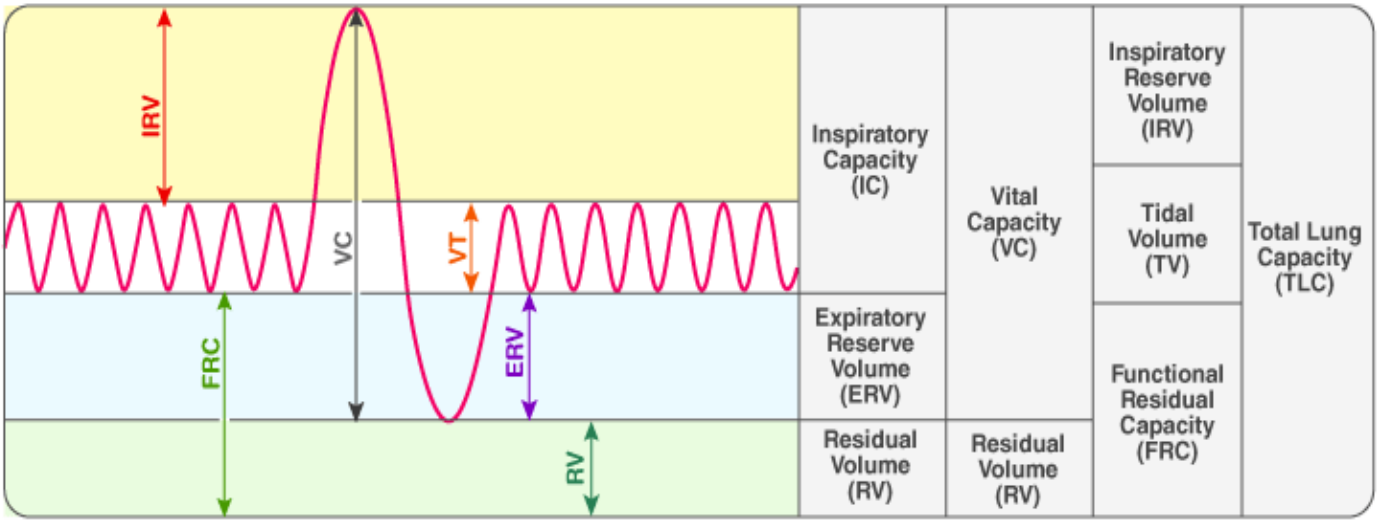
SPIROMETRY

Introduction

A spirometer is a medical device that is used to measure the volume of air expelled per breath. It can be used to estimate the air capacity of the lungs and diagnose respiratory conditions like asthma or chronic obstructive pulmonary disease. A typical respiratory cycle may include different phases:

- **Tidal volume:** The volume of air that is exchanged via normal breathing
- **Vital capacity:** The volume of air exchanged by the lungs via maximum inhalation and exhalation
- **Inspiratory reserve volume:** Volume of air inspired with maximum effort after a normal inhalation
- **Expiratory reserve volume:** Volume of air expired with maximum effort after a normal exhalation



Aim

To determine the volumes of air involved in the different respiratory stages when at rest.

Method

1. Set end of mouthpiece to nozzle of spirometer (measurement units = cubic centimetres)
2. Ensure indicator is pointed to zero (if not, adjust by moving the upper outer ring from right to left)
3. Set mouthpiece to lips and exhale, keeping the spirometer horizontal during the measurement
4. Record the measurements after the following activities to determine volumes of different phases:
    - Vital capacity – Undertake a maximum inhalation and then expel all air into the spirometer
    - Tidal volume– Inhale normally and then expel air from a normal exhalation into the spirometer
    - Expiratory reserve volume – Exhale normally and then expel remaining air into the spirometer
    - Inspiratory reserve volume – Subtract tidal volume and expiratory reserve from vital capacity
    - Residual volume – Assume to be roughly 20% of the vital capacity (Vital Capacity $\times$ 0.2)

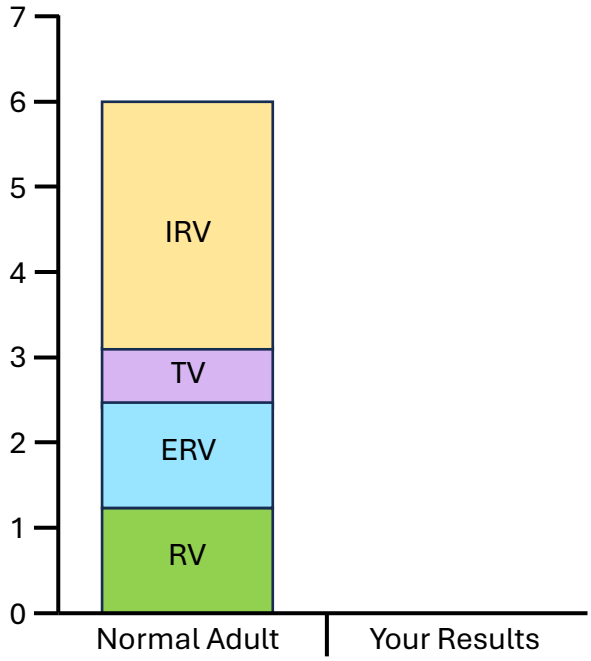
Safety Considerations

Do not undertake the test following strenuous exercise or if suffering from a respiratory infection. Do not undertake the test if currently taking breathing medications (such as bronchodilators). Try to wear loose fitting clothes that do not restrict chest movements. Do not share mouthpiece with any other participant (mouthpieces will be disinfected following use).

Results

1. Record averaged results of three attempts and use the data to construct a lung capacity bar chart

Phase	Average Result
Vital Capacity	
Tidal Volume	
Expiratory Reserve	
Inspiratory Reserve	
Residual Volume	



2. Collate class data for total lung capacity (in ml) and height (in cm) into the table included below

	1	2	3	4	5	6	7	8	9	10
Height (cm)										
TLC (ml)										

3. Use Excel to calculate the correlation coefficient between the two sets of data (=CORREL function)

Correlation coefficient	Explanation of what it means

Discussion

1. Distinguish between correlation and causation
