

Data analysis: Partial Pressures of Gases in the Pulmonary System

Necessary Background information

- 1) Bar charts
- 2) Calculating percent (Data analysis: Emperor penguins, Data analysis: Protein deficiency, Data analysis: Trans fats)
- 3) Tissue types, tissue type structure and function (Lecture Question #16: How are organs protected?)
- 4) Diffusion and concentration gradients (Lecture Question #11: How do substances that are permeable to the plasma membrane get into and out of cells?)
- 5) Capillary exchange, and what pressure is and what causes it. (Question #56: What causes blood pressure and how does it affect capillary exchange?)
- 6) Pulmonary and systemic circuits. (Question #54: How does the structure of the heart contribute to its efficiency?)

Introduction:

Ventilation maintains concentration gradients of oxygen and carbon dioxide between air in alveoli and blood flowing in adjacent capillaries.

All organisms absorb one gas from the environment and release a different one. This process is called gas exchange. Leaves absorb carbon dioxide to use in photosynthesis and release the oxygen produced by this process. Lungs absorb oxygen for use in cell respiration and release the carbon dioxide produced by this process.

Terrestrial organisms exchange gases with the air. In humans, gas exchange occurs in small air sacs called alveoli inside the lungs

Gas exchange happens by diffusion between air in the alveoli and blood flowing in the adjacent capillaries. The gases only diffuse because there is a concentration gradient: the air in the alveolus has a higher concentration of oxygen and a lower concentration of carbon dioxide than the blood in the capillary. To maintain these concentration gradients fresh air must be pumped into the alveoli and stale air must be removed. This process is called ventilation.

