

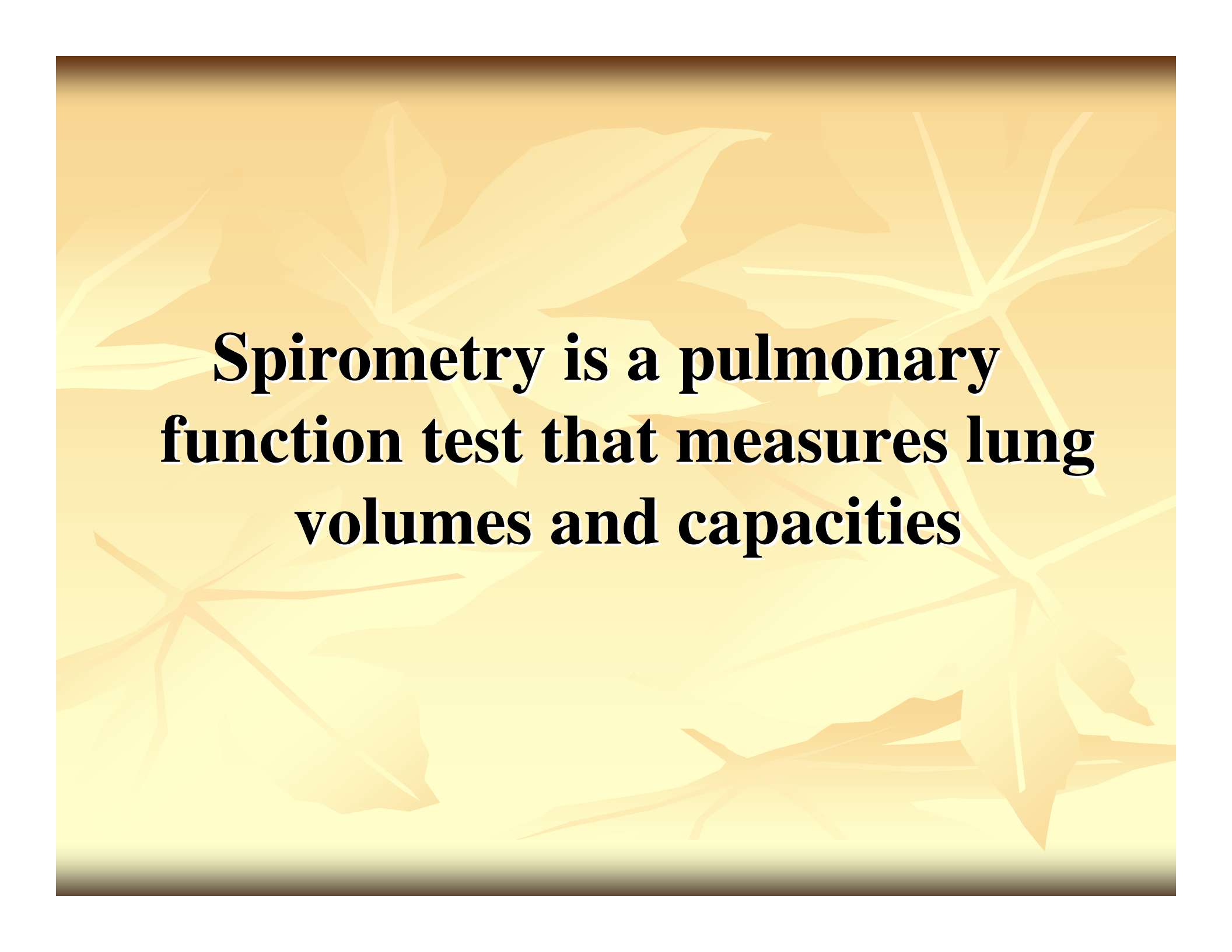
# RESPIRATION PRACTICALS

# SPIROMETRY



# Objectives

- Use a spirometer and determine lung volumes and capacities
- Define and provide values for the various lung volumes and capacities
- Recognize the physiological and some pathological factors that modify lung volumes and capacities



