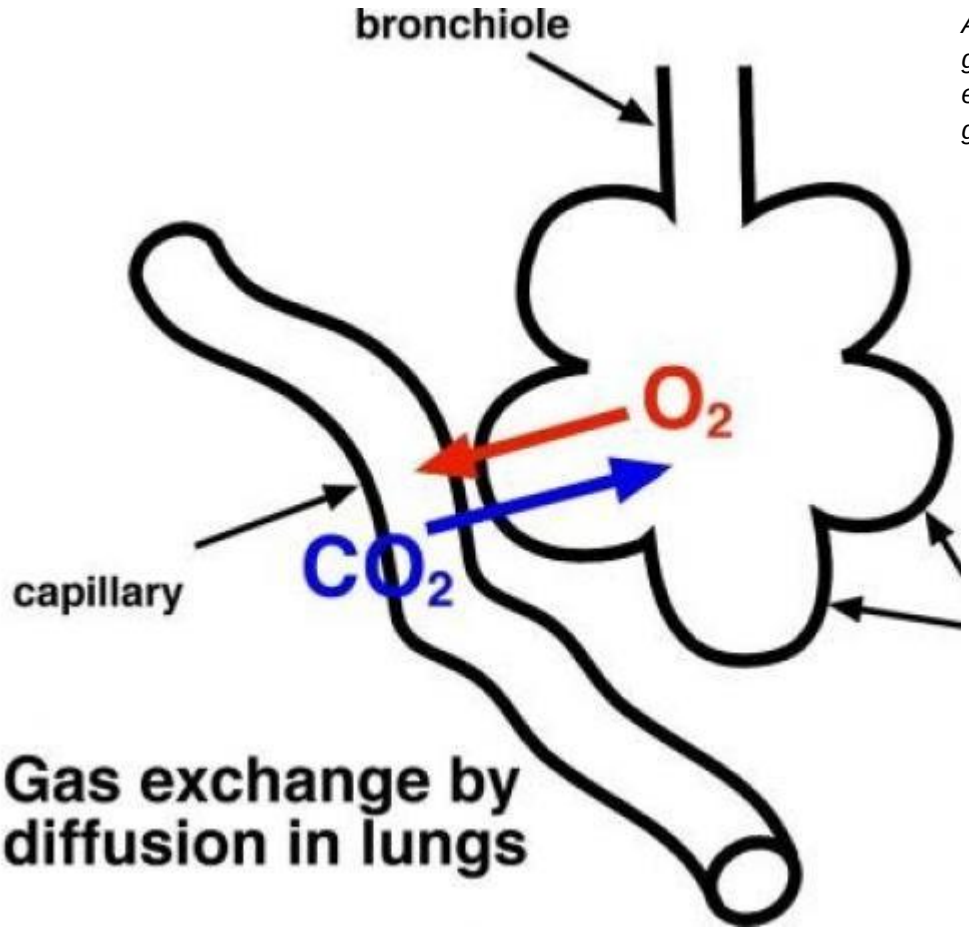
Features Common to Respiratory Surfaces

Introduction:

A respiratory surface enables the rapid and efficient exchange of gases between the organism and its environment; it is therefore in direct contact with the environment.