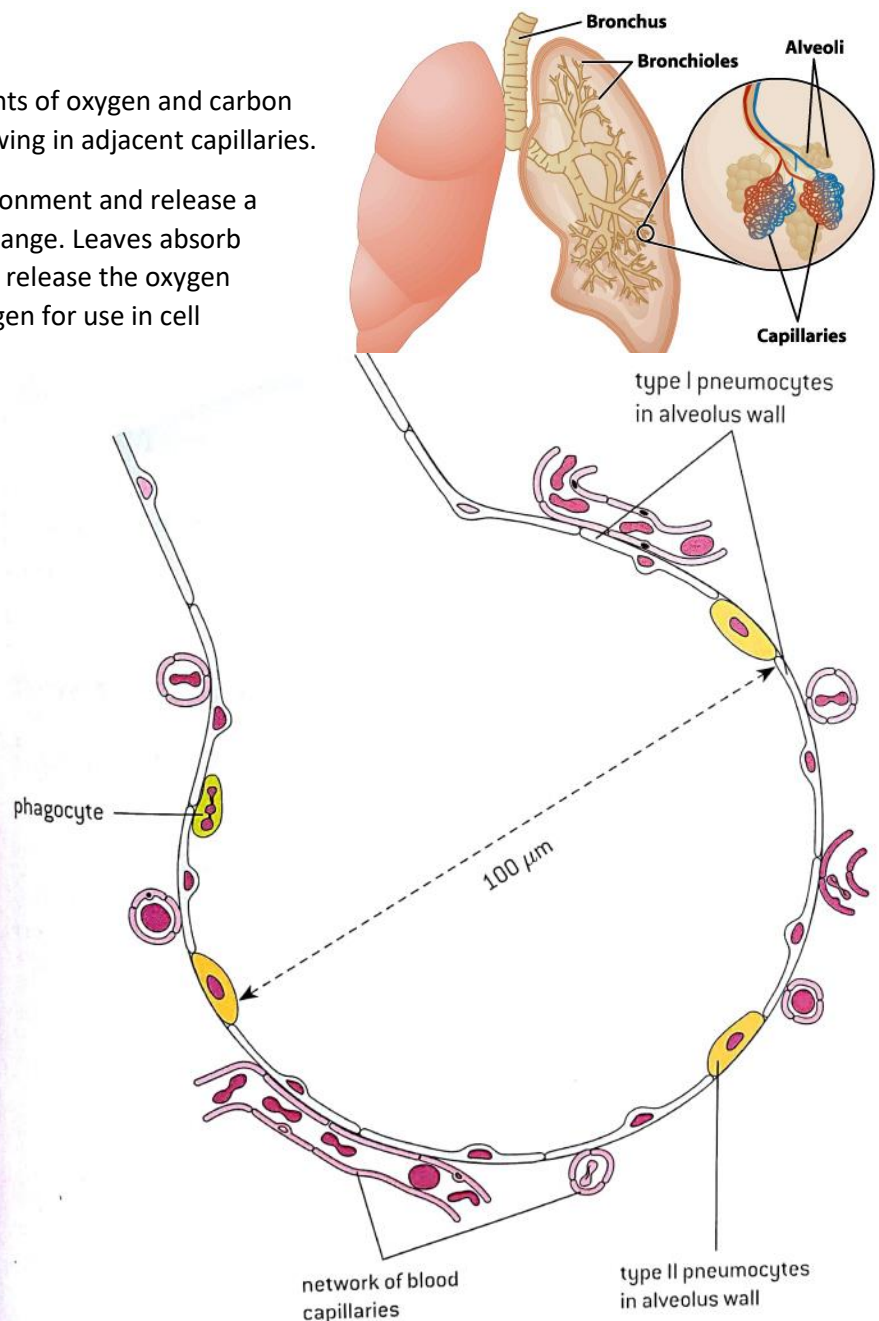
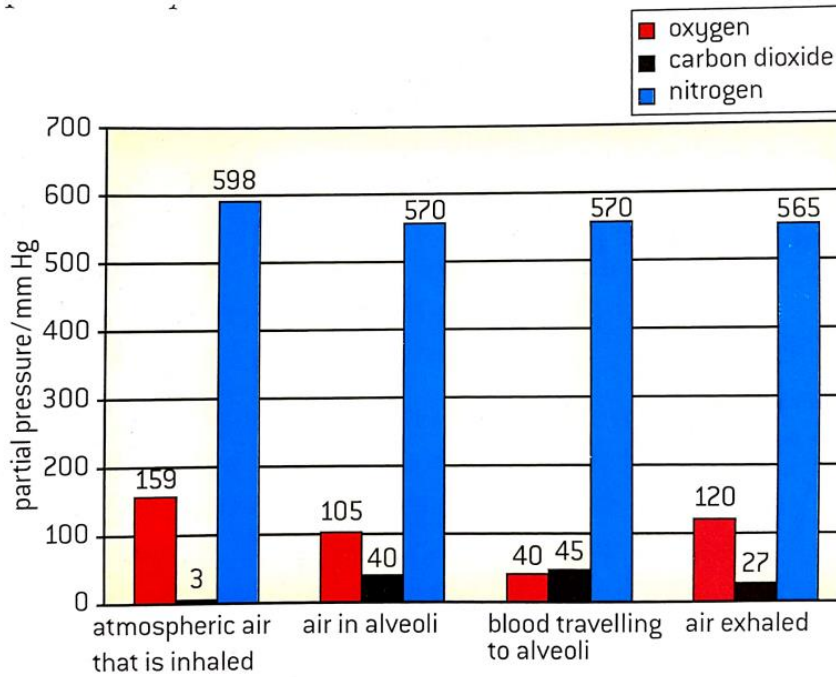


Figure 2 shows the typical composition of atmospheric air, air in the alveoli and gases dissolved in air returning to the lungs in the pulmonary arteries.



▲ Figure 2 Partial pressures of gases in the pulmonary system

1) Fill in the data table below with the appropriate calculations. **Show your work!**

| | Total pressure in mm Hg | Percent of total pressure caused by O ₂ | Percent of total pressure caused by CO ₂ | Percent of total Pressure caused by N ₂ |
|-----------------------------|-------------------------|--|---|--|
| Atmospheric Air | | | | |
| Air in alveoli | | | | |
| Blood travelling to alveoli | | | | |
| Air exhaled | | | | |

