Learning Objectives:

* Collect FEV1 and PEF data
* Analyze lung volume and capacity data
* Connect anatomical knowledge and physiological knowledge to data

Grading: Each question in Parts 2 and 3 are worth the indicated number of points

Procedure: Follow the instructions below to record your own lung volumes and capacities with the [Mir Smart One Spirometer](https://usa.spirometry.com/personal-spirometer/smart-one) and the SmartOne App (download from the Apple or Android store).

Icon

Description automatically generated

**Part 1: Data collection**

1. Open the Smart One app. Close any ads or updates.
2. Click on settings and enter your birthdate, ethnicity, height, weight, and sex. This will help determine your predicted values for your lung capacity so as to make comparisons with your own data. Record your target predicted value here for peak expiratory flow rate (PEF): \_\_\_\_\_\_\_\_ L/min
3. Click on Test. If the spirometer has trouble syncing, click on the three bars in the upper right corner to select the spirometer to sync with.
4. Take a disposable mouth piece (blue tube) and insert it on the front of the spirometer. Twist clockwise to make sure it is tightly in place.
5. Select Start Test Peak flow. When ready, take a deep breath in, place your mouth tightly on the blue mouth piece, and exhale as hard and as fast as you can. When prompted, repeat a second and third time.
6. Click on your results to record your flow rate (number in green circle, L/min) and FEV1 (upper right corner, L).

Peak expiratory flow rate (PEF): \_\_\_\_\_\_\_\_ (L/min)

FEV1: \_\_\_\_\_\_\_ (L)

1. Throw away the blue mouth piece and close the app.
2. After everyone in your group has made these measurements, pass the spirometer onto the next group.

**Part 2: Classmates lung physiology data collection and analysis**

**1. (+1)** Add your data to the table below in row 5. Data for subjects 1 to 4 are already provided.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Subject | Age | Height (in) | Weight (lb) | Anatomical sex | FEV1 (L) | PEF (L/min) | Predicted PEF (L/min) | % PEF | FVC (L) | TLC (L) |
| 1 | 37 | 72 | 165 | Male | 3.33 | 824 | 594 |  |  |  |
| 2 | 5 | 44 | 37 | Female | 0.99 | 190 | 143 |  |  |  |
| 3 | 9 | 53 | 70 | Male | 1.85 | 278 | 242 |  |  |  |
| 4 | 36 | 64 | 130 | Female | 2.92 | 514 | 379 |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |

**2. (+1)** Calculate % PEF as a percentage of the target PEF for each subject. Enter the data in the table above. What are some anatomical or physiological reasons why the values are higher or lower than expected?

**3. (+1)** Calculate the forced vital capacity (FVC (L), also known as vital capacity) for each subject by assuming that the FEV1/FVC ratio is equal to 80%. Enter the data in the table above.

**4. (+1)** Assuming a typical residual volume of 1.2 L, calculate the total lung capacity (L) for each subject. Enter the data in the table above. Are there any subjects who you think this assumption is invalid for?

**5. (+1)** Do you notice any trends in the data based on age, sex, height, or weight? Explain any trends and give an anatomical or physiological explanation for them.

**Part 3: Prediction of your lung physiology parameters**

**1. (+3)** Go to <https://www.cdc.gov/niosh/topics/spirometry/refcalculator.html> and enter your date of age, sex, ethnicity, and weight. Do not change the other parameters and click Submit. Record your predicted values in the table below. Use your textbook or the Glossary link on the website to help you define each parameter.

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Definition of parameter** | **Your predicted value** |
| FEV1 |  |  |
| FVC |  |  |
| FEV1/FVC |  |  |

**2. (+1)** Calculate your TLC from your calculated parameters assuming a residual volume of 1.2 L. We usually assume a typical TLC of 6 L for the average adult. How does your TLC value compare to this value? Why is your value lower or higher?

**3. (+1)** Compare your predicted FEV1 value with that of the table of data in Part 2 above. How does your FEV1 fit in with the data? Provide an anatomical or physiological explanation for how your FEV1 compares.