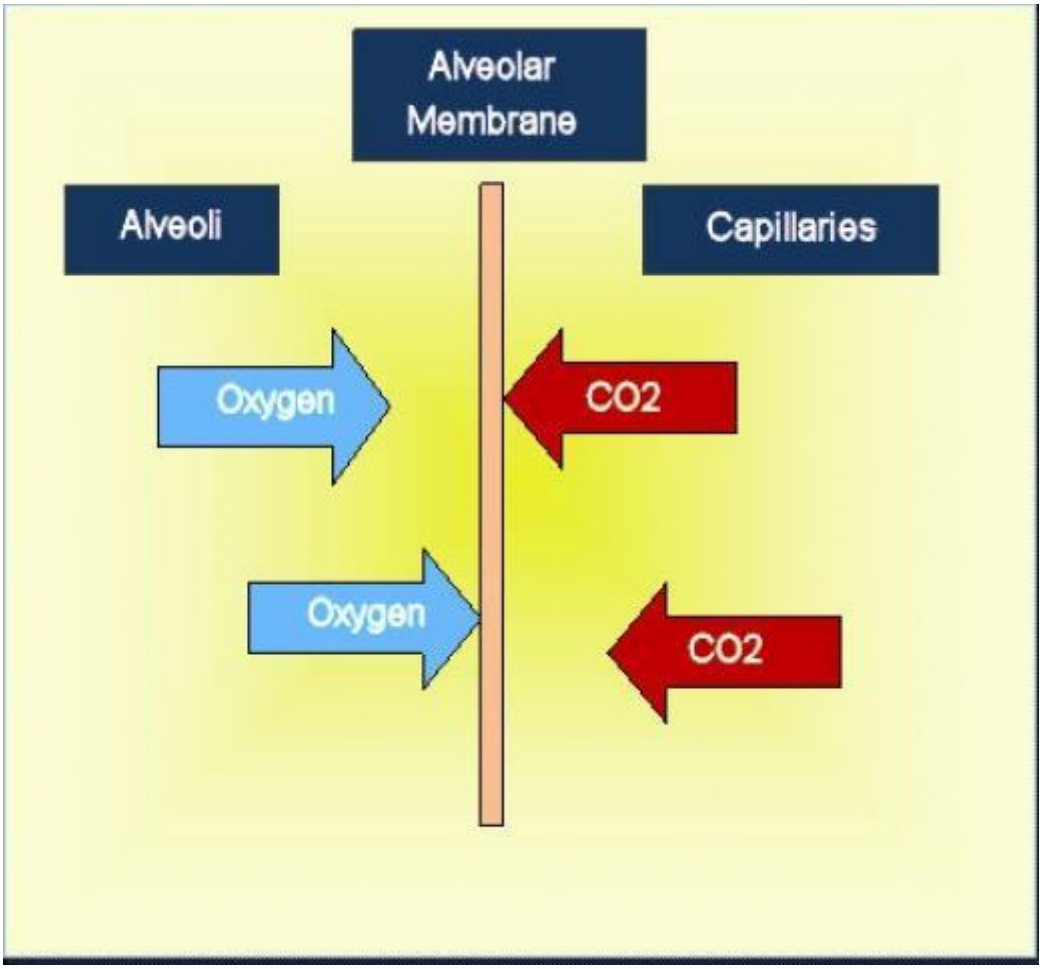
Respiratory surfaces must be:

- **Moist:** special cells in the alveoli secrete a watery liquid. Oxygen dissolves in this liquid before diffusing across the wall of the alveolus. Gases can move across cell membranes only by diffusion when they are dissolved in water. So in order for gaseous exchange to take place the respiratory surfaces must be moist.
- **Thin:** they must be one cell thick. Capillary walls are also one cell thick and so oxygen molecule only has to diffuse across this small thickness to get into the blood.
- **Highly vascular:** blood is constantly pumped to the lungs via the pulmonary artery. This branches into thousands of capillaries which take blood to all parts of the lungs. Carbon dioxide in the blood can diffuse into the blood. The blood is then taken back to the heart via the pulmonary vein, ready to be pumped to the rest of the body.
- **Have a large surface area:** the alveoli have a total surface area of over $100m^2$. Therefore a thin surface enables the quick movement of gases from the surface to the transporting medium in organisms. To ensure the exchange of adequate amounts of gases and to facilitate the rapid and efficient movement of dissolved gases, a large surface area is needed, as well as extensive supply of capillaries.
- **Are delicate and need to be protected:** since the respiratory surfaces are thin and have a large surface which is highly vascular, they are susceptible to external injury. Respiratory surfaces are located within organisms to ensure them adequate protection from damage.



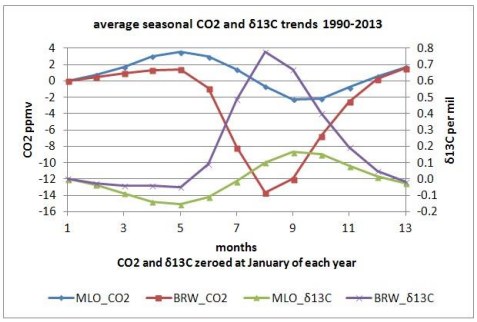
Alveolar gas exchange

Alveolar diffusion



Comparison of inhaled and exhaled air

Name of gas	Inspired air	Expired air
Oxygen	21%	16%
Carbon dioxide*	0.03%	4%
Nitrogen	78%	78%
Water vapour	Usually dry	Moist
Temperature	Usually cooler	Warm



Carbon dioxide increased from 0.03% to 4% because the by- product of respiration is carbon dioxide and all cells respire and so all cells produce carbon dioxide.