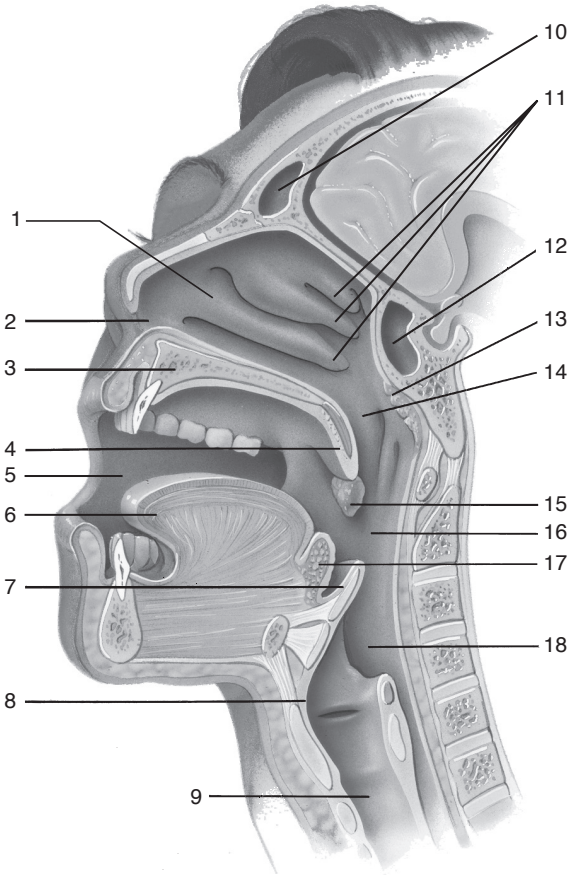
1. Organs of the Respiratory System

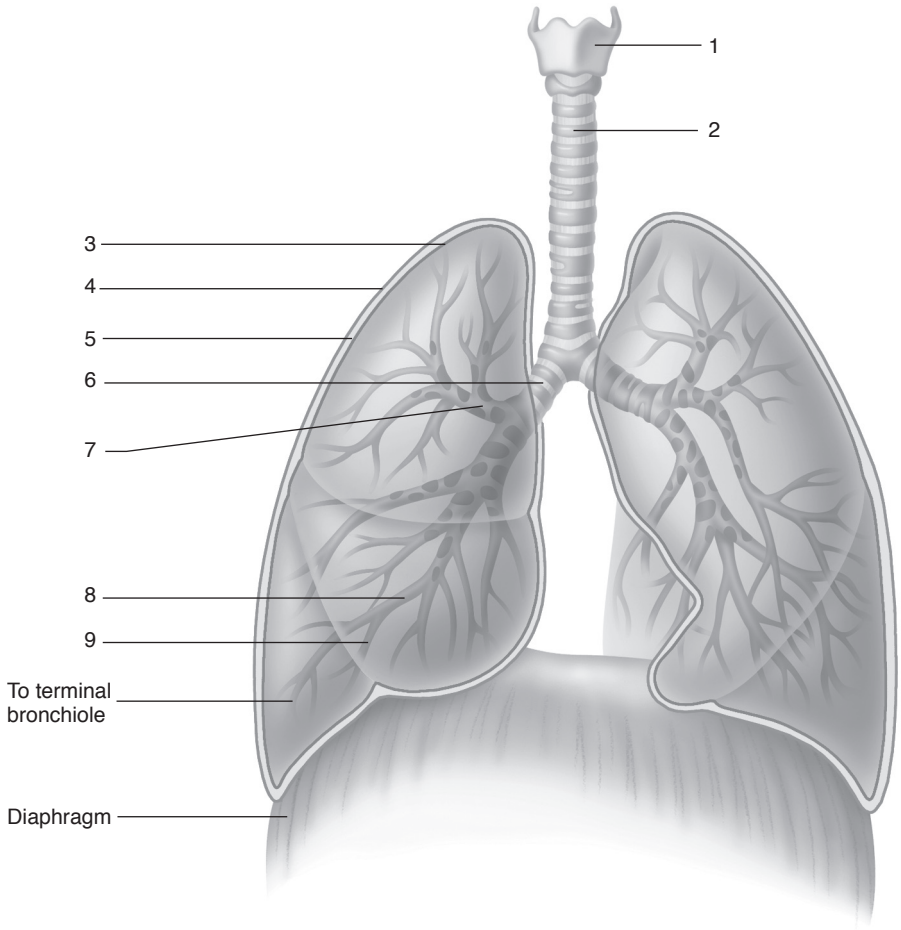
a. Label the parts of the upper respiratory tract by placing the numbers of the structures by the correct labels.

