

Chapter 22 Notes – Gas Exchange

22.1: **Gas exchange** occurs when O_2 enters the organism and CO_2 leaves the organism.

- **Breathing** is the first phase of gas exchange, followed by the **transport** of those gasses through the circulatory system.
- **Body cells** require a continuous supply of O_2 and dispose CO_2 .

22.2: CO_2 and O_2 are exchanged on **respiratory surfaces**.

- The thin and moist respiratory surface allows gasses to easily diffuse into the circulatory system or body tissues.
- Some organisms use their entire skins as a respiratory organ, such as **earthworms**, which take in gasses through the **outer skin**, a respiratory surface.

22.3: **Gills** are **respiratory surfaces** in many aquatic animals and are well adapted to aquatic environments.

- **Gills** filter O_2 from the water at a high efficiency.
- **Ventilation** occurs in the gills in order to supply a constant flow of water.
- **Countercurrent exchange** is the transfer of something from a fluid moving in one direction to a fluid moving in the opposite direction.

22.4 **The tracheal system** is a system for respiration in insects where gas exchange requires no assistance from the circulatory system.

- The main problem facing any air-breathing animal is the loss of water to the air by evaporation.
- In flying insects, the contraction/relaxation of flight muscles pumps air into the tracheal system.
- O_2 enters through a **trachea** that branches into **tracheole** that serves individual **somatic cells**.

22.5: **Lungs**, present in most **terrestrial vertebras**, have **extensive branches**, which form a **large respiratory surface**.

- Reptiles, birds, mammals, and most amphibians exchange gas in lungs
- The **diaphragm** is the muscle beneath the lungs.
- Air traverses the **pharynx, larynx, and vocal chords** on the way to the **trachea**.
- A **bronchus** leads to each lung, where there are many finer tubes called **bronchioles**.
- Bronchioles end in **alveoli**, air sacs, where gas exchange takes place.

22.6: **Smoking** destroys the respiratory system.

- **Emphysema** is a disease caused by smoking. In emphysema, the alveoli deteriorate, reducing the surface area for gas exchange.
- Smokers are also at a high risk for cardiovascular diseases, such as heart attacks.

22.7: **Breathing**, the alteration of **inhalation** and **exhalation** ventilates the lungs and is caused by the contraction and relaxation of the diaphragm.

- **Negative pressure breathing** occurs when the volume of the lungs during inhalation lowers the air pressure in the alveoli to less than atmospheric pressure.
- **Vital capacity** is the maximum volume of air that can be inhaled and exhaled during forced breathing.

22.8: Breathing is not a voluntary action.

- The **Pons** and **Medulla**, two parts of the **brain**, are part of the **breathing control center**.
- **Hyperventilating** puts strain on the body because the control center ceases to send signals to the rib muscles and diaphragm.

22.9: The circulatory system transports respiratory gases through the blood.

- **Partial pressure** is the individual pressure of a mixture.
- Blood **leaving** the heart is rich in O_2 and poor in CO_2 on its way to the somatic cells.
- Blood **arriving** at the heart from tissue capillaries (tissue cells) is rich in CO_2 , but poor in O_2 .

22.10: Hemoglobin carries O_2 and helps transport CO_2 and buffer the blood.

- **Oxygen** is not soluble in blood.
- **Hemoglobin** buffers the blood by preventing harmful changes in **PH**.

22.11: A fetus carries out gas exchange using the mother's bloodstream through the placenta.

- When a baby is born, the placental gas exchange ceases and the lungs inhale for the first time.
- **Adaptations** in the circulatory system support the respiratory system in gas exchange function.