Lab 9 Respiratory System

Name _____ Seat number ____

Objectives:

A. Respiratory tract labeling exercise

B. Sagittal view labeling exercise

C. External respiration

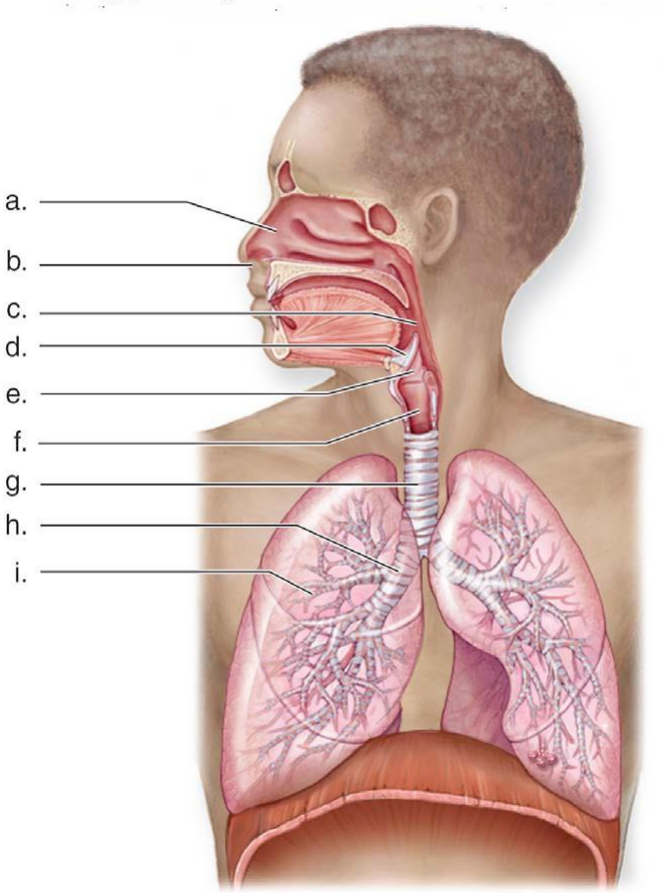
D. Internal Respiration

E. Measurements of lung volumes and capacity

F. Questions

A. Respiratory tract labeling exercise

Use your text to help you label the structures below.
Be sure to be able to identify these same structures on the models



Label below on right

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

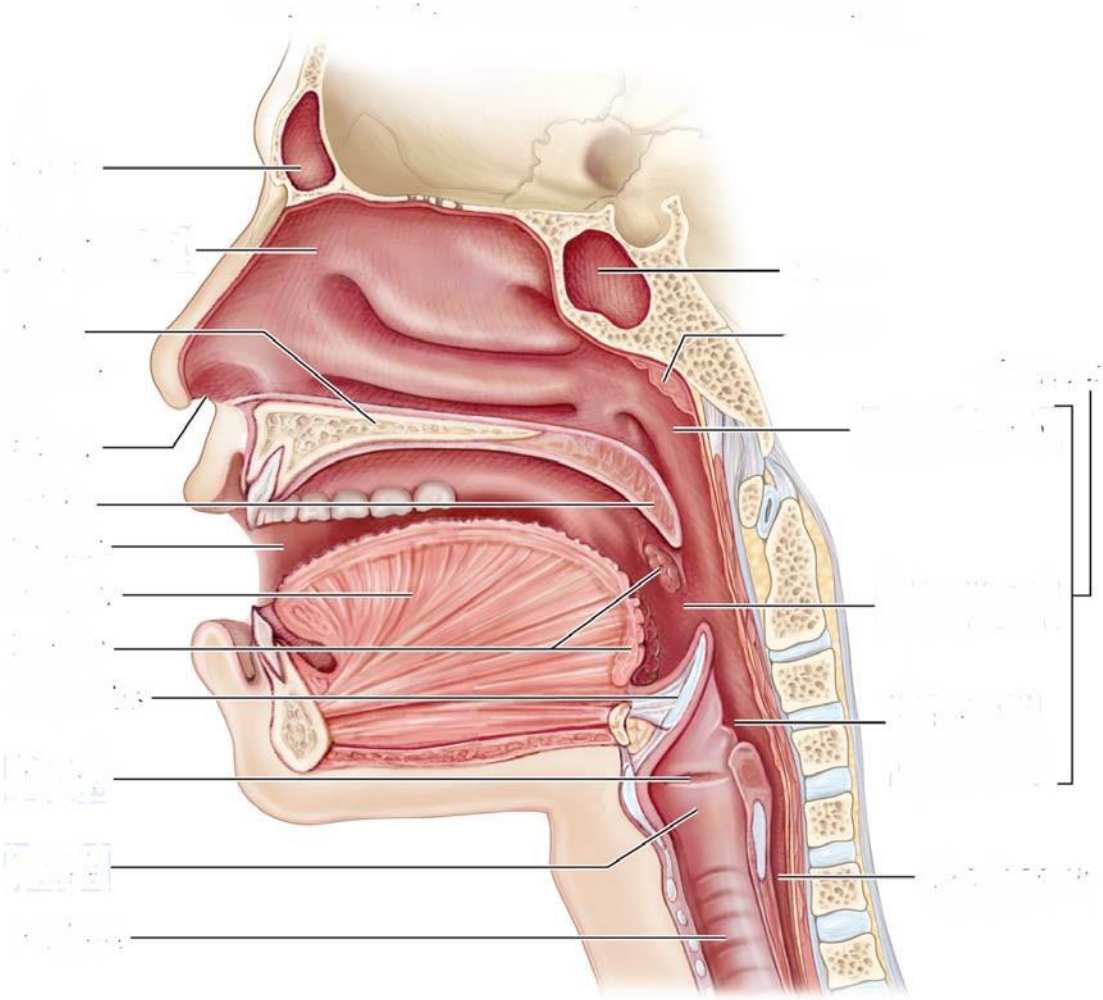
g. _____

h. _____

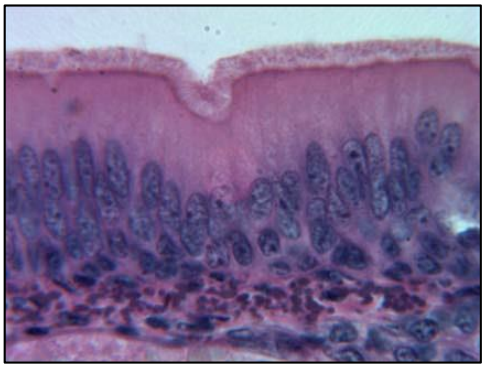
i. _____

B. Sagittal view labeling exercise

Use your text to help you label the structures below. Write next to ALL the lines. Be sure you can identify these same structures on the models



Draw and label PCCE. Label the epithelial cells with cilia. Magnify to high power and record magnification



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C. External respiration

External Respiration is the exchange of gases between the air in the alveoli and blood in the pulmonary capillaries. With arrows show which way the CO_2 and O_2 diffuse (Do they diffuse from the alveolus to the capillary or the capillary to the alveolus?).

ALVEOLUS	Draw arrow to left or right	CAPILLARY
O_2		O_2
CO_2		CO_2

Most of the CO_2 is carried in plasma as bicarbonate ions. Fill in the equation for this reaction as it proceeds with the help of carbonic anhydrase, CA, in the red blood cells. This is one of the most important equations in physiology.

$$\underline{\quad H^+ \quad} + \underline{\quad\quad\quad\quad\quad\quad} \text{ bicarbonate ion} \rightarrow \underline{\quad H_2CO_3 \quad} \xrightarrow{CA} \underline{\quad H_2O \quad} \text{ water} + \underline{\quad\quad\quad\quad\quad\quad} \text{ carbon dioxide}$$

