What is Gas Exchange in the Respiratory System?

Worksheet

Gas exchange is the diffusion of oxygen from alveolar air into blood and carbon dioxide from blood into alveolar air, driven by differences in partial pressure across the thin alveolar-capillary membrane.

Questions

1. Where does gas exchange take place in the lungs?

A) Trachea
B) Bronchi
C) Alveoli
D) Larynx

2. What causes oxygen to diffuse from alveoli into the blood?

A) Active transport
B) A higher partial pressure of O2 in alveolar air than in blood
C) Muscle contraction
D) Osmosis of water

3. What molecule carries most of the oxygen in blood?

A) Plasma
B) Hemoglobin
C) Fibrinogen
D) Glucose

4. Which gas is removed from the blood during gas exchange?

A) Nitrogen
B) Oxygen
C) Carbon dioxide
D) Hydrogen

5. At rest, a healthy adult breathes about 12-20 times per minute. If someone breathes 16 times per minute, how many breaths do they take in one hour?

6. Blood entering the lungs typically has an oxygen saturation of about 75%. After passing through the alveoli, healthy blood leaves with about 98% saturation. What is the increase?

7. The human lungs contain about 300 million alveoli with a total surface area of roughly 70 m. If this area were a square, roughly how long would each side be?

8. Define: Where does gas exchange occur in the lungs?

9. Define: What drives gas exchange across the alveolar membrane?

10. Define: What carries oxygen in the blood?

Answer Key

1. C) Alveoli - Alveoli are the tiny air sacs where O2 and CO2 diffuse between air and blood.

2. B) A higher partial pressure of O2 in alveolar air than in blood - Gases diffuse passively from areas of higher partial pressure to lower partial pressure.

3. B) Hemoglobin - Hemoglobin in red blood cells binds oxygen and carries it throughout the body.

4. C) Carbon dioxide - CO2 diffuses out of the blood into the alveoli to be exhaled.

5. Breaths per minute = 16 Minutes per hour = 60 Breaths per hour = 16 60 = 960 breaths

6. Increase = final saturation initial saturation Increase = 98% 75% = 23 percentage points This rise happens as O2 diffuses from alveolar air into the capillary blood.

7. Area = side side = 70 8.4 meters This huge surface area (close to the size of a tennis court) is what makes fast gas diffusion possible.

8. In the alveoli - tiny air sacs surrounded by capillaries, where O2 and CO2 diffuse across a thin membrane.

9. Differences in partial pressure - gases diffuse from high concentration to low concentration.

10. Hemoglobin, a protein inside red blood cells, binds oxygen and transports it to tissues.