**Spirometry is a pulmonary  
function test that measures lung  
volumes and capacities**

# Spirometer

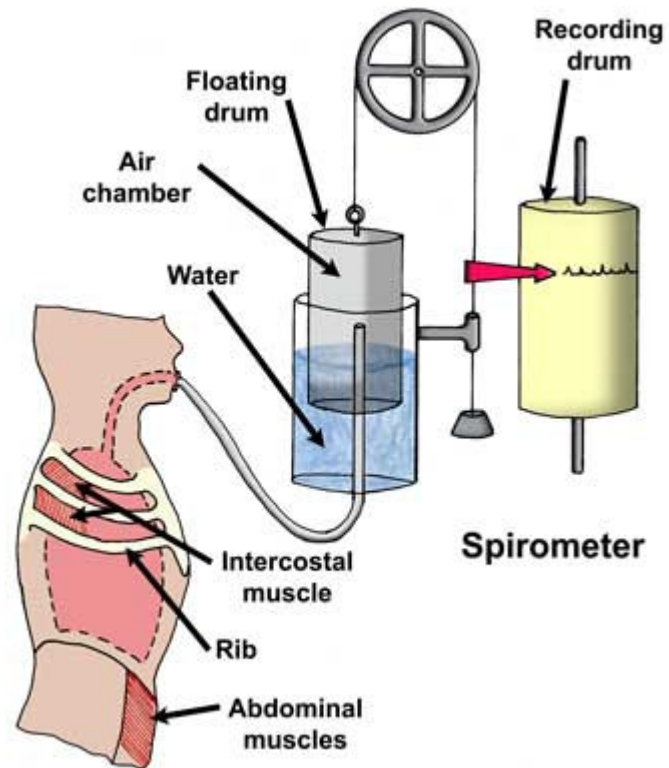
■ Drum inverted over a chamber of water with the drum counterbalanced by a weight

■ In the drum is air or Oxygen

■ A Tube connects the mouth with the gas chamber

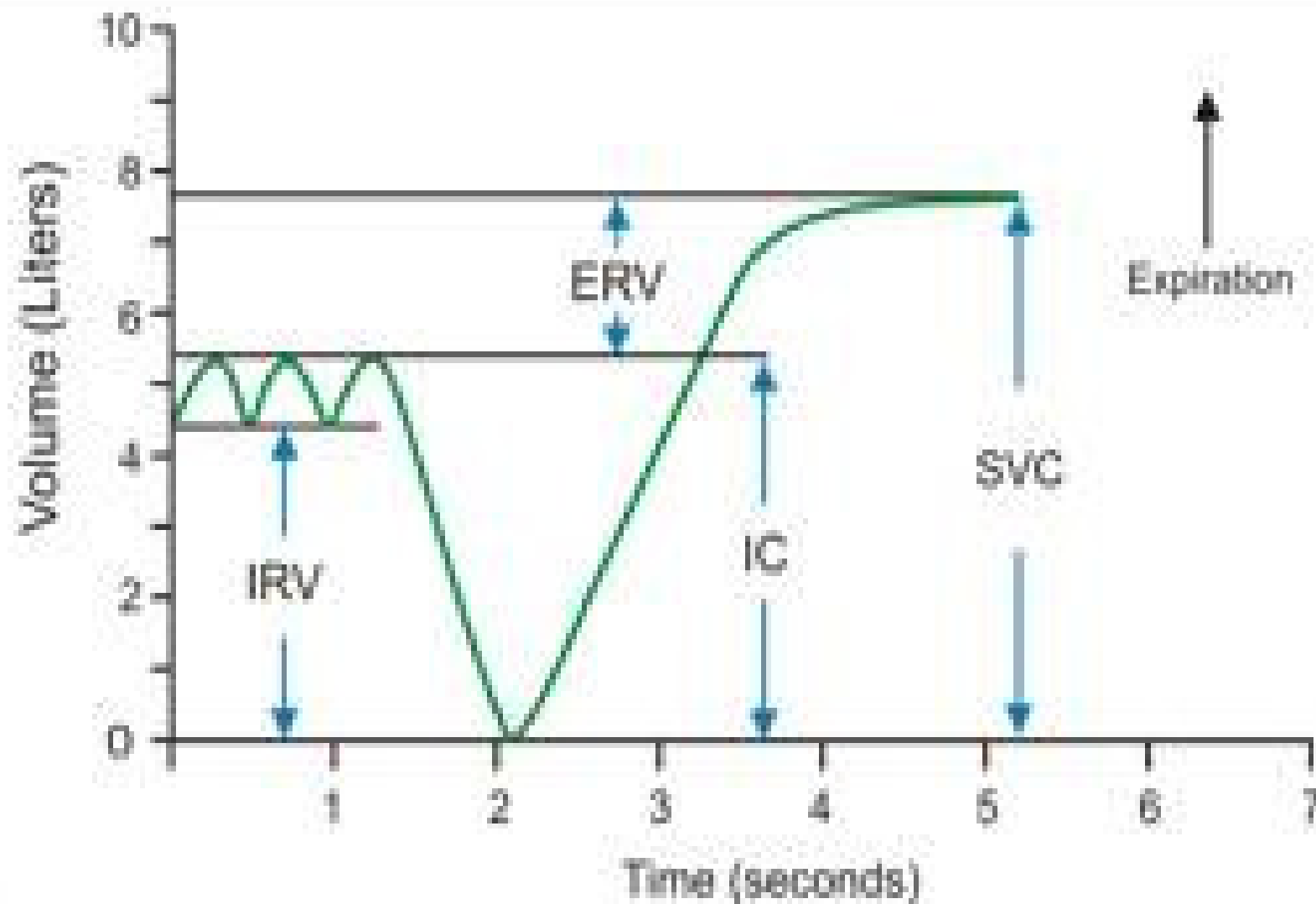
■ When one breathes in and out of the chamber, the drum rises and falls and an appropriate recording is made on a moving paper

