

Your name:

## Young Scholars Project All-cohort Lab investigation

In today's experiment, you will be measuring your lung volume and capacity, as well as your blood pressure. **Spirometry** allows many components of pulmonary function to be visualised, measured, and calculated. You will follow the PowerLab directions to perform spirometry and obtain a visual readout in the form of a graph.

### SAFETY NOTES

- The use of mouthpiece droplet filters and the tubing associated with the spirometer are a potential source of infection from saliva. **Do not** operate the spirometry apparatus without the mouthpiece droplet filter.
- Wash hands before **and** after completion of the exercises. Disposable gloves should be worn during the exercise.
- Used mouthpieces and gloves should be disposed of into the biohazard bags provided. Handling of mouthpieces and associated tubing should be minimised to avoid cross contamination.
- Do not, under any circumstances, reuse an unclean mouthpiece droplet filter. If you and your partner require a new mouthpiece droplet filter for Exercise 3, ask a tutor for a clean object.

### On your desk...

You should see a set of laminated cards. These contain all the information you need to **predict** the values of your lung volume and capacity. Record your predicted values in the table on page 3.

Then, you and your partner will use the Spirometry arrangement to visualise, measure and calculate your **experimental values**. These are the values that appear on the PowerLab screen while you breathe into the mouthpiece. These values describe your real-time lung capacity and volume.

### PowerLab and LabTutor

Working in your groups, start the *LabTutor* program by following this pathway:

**Start > LabTutor > Student Login:** Each member of the group must enter their username and their password (provided at your computer) then click the 'Green Arrow'.

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## Exercise One: Spirometry experiment

### Materials

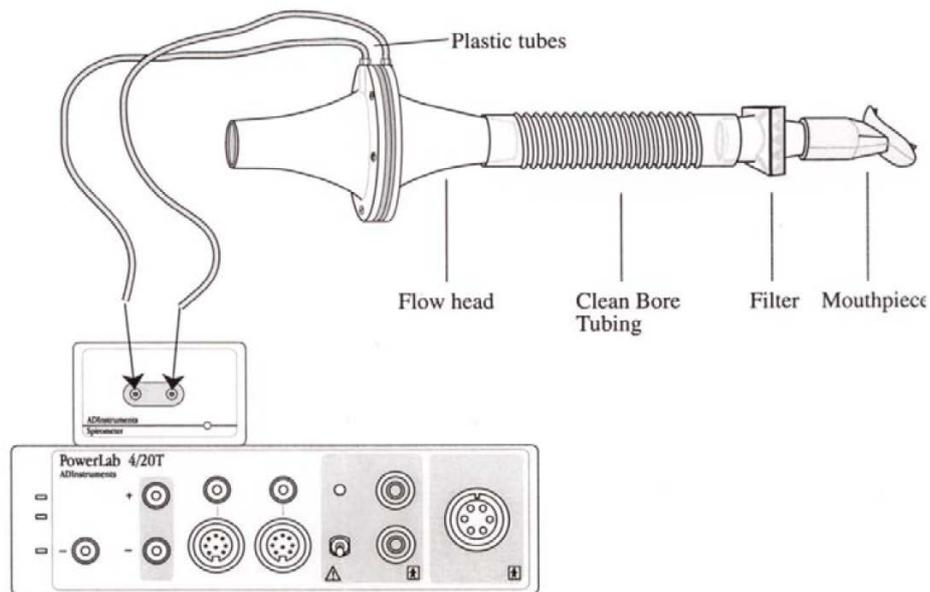
- PowerLab
- Spirometer front-end/ Spirometer pod
- Respiratory flow head and connection tubes
- tubing adaptor
- disposable mouthpiece-filters
- nose clip

### Method

Work in pairs

### Set up

Note that you will be using a disposable, combined mouthpiece-filter, rather than the separate mouthpiece and filter shown below.



- Attach the mouthpiece-filter to the flow head via the plastic tube
- Place mouthpiece in mouth and breathe naturally for 1 minute. Do NOT observe the PowerLab screen while breathing. Your partner will observe the output.
- Follow the LabTutor directions to perform spirometry and obtain a graph of real-time values



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### Exercise Two: Resting blood pressure(BP) and heart rate(HR)

**Materials:** Digital blood pressure monitoring unit

**Method:** Work in pairs

**Set-up:**

- Place cuff on arm (wrap around arm just above the elbow and use Velcro to fasten cuff firmly)
- Keep arm still and rested on table. Turn machine on
- Allow the cuff to inflate and then deflate. It will automatically take BP and HR readings
- Record your resting BP and HR

Parameter	Measurement	Higher/lower than average?
Blood pressure		
Heart rate		

### Blood pressure

Normal blood pressure is considered the same for all adolescents, adults and older adults: **below 120/80**. If either one of those two numbers are too high, the blood pressure is not considered normal.

Some people have naturally low blood pressure without experiencing any symptoms, but for others, a low systolic blood pressure -- typically lower than 90 -- can result in symptoms such as dizziness, light-headedness or fainting. Low blood pressure is typically caused by another problem, such as dehydration, a sudden blood loss, or a side effect of drugs.

### Heart rate

The average heart rate for a 16-year-old male is **69bpm**. For a 16-year-old female, it is **77bpm**. A 16-year-old elite athlete would have a resting heart rate of **54bpm**.

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**Exercise 3: Extension Activity**

Run your own experiment using either the spirometer or blood pressure unit (or both). Fill in the sheet below and record your data. You should design your study using the equipment and materials supplied in the lab. Check your ideas with a tutor before you start.

*What idea / theory would you like to test?*

**Research Question:**

*What do you think the outcome of your experiment would be?*

**Hypothesis:**

*How will you carry out the experiment?*

**Methods:**

*Record your findings*

**Results:**

<b>Respiratory Rate 1</b>		<b>Respiratory Rate 2</b>	
<b>Lung Volume 1</b>		<b>Lung Volume 2</b>	
<b>Blood pressure 1</b>		<b>Blood pressure 2</b>	

*What does your data tell you? Think about this in terms of your hypothesis and research question.*

**Conclusions:**

*Confounding factors are things that may have influenced your results that you may not have measured. What else might influence or explain your results? How would this affect your conclusion?*

**Limitations:**

*Can you think of a better way to answer your research question? If you had lots of time and money to spend, what kind of study would you design?*

**Future research:**