**­­­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.**

**Ans)**

**Total lung capacity:** The total maximum volume up to which lungs can be expand is called total lung capacity.

* **Data:**
* **ERV=**1000ml
* **RV=**1200ml
* **IC=**3000ml
* **Solution:**

**Vital capacity:**

ERV+IC = 1000ml + 3000ml

VC = 4000ml

**Total lung capacity:**

VC+RV = 4000ml + 1200ml

Total lung capacity= 5200ml. **(ans)**

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

**ANS)**

**Pulmonary Edema:**

* Pulmonary edema is a condition caused by excess fluid in the lungs (congestive heart failure).
* This fluid collects in the numerous air sacs in the lungs, making it difficult to breath.
* In most cases heart problems cause pulmonary edema.
* When the heart is not able to pump efficiently blood can backup into veins that take blood through lungs.
* As the pressure in these blood vessels increases, fluid is pushed into the alveoli in the lungs instead of air.
* The treatment of pulmonary edema depends on it’s cause and severity.

**Muscles of Inspiration:**

**Core muscles;**

* External intercostals (contracts to elevate the ribs)
* Diaphragm (contracts to expand thoracic cavity)

**Accessory muscles;**

* Sternocleidomastoid (contracts to elevate sternum)
* Pectoralis minor (contract to pull ribs outwards)

**Muscles of Expiration:**

**Core muscles;**

* Internal intercostals (contrats to pull ribs down)
* Diaphragm (relaxes to reduce thoracic cavity)

**Accessory muscles;**

* Abdominals (contracts to compress abdomen)
* Quadratus lumborum (contracts to pull ribs down)

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

**Ans) Comparison of poperties of different blood group:**

**Antigen and Antibody present in ABO blood group:**

|  |  |  |  |
| --- | --- | --- | --- |
| **ABO Group** | **Antigen Present** | **Antigent Missing** | **Antibody Present** |
| A | A | B | Anti-B |
| B | B | A | Anti-A |
| O | None | A and B | Anti-A and B |
| AB | A and B | None | None |

**Universal Donor:**

* Antibody of donor and antigen of recipient are ignored mostly.
* RBC of O group has no antigen and so agglutination does not occur with any other group of blood.
* So O group can be given to any blood group person and the people with this blood group are called Universal Donor.

**Universal Recipients:**

* Plasma of AB group has no antibody.
* This does not cause agglutination of RBC from any other group of blood.
* People with AB group can receive blood from any blood group persons.
* So people with this blood group are called Universal Recipients.

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

**ANS)**

**Respiratory Membrane:**

* It is the membrane separating air within the alveoli from the blood within pulmonary capillaries.
* It consist of following layers:
* A layer fluidlining the alveolus and containing surfactant that reduces the surface tension of the alveolar fluid.
* Alveolar epithelium composed of thin epithelial cells.
* Epithelial basement membrane.
* Thin interstitial space between the alveolar epithelium and the capillary membrane.
* Capillary basement membrane that in many places fuses with the alveolar epithelial basement membrane.
* Capillary endothelial membrane.

**Factors that effect diffusion of gases across the membrane:**

1. **The thickness of membrane**

* Rate of diffusion is inversely proportional to membrane thickness.
* Increasing thickness by 2-3 times interferes significantly with normal respiratory exchange.
* Edema fluid and fibrosis increase thickness.

1. **Surface area of respiratory membrane**

* Decreases the surface area to 1 fourth normal impedes gas exchange significantly.
* Removal of lung tissue during surgery effects of gas exchange.

1. **Transfer of gas through membrane depends on diffusion co efficient**

* Solubility and molecular weight of gas determine D.
* Co2 diffuses 20 times faster than O2.
* O2 diffuses twice as rapidly nitrogen.

1. **Pressure difference across the respiratory membrane**

* Difference in partrial pressure of gas in alveoli and pulmonary blood.
* Measure of net tendency for gas molecules to move through the membrane.
* Diffusion occurs across the membrane down the pressure gradient, simple diffusion.

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

**ANS)**

**Difference between anatomical and physiological dead space:**

|  |  |  |
| --- | --- | --- |
|  | **Anatomical Dead Space** | **Physiological Dead Space** |
| **Defination** | Anatomical dead space is the air filled in conductive airways that does not participate in gas exchange. | Physiological dead space is the sum of all parts of the tidal volume that doesnot participate in gas exchange. |
| **Value** | Average value is 150ml. | Normal value is 150ml but becomes larger under disease condition. |
| **Gas Exchange regions of the lung** | Does not penetrate the gas echange regions of the lung. | Penetrates the gas exchange regions of the lung. |
| **Parts of the respiratory tract involved** | Nose, pharynx, trachea and bronchi | Nose, pharynx, trachea and bronchi, bronchioles, alveolar duct, alveolar sac and alveoli |
| **Clinically importance** | Anatomical dead space is not clinically important. | Physiological dead space is clinically important. |

**Clinically manifestation of pulmonary effusion:**

* The symptoms of a patient with a pleural effusion are to a large extent dictated by the underlying process causing the effusion.
* Many patients have no symptoms referable to the effusion when effusion is small.
* When symptoms are related to the effusion, they arise either from inflammation of the pleura or from compromise of pulmonary mechanics.
* Pleuritic chest pain is the usual symptom of pleural inflammation.
* Irritation of the pleural surfaces may also result in dry cough.
* With larger effusions, dyspnea results from lung compression.