**SNS COLLEGE OF ALLIED HEALTH SCIENCE, COIMBATORE –35**
(Affiliated to the Tamil Nadu Dr M.G.R Medical University, Chennai)
**B.Sc. OPERATION THEATRE AND ANAESTHESIA TECHNOLOGY**

**PUZZLE**
**1131 – BASIC SCIENCES - PHYSIOLOGY**
**UNIT III – RESPIRATORY SYSTEM**

# Lung Volumes and Capacities Logic Puzzle: Spirometry Measurement Matching

**Scenario:** **Total marks: 10 marks**

A respiratory therapist is performing spirometry on a patient with restrictive lung disease. The test measures key lung volumes and capacities: tidal volume (TV), inspiratory reserve volume (IRV), expiratory reserve volume (ERV), residual volume (RV), vital capacity (VC), total lung capacity (TLC), inspiratory capacity (IC), functional residual capacity (FRC), and forced expiratory volume in 1 second (FEV1). Disease affects elastic recoil, and the therapist must match each parameter to its definition, measurability (direct/indirect), normal values, and disease impact. Only one definition per parameter.

**Clues**:

1. Tidal volume (TV) is normal breathing volume (~500 mL), directly measurable by spirometry, minimally affected in restrictive disease.
2. Vital capacity (VC = IRV + TV + ERV) is maximum breath after full exhalation, directly measured, reduced in restrictive disease due to low compliance.
3. Residual volume (RV) is air remaining after maximal exhalation (~1.2 L), not directly measurable (requires gas dilution), often normal or increased relatively in restrictive patterns.
4. Total lung capacity (TLC = VC + RV) represents full lung inflation, indirectly calculated, decreased in restrictive disease (<80% predicted).
5. Inspiratory capacity (IC = TV + IRV) is maximum inspiratory volume from resting level, directly measurable, reduced in restriction.
6. Functional residual capacity (FRC = ERV + RV) is resting end-expiratory volume, indirectly measured, often normal in early restriction but reduced later.
7. FEV1 measures forced expiration in 1st second, directly spirometric, reduced in both obstructive/restrictive but FEV1/FVC ratio helps differentiate (normal/high in restrictive).
8. The restrictive disease primarily reduces volumes requiring full expansion (VC, TLC, IC), not trapped air (RV relatively preserved).
9. ERV is volume exhaled after normal expiration, directly measurable, often reduced first in obesity/restriction due to diaphragm elevation.

**Question**: Match each lung volume/capacity to its definition, measurability, and restrictive disease effect, and identify which parameters are most reduced in this pathology.

**Rubrics**

| **Criterion** | **Points** |
|---|---|
| Key Elements | 2 pts |
| Logical Steps | 4 pts |
| Correct Solution | 2 pts |
| Biological Insight | 2 pts |
| **Total** | **10 pts** |