Lung Capacity Lab Name _____

Background Information: Your lung capacity is equal to the amount of air that can be stored in your lungs. Lung capacity is dependent upon many factors such as weight, sex, age and activity. For example, females tend to have a 20-25% lower capacity than males. Tall people tend to have a larger lung capacity than shorter people. Heavy smokers have a drastically lower lung capacity than nonsmokers. Some people, such as athletes, have a capacity well above average. While the average lung capacity is about 5.8 liters, it varies from one person to the next.

Purpose: This lab activity will allow you to determine your lung capacity. You will then compare this value to the theoretical capacity for someone your age that is the same height.

Research Question: How do you think your lung capacity compares to the theoretical capacity?

Hypothesis: _____

_____

Materials: string, metric ruler, balloon

Procedure:

1) Stretch your balloon several times by blowing it up & slowly releasing the air before starting the lab.
2) Inhale as much air as possible and exhale as much as your can into the balloon. **Do not** inhale a second time!
3) Hold the end of your balloon shut to stop the air from escaping. **Do not** tie your balloon shut.
4) Have a classmate help you measure the largest part of your balloon using the string and ruler. You should measure the distance around the balloon . . .this is the circumference (**use cm**).
5) Repeat this 2 more times so you can find your average lung capacity.

Circumference #1 (cm)	Circumference #2 (cm)	Circumference #3 (cm)	AVERAGE

6) Use your average circumference to find the ***radius*** [r = Average/6.28] _____

7) Now calculate the volume of your balloon [$V = 4.18r^3$]. This is your **experimental lung capacity**. For those of you struggling with the math, here's how it works: V = 4.18 x r x r x r.

V= _____mL

8) Since this number is in millimeters, divide your volume by 1000 (we want liters). [V/1000]

What is your **experimental lung capacity?** _____liters

9) Fill in the following information so you can figure out your **theoretical lung capacity**.

My height = _____feet + _____ inches

My height in inches = _____ [remember there are 12 inches in each foot]

My height in cm = _____ [height in inches x 2.54]

My age in years = _____

10) Here's the formula you need to calculate your theoretical lung capacity = (0.041 x h) – (0.018 x a) – 2.69

Hints: remember to multiply before you subtract!

h = height in cm (from up above)

a = your age

What is your **theoretical lung capacity?** _____liters

11) How does your experimental lung capacity compare to your theoretical lung capacity?

12) How might your lifestyle explain this difference (ex: asthma, great athlete, smoker, etc)?

13) Now we're going to find your **expiratory reserve**. This is the amount of air that remains in your lungs after you normally exhale. Are your lungs ever really empty (yes or no)? _____

14) Breathe normally a few times. After your exhale, **do not** take in another breathe. Instead, force the air that's still in your lungs into the balloon. Measure the circumference of the balloon the same way you did before. Repeat several times to find the average.

Circumference #1 (cm)	Circumference #2 (cm)	Circumference #3 (cm)	Average (cm)

15) Now find the radius [r = Average/6.28] _____

16) Calculate the volume [$V = 4.18r^3$] _____mL

17) Since this number is in millimeters, divide your volume by 1000 (we want liters). [V/1000]

What is **expiratory reserve**? _____liters

18) Define lung capacity.

19) Define expiratory reserve.

20) How do your measurements compare with those of your classmates? Explain any differences.