

(potassium hydroxide) in the breathing circuit absorbs the carbon dioxide in the exhaled air. A drum attached to the spirometer revolves at a **known** speed and records oxygen up-take from changes in system's volume. It is difficult to measure oxygen uptake during exercise in a closed circuit spectrometry. The subject must remain close to the bulky equipment, the circuit's resistance to the large breathing volumes in exercise is considerable, and the speed of carbon dioxide removal becomes inadequate during heavy exercise.

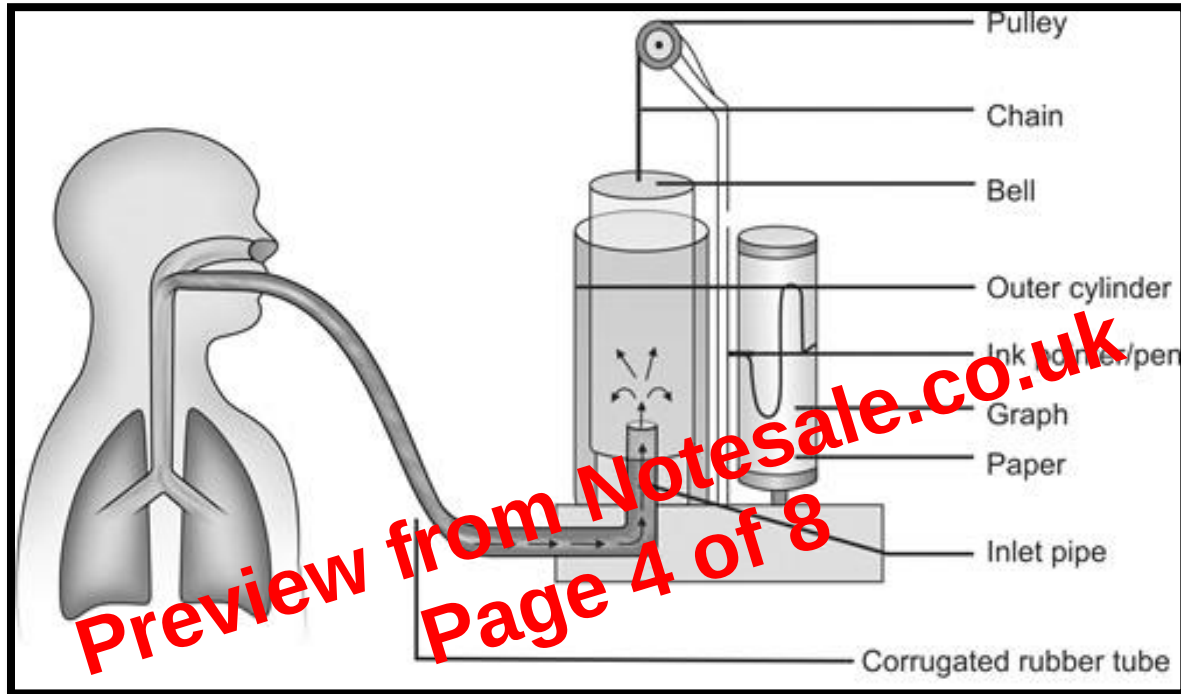


Figure 1.3-Closed Circuit Spirometry.

- **Open-circuit spirometry:**
- **Working Mechanism:**

An open-circuit spirometry, a subject inhales ambient air with a constant composition of **20.93% oxygen, 0.03% carbon dioxide, and 79.04% nitrogen**. The nitrogen fraction also include a small quantity of inert gases. The changes in oxygen and carbon dioxide percentages in expired air compared with those in inspired ambient air indirectly reflect the ongoing process of energy metabolism.

Thus, analysis of two factors—volume of air breathed during a specified time period and composition of exhaled air—provides a useful way to measure oxygen uptake and infer energy expenditure. Four common indirect calorimetry procedures measure oxygen uptake during various physical activities: