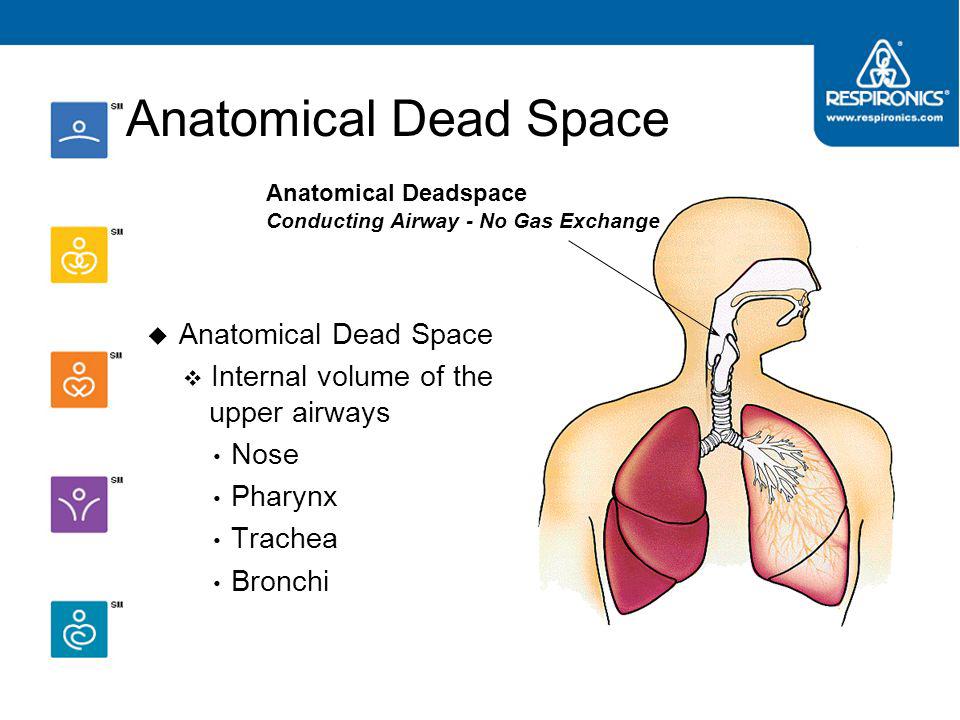
* *Carbon dioxide diffuses through the respiratory membrane so rapidly that the average Pco2 in the pulmonary blood is not far different from the Pco2 in the alveoli.*
* *The average difference is less than 1 mm Hg -and with the available techniques.*
* *The difference is too small to be measured.*

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

***Anatomical Dead Space:***

* *Anatomical dead space is the total volume of the conducting airways from the nose or mouth down to the level of the terminal bronchioles.*
* *It is about 150 ml on the average in humans.*
* *The anatomical dead space fills with inspired air at the end of each inspiration.*
* *But this air is exhaled unchanged.*
* *Thus, assuming a normal tidal volume of 500 ml.*
* *About 30% of this air is “wasted” in the sense that it does not participate in gas exchange.*



***Physiological dead space:***

* *Physiological dead space includes all the non-respiratory parts of the bronchial tree include in anatomical dead space.*
* *Dead space is the volume of air that is inhaled that does not take part in either remains in the conducting airways.*
* *Physiological or total dead space is equal to anatomical plus alveolar dead space.*
* *The volume of the air in the respiratory zone that does not take part in gas exchange.*
* *The respiratory zone is comprised of respiratory bronchioles, alveolar duct, alveolar sac, and alveoli.*

***Symptoms of Pulmonary Effusion:***

*Some patients with pulmonary effusion have no symptoms, with the condition discovered on a chest x-ray that is performed for another reason.*

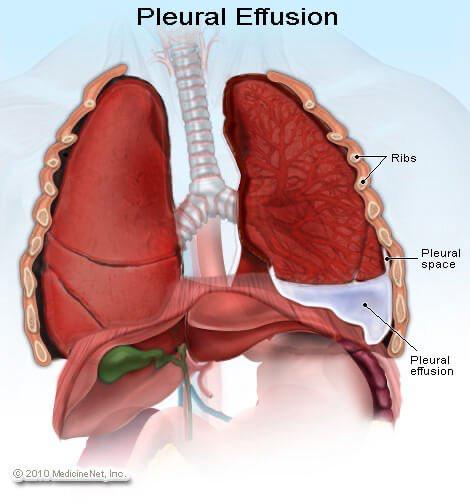
*The patient may have unrelated symptoms due to the disease or condition that has caused the effusion.*

*Symptoms of pulmonary effusion include:*

* *Chest pain.*
* *Dry, nonproductive cough.*
* *Dyspnea ( shortness of breath, or difficult, labored breathing)*
* *Orthopnea (the inability to breathe easily unless the person is sitting up straight or standing erect).*

***Causes of pulmonary effusion:***

* *Heart failure.*
* *Pulmonary embolism.*
* *Cirrhosis.*
* *Post open heart surgery.*
* *Certain medication, abdominal surgery and radiation therapy may also cause pleural effusion.*
* *Pleural effusion may occur with several types of cancer including lung cancer, breast cancer and lymphoma.*

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