11 Conchae	**14** Nasopharynx	**15** Palatine tonsil
7 Epiglottis	**2** Nostril	**13** Pharyngeal tonsil
18 Laryngopharynx	**5** Oral cavity	**10** Sinus, frontal
8 Larynx	**16** Oropharynx	**12** Sinus, sphenoidal
17 Lingual tonsil	**3** Palate, hard	**6** Tongue
1 Nasal cavity	**4** Palate, soft	**9** Trachea



b. Label the parts of the lower respiratory tract by placing the numbers of the structures by the correct labels.

9 Bronchiole	**8** Bronchus, tertiary	**5** Pleural cavity
6 Bronchus. primary	**1** Larynx	**2** Trachea
7 Bronchus. secondary	**4** Parietal pleura	**3** Visceral pleura



c. Write the words that complete the sentences in the spaces at the right.

Air enters the nasal cavity via the ____1___ , and it is ____2___ , ____3___ , and ____4___ as it flows over the nasal mucous membranes. Mucus and entrapped particles are moved by ____5___ to the ____6___ and are swallowed.

1) **Nostrils**
2) **Warmed**
3) **Filtered**
4) **Moistened**
5) **Cilia**
6) **Pharynx**

d. Write the names of the structures that match the statements in the spaces at the right.

1) Openings allowing air to enter nose. **Nostrils**
2) Interior chamber of nose. **Nasal cavity**
3) Separates oral and nasal cavities. **Palate**
4) Increase surface area of nasal cavity. **Nasal conchae**
5) Connects nasal cavity with larynx. **Pharynx**

6) Air-filled cavities in skull bones. **Sinuses**

7) Lymphoid tissue in upper pharynx. **Pharyngeal tonsils**

8) Lymphoid tissue at junction of pharynx and oral cavity. **Palatine tonsils**

9) Cartilaginous boxlike structure containing vocal folds. **Larynx**

10) Opening between vocal folds. **Glottis**

11) Cartilage forming Adam's apple. **Thyroid cartilage**

12) Flops over larynx opening in swallowing. **Epiglottis**

13) Windpipe extending from larynx to bronchi. **Trachea**

14) Bronchi that enter lungs. **Primary bronchi**

15) Support walls of bronchial tree passageways larger than bronchioles. **Cartilagenous rings**

16) Lines air passageways larger than bronchioles. **Ciliated epithelium**

17) Tiny air sacs at ends of alveolar ducts. **Alveoli**

18) Membrane covering outer surface of lung. **Visceral pleura**

19) Membrane lining inner wall of thorax. **Parietal pleura**

20) Potential space between pleurae. **Pleural cavity**

2. Breathing

a. Write the words that complete the sentences in the spaces at the right.

Air flows into the lungs during ____1___ and out of the lungs during ____2___ . During breathing, air flows from an area of ____3___ pressure to an area of ____4___ pressure. Contraction of the ____5___ and the ____6___ muscles causes an increase in the ____7___ of the lungs, which decreases the air ____8___ within the lungs. Air flows into the lungs because of the ____9___ atmospheric pressure. When the muscles of inspiration relax, the ____10___ of the lungs is decreased, which increases the air ____11___ within the lungs. Air flows out of the lungs because of the ____12___ air pressure within the lungs.

1) **Inspiration**
2) **Expiration**
3) **Higher**
4) **Lower**
5) **Diaphragm**
6) **External intercostal**
7) **Volume**
8) **Pressure**
9) **Higher**
10) **Volume**
11) **Pressure**
12) **Higher**

b. Indicate whether each statement is true (T) or false (F).

__**T**__ Negative pressure in the pleural cavity is necessary for inspiration.

__**T**__ Surfactant prevents collapse of alveoli.

__**T**__ Forceful expiration involves contraction of abdominal and internal intercostal muscles.

__**T**__ Pneumothorax causes collapse of a lung.

__**T**__ Breathing exchanges air between the atmosphere and the alveoli of the lungs.

3. Respiratory Volumes

Match the respiratory volumes with the statements.

1) Expiratory reserve volume
2) Inspiratory reserve volume
3) Residual volume
4) Tidal volume
5) Total lung capacity
6) Vital capacity

__4__ Volume of air exhaled in quiet expiration.
__3__ Air that always remains in the lungs.
__1__ Volume forcefully exhaled after quiet expiration.
__2__ Volume forcefully inhaled after quiet inspiration.
__6__ Maximum volume forcefully exhaled after maximum forceful inspiration.
__4__ Averages about 500 ml.
__5__ Averages about 5,800 ml.

4. Control of Breathing

Write the terms that match the statements in the spaces at the right.

1) Locations of respiration control centers. **Medulla oblongata**, **Pons**
2) Controls forceful expirations. **Medullary expiratory center**
3) Coordinates the depth and length of inspiration. **Pons respiratory center**
4) Controls normal rhythmic breathing. **Medullary respiratory center**

5. Factors Influencing Breathing

Indicate whether each statement is true (T) or false (F).