1. If you hyperventilate (breathe in and out more often than normal) you will exhale more CO_2 and thus push this reaction to the right. This will result in higher | lower (*CIRCLE ONE*) H^+ and thus a high | low (*CIRCLE ONE*) pH and acidosis | alkalosis (*CIRCLE ONE*) results.
2. What could you do to compensate for this result?
3. If you hold your breath, which gas will build up? _____
    a. What will happen to the H^+? increase | decrease (*CIRCLE ONE*)
    b. What will happen to the pH? Increase | decrease (*CIRCLE ONE*)
    c. What condition might result? Acidosis | alkalosis (*CIRCLE ONE*)

D. Internal respiration

Internal Respiration is gas exchange between the blood and the tissue cells. This would include all the tissues, muscles, bones, skin, brain, etc. With arrows show which way the CO_2 and O_2 diffuse.

BLOOD	Draw arrow to left or right	TISSUE/CELL
O_2		O_2
CO_2		CO_2

Fill in the equation for this reaction as it proceeds with the help of carbonic anhydrase.

$$\underline{\quad\quad\quad\quad} \text{ water} + \underline{\quad\quad\quad\quad\quad\quad} \text{ carbon dioxide} \xrightarrow{CA} \underline{\quad\quad\quad\quad\quad\quad} \text{ carbonic acid} \rightarrow \underline{\quad\quad\quad\quad\quad\quad} \text{ hydrogen ion} + \underline{\quad HCO_3 \quad}$$

1. From what source do the carbon and oxygen in the CO_2 come from?
2. What is the process called that forms this CO_2?
3. How is the O_2 carried around in the blood?

E. Measurement of lung volumes and capacities

Please measure the lung volumes and capacities of yourself and your partner after the correct use of the spirometer has been demonstrated.

Tidal Volume, TV

1. Maintain normal breathing for 30 seconds.

2. At the end of an inhalation, put the mouthpiece in your mouth while holding your nose so no air escapes through your nasal cavity and exhale normally as you practiced in the first 30 seconds.

3. Record the volume in the Table below.

4. Repeat two more times and calculate the average TV and record in the Table.

5. Please note that this is the MAJOR place for error. Your TV should be around ***500 ml*** unless you are abnormal.

Expiratory Reserve Volume, ERV

1. Maintain normal breathing for 30 seconds.

2. At the end of an exhalation, put the mouthpiece in your mouth while holding your nose so no air escapes through your nasal cavity.

3. Exhale as hard and long as possible.

4. Record the volume in the Table below.

5. Repeat two more times and calculate the average ERV and record in the Table.

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Vital Capacity, VC

1. Maintain normal breathing for 30 seconds.

2. Inhale as long and hard as possible. Then put the mouthpiece in your mouth while holding your nose closed as above.

3. Exhale as hard and long as possible.

4. Record the volume in the Table below.

5. Repeat two more times. Calculate the average VC and record in the table.

	Trial 1 (mL)	Trial 2 (mL)	Trial 3 (mL)	Average (mL)
TV				
ERV				
VC				

Average lung volumes and capacities for young adults in mL are as follows;

	Male average	Female average
TV	500 mL	500 mL
ERV	1,100 mL	700 mL
VC	4,600 mL	3,100 mL

TV + ERV + IRV = VC

F. Questions

1. How did your results compare to the average male or female (of your sex) above?

2. What might influence a difference between your results and the average?

3. What is the air that ALWAYS remains in your lungs called?

4. This lung volume from #3 is usually about 25% of your VC. Calculate this approximate volume from YOUR VC that you measured.

5. We can't measure inspirations with the spirometer but we can calculate the Inspiratory Reserve Volume, IRV, from the data we collected.

a. What is the equation for calculating the IRV?

   IRV=

b. What is your IRV? Use your measured values. Show your work

c. What is the average IRV for a person of your same gender?
   Use the average lung volumes

6. The total lung capacity, TLC can be calculated. The equation is the VC + RV = TLC.
   Show your work

   a. What is your TLC? Use your measured values.

   b. What is an average TLC in a young adult of your same gender? Use the average lung volumes.

7. Name 3 major things that influence variations in TLC.