

# (PM1-2) Archimedes' Principle

## Aim of experiment

Determination of the specific density of a solid and of a liquid.

## Apparatus

Sensitive Balance – Regular Solid Body – Beaker Contains Water - Beaker Contains Any Other Liquid.

## Theory of experiment

Archimedes principle states that *if a body is immersed in a liquid, it will be acted upon by upward upthrust force equal to the weight of the displaced liquid,*

Up thrust force = weight of the displaced liquid

= volume of displaced liquid  $\times$  density of liquid  $\times$  acceleration due to gravity

= volume of the body,  $V_b \times$  density of liquid,  $\rho_L$ ,  $\times$  acceleration due to gravity,  $g$ .

$$F_{up}=w_1-w_2= V_b \cdot \rho_L \cdot g$$

Where,  $w_1$  and  $w_2$  are weights of the body in air and in liquid respectively.

*Specific gravity, or density,* is defined as the ratio between the weights of a given volume of a substance to the weight of an equal volume of water. It is dimensionless quantity .If this equation is applied for the same body in water; one can obtain the following equation:

Specific density of a liquid  
 $= (w_1- w_3)/(w_1- w_2)$

Where,  $w_3$  is the weight of the body in the liquid.

Also, the specific density of a solid can be obtained from the following equation:  
Specific density of a solid  $= w_1/(w_1- w_2)$

## Procedures

1. Find the weight of the body in air,  $w_1$ .
2. Find the weight of the body when it is completely immersed in the water,  $w_2$
3. Find the weight of the body when it is completely immersed in the liquid,  $w_3$
4. Repeat steps 1-3 at least three times, and calculate the average.
5. Calculate the volume of the body and verify Archimedes' principle.

## Results

	Trial 1	Trial 2	Trial 2	$w_{av}(N)$
$w_1(N)$				
$w_2(N)$				
$w_3(N)$				

Specific density of a liquid  $= (w_1- w_3)/(w_1- w_2) =$

Specific density of a solid  $= w_1/(w_1- w_2)=$