__T__ A fever increases the breathing rate.
__F__ The respiratory center detects blood levels of carbon dioxide and oxygen.
__T__ An increase in the blood H^+ concentration increases the breathing rate.
__F__ A mild increase in blood oxygen concentration decreases the breathing rate.
__T__ An increase in blood CO_2 concentration increases the breathing rate.
__F__ Higher brain centers can permanently override the action of the respiratory center.
__T__ Chemoreceptors for blood oxygen are located in the carotid and aortic bodies.
__T__ A very low blood oxygen concentration increases the breathing rate.

6. Gas Exchange

Write the words that complete the sentences in the spaces at the right.

The exchange of respiratory gases occurs by ____1___ . In comparison to the air in the alveoli, blood returning to the lungs has a lower concentration of ____2___ and a higher concentration of ____3___ . Therefore, oxygen diffuses from the ____4___ into the ____5___ , and carbon dioxide diffuses from the ____6___ into the ____7___ . Blood leaving the lungs is ____8___-rich and ____9___-poor.

In comparison to concentrations in tissue cells, blood entering tissue capillaries has a lower concentration of ____10___ and a higher concentration of ____11___ . Therefore, oxygen diffuses from the ____12___ into the ____13___ , and carbon dioxide diffuses from the ____14___ into the ____15___ . Blood leaving tissue capillaries is ____16___-rich and ____17___-poor.

1) **Diffusion**
2) **Oxygen**
3) **Carbon dioxide**
4) **Lungs (alveoli)**
5) **Blood**
6) **Blood**
7) **Lungs (alveoli)**
8) **Oxygen**
9) **Carbon dioxide**
10) **Carbon dioxide**
11) **Oxygen**
12) **Blood**
13) **Tissue cells**
14) **Tissue cells**
15) **Blood**
16) **Carbon dioxide**
17) **Oxygen**

7. Transport of Respiratory Gases

a. Write the terms that match the statements in the spaces at the right.

1) Compound in which most oxygen is transported. **Oxyhemoglobin**
2) Cell in which most oxygen is transported. **Erythrocyte**
3) Compound in which most CO_2 is carried. **Bicarbonate ion**
4) Combination of hemoglobin and CO_2. **Carbaminohemoglobin**
5) Enzyme speeding up reaction of CO_2 and H_2O to form carbonic acid. **Carbonic anhydrase**
6) Cell in which most carbonic acid is formed. **Erythrocyte**

b. Indicate whether each statement is true (T) or false (F).

__**T**__ Hemoglobin can carry both O_2 and CO_2 at the same time.
__**T**__ Oxygenated blood carries some carbon dioxide.
__**T**__ Deoxygenated blood carries some oxygen.
__**T**__ Hemoglobin loads or unloads oxygen, depending on the surrounding oxygen concentration.
__**F**__ Oxygen and carbon dioxide compete for the same binding site on the hemoglobin molecule.
__**T**__ Blood loads or unloads CO_2 depending upon the surrounding carbon dioxide concentration.

8. Disorders of the Respiratory System

Write the disorders that match the statements in the spaces at the right.

1) Accumulation of fluid in the lungs. **Pulmonary edema**
2) Inflammation of the bronchi. **Bronchitis**
3) Rupture of alveoli due to exposure to airborne irritants. **Emphysema**
4) Acute inflammation of alveoli due to viral or bacterial infection. **Pneumonia**
5) Collapse of alveoli in infants due to an insufficient amount of surfactant. **Respiratory distress syndrome**
6) Wheezing, labored breathing due to constriction of bronchioles. **Asthma**
7) Viral disease characterized by fever, chills, aches, and coldlike symptoms. **Influenza**
8) Disorder characterized by a reduction of the respiratory surface area and decrease in the expiratory reserve volume. **Emphysema**
9) Inflammation of nasal membranes. **Cold**
10) Blockage of artery in lung by a transported blood clot. **Pulmonary embolism**

9. Clinical Applications 

a. One treatment for hyperventilation is having the patient breathe into a paper bag. How does this reestablish normal breathing? **As CO_2 increases and O_2 decreases in the bag, rebreathing the air in the bag decreases O_2 and increases CO_2 concentrations in blood to normal levels, returning respiration rates to normal.**

b. A newborn infant, born a month early, is having difficulty breathing and is placed under an O_2 hood. What is the probable problem? **Insufficient surfactant**
Should the infant receive pure oxygen or an oxygen-carbon dioxide mixture? **O_2 -CO_2 mixture**
Explain. **An O_2 - CO_2 mixture can supply additional oxygen while stimulating normal breathing. Also, pure O_2 may cause damage to the eyes (retinopathy of prematurity).**