# Spirometer



# Method

- ◆ Insert a sterilized mouthpiece
- ◆ Close the nose with the nose clip
- ◆ Take a normal breath through the mouthpiece for a short time then take a deep inspiration to fill the lungs completely, then breathe normally for a short time.
- ◆ Expire quickly, forcibly and as completely as possible, then breathe normally for a short time.
- ◆ Take a deep forceful inspiration and immediately expire quickly forcibly and as completely as possible, then breathe normally.
- ◆ The spirogram is recorded on a moving drum



# Lung volumes

- **Tidal volume:**

The amount of air that moves into the lungs with each inspiration (or the amount that moves out with each expiration) = **500ml**.

- **Inspiratory reserve volume:**

The extra volume of air that can be inspired above the normal tidal volume = **3000ml**



- **Expiratory reserve volume:**

The volume expelled by an active expiratory effort after passive expiration ( after the end of a normal tidal expiration) = **1100ml**

- **Residual volume:**

The air left in the lungs after the most forceful expiration = **1200ml**

# Lung Capacities

■ **The inspiratory capacity :**

$$\text{IC} = \text{TV} + \text{IRV}$$

The amount of air a person can breathe beginning at the normal expiratory level and distending the lungs to the maximum amount = **3500ml**

■ **The functional residual capacity :**

$$\text{FRC} = \text{ERV} + \text{RV}$$

The amount of air that remains in the lungs at the end of normal expiration = **2300ml**

❖ **The vital capacity:**

$$\mathbf{VC = IRV + TV + ERV}$$

The maximum amount of air a person can expel after maximal inspiration = **4600ml**

❖ **The total lung capacity:**

$$\mathbf{TLC = VC + RV}$$

The max volume to which the lungs can be expanded with the greatest possible inspiratory effort = **5800ml**

# Physiological factors influencing lung volumes and capacities

- **Sex: female 20-25% less**
- **Age:                   ↓ VC**
- **Obesity:               ↓ VC**
- **Height:               ↑ VC**
- **Athletes: ↑ VC**

# Pathological factors

Vital capacity is decreased with :

❖ ↓lung volume:

eg: surgical removal of lung tissues  
large tumors

❖ Restrictive lung disease: inability to fully expand the lungs.

eg: Pneumonia, pulmonary edema, broken ribs

❖ Obstructive lung disease

eg: Chronic bronchitis, asthma, foreign body

❖ Loss of elastic recoil

eg: emphysema

THANK YOU...