The text discusses the processes of respiration and breathing in different organisms. Gas exchange requires special organs such as gills, lungs, and skin, which provide surface area for the acquisition and distribution of oxygen and the disposal of carbon dioxide. Aquatic respiratory organs such as gills increase surface area, but can be easily damaged or depleted of oxygen. Mammals have a more efficient respiratory system with lungs that are packed with air sacs called alveoli. The respiratory system includes the nostril, nose hair, turbinates, sinuses, pharynx, glottis, epiglottis, larynx, trachea, ciliated cells, bronchi, bronchioles, alveoli, and pleura.

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| **Main Ideas** | **Notes** |
| Respiration and Breathing |  |
|  | - Maximizing the Efficiency of Respiration - A challenge of all organisms is the acquisition and distribution of oxygen and the disposal of carbon dioxide - Gas exchange requires special organs which provide intimate contact between the internal and external environment and provide enough surface area for these processes to meet the needs of the organism |
|  | - Gas Exchange in Animals - Respiration involves the diffusion of gases across plasma membranes.  - Plasma membranes are surrounded by water to be stable therefore oxygen from air dissolves in the aqueous layer. |
|  | - Gills as Respiratory Structures - Aquatic respiratory organs increase the diffusion surface area by extensions of tissue called gills - The great increase in surface area provided by gills allows organisms to extract oxygen from water than would be possible from their body surface alone - External gills increase surface area, but the organism must always be kept moving because oxygen in stagnant water can be quickly depleted. |
| In fish, water enters the mouth, passes over the gills, and exits through the gill cover (operculum). Countercurrent exchange between the opposing movements of water and blood maximizes diffusion of O2 in and CO2 out. | - Gills - Gills are evaginated structures (outgrowths from the body) that have large surface areas over which gas exchange occurs. - Inside the gills, a circulatory system removes the oxygen and delivers waste CO2. |
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|  | - Respiration in Amphibians - Very unique organisms that have the ability to acquire gases through two means: the lungs and the skin. - Amphibians – force air into their lungs by creating a greater-than-atmospheric pressure in the air outside their lungs. Air is filled in their buccal cavity, they close their nose and mouth, floor of mouth is raised, and the air is forced into their lungs. |
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|  | - Respiration in Mammals - Mammals have higher metabolic rates to produce and sustain their body temp and thus require a more efficient respiratory system |
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|  | - Flow of Air - Air is brought into the alveoli through a system of passages: |
|  | - Features of the respiratory system - Nostril – conducts air into hollow nasal cavity. |
|  | - Nose Hair - Nose hairs help to filter out dust and dirt particles from entering the respiratory tract |
| Turbinates – Thin bones found in the nasal cavity that increase surface area and secrete mucous. This helps to moisten the air. The turbinates are lined with capillaries that warm and increase humidity of incoming air. |  |
|  | - Sinuses  - Main function is to produce mucus that moisturizes the inside of the nose. |
| Pharynx- connects the mouth to the throat |  |
|  | - Epiglottis - Glottis – opening to the trachea |
|  | - Larynx - Larynx – houses the vocal cords. |
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|  | - Trachea - Trachea – Flexible tube that is the passageway of air. - Supported by semi-circular cartilage rings to ensure it does not collapse with the passage of food in the esophagus. |
|  | - Ciliated Cells - Ciliated Cells – These cells secrete mucous.  - The mucous traps the foreign particles. |
|  | - Bronchi - Bronchi – 2 smaller branches of the of the trachea |
|  | - Alveoli - Alveoili – grape like clusters of tiny sacs at the end of the bronchioles.  - These sacs are always kept moist.  - This is the site of gas exchange.  - The sacs provide an abundance of surface area for the exchange of gases. |
|  | - Lungs - Lungs are a flexible membrane that allow expansion and contraction. The right lung has 3 lobes, and the left lung has 2 lobes. The lungs house part of the bronchi, bronchioles and alveoli. |
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