SAXONY EGYPT UNIVERSITY
FOR APPLIED SCIENCE AND TECHNOLOGY

2nd term

Name: ……..

Department: ……...

No.	Exp.	Date	Mark	Signature
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Good Luck

Head of physics department

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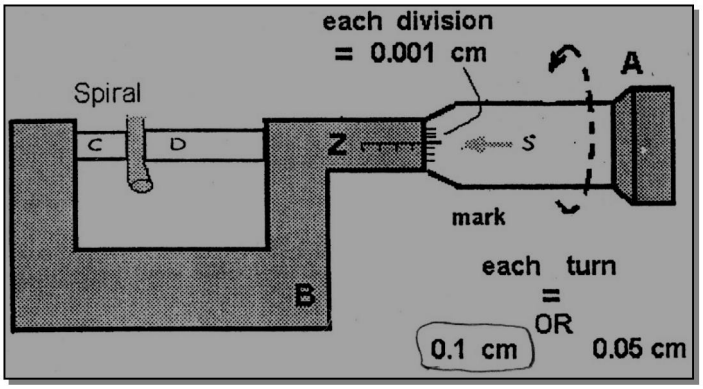
EXP. (1): Measuring Instruments

I- MICROMETER

The micrometer is used to measure *"the diameter and hence the radius of a wire"*.



There are two types:

1- 100 divisions type *(100 D. Type)*

2- 50 divisions type *(50 D. Type)*

The reading is given by counting the number of complete turns plus the number of divisions required to close the jaws on the wire. For example if six complete turns and forty two divisions *(6 complete turns + 42 divisions)* are recorded, the reading will be:

100 D. Type	**50 D. Type**
$2r = 6 \times 0.1 + 42 \times 0.001$ cm	$2r = 6 \times 0.05 + 42 \times 0.001$ cm
$= 0.6 + 0.042$ cm	$= 0.30 + 0.042$ cm
$= 0.642$ cm	$= 0.342$ cm
$r = 0.642/2 = 0.321$ cm	$r = 0.342 / 2 = 0.171$ cm

II- VERNIER CALIPER

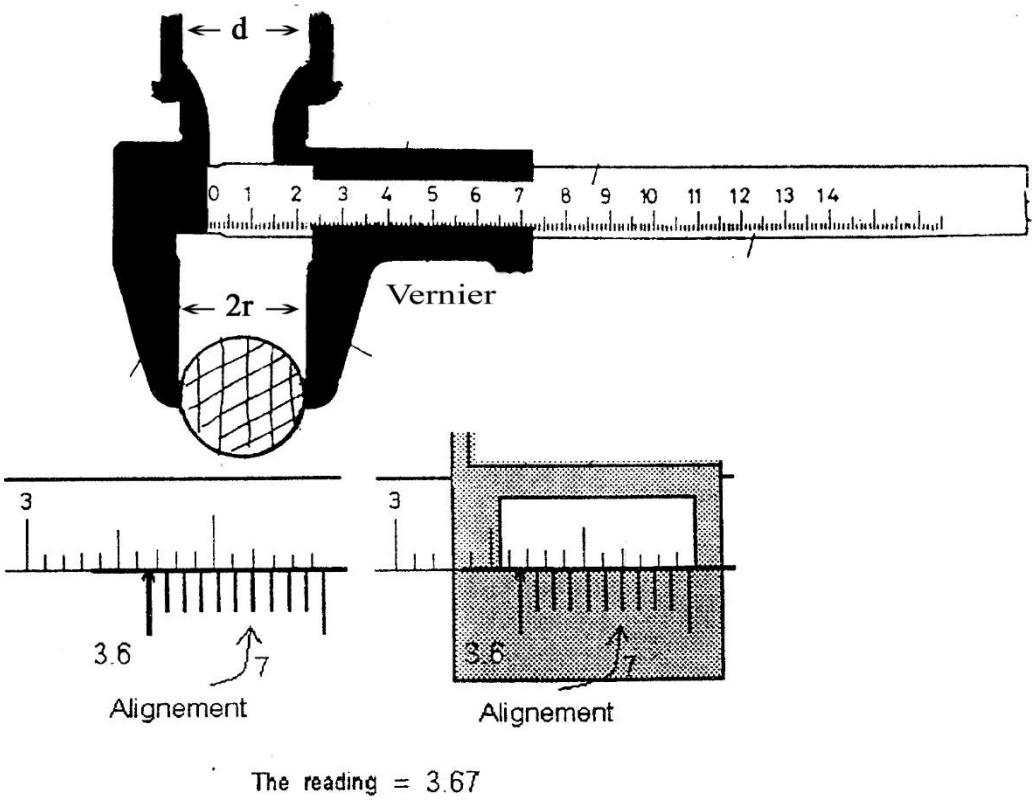
The vernier caliper is a device that measures *thickness, internal or external diameters and distance between two objects*.

It consists, as shown in figure, of a fixed ruler as a main scale and a moving vernier scale. The main scale is divided into centimeters as major divisions and millimeters as minor divisions. The moving vernier scale is equivalent to *0.9 cm*. by usuing a vernier caliper, distances can be measured accurately up to *0.01 cm*.

The vernier caliper is used in our laboratory to measure:

1- The diameter and hence the radius of the bob of the simple pendulum.

2- The internal diameter of the resonance tube.



The reading = 3.67

Results:

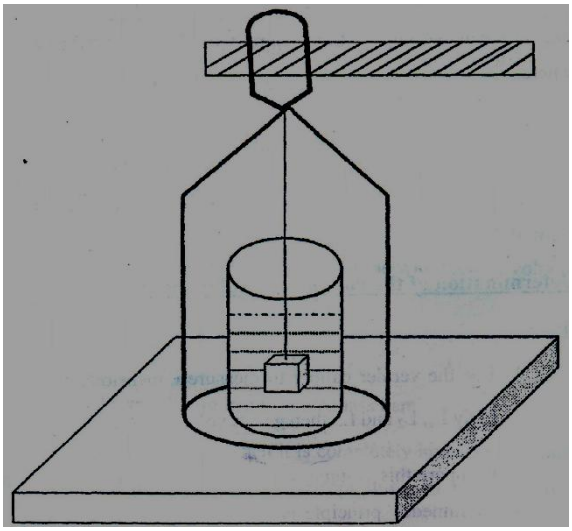
Exp. (2): Archimedes' Principle

Apparatus:

Beam Balance- Weights- Beaker Containing Water- Solid Bodies- Spiral Wire

Theory:

Archimedes' principle states that "If a body is immersed wholly or partially in a liquid it will be acted upon by an upward force. This force is called up-thrust force and it is equal to the weight of the displaced liquid".



A- Determination of the specific gravity of a solid body:

Method:

1- Weigh the solid body in air; let its mass be m.

2- Weigh the body when it is completely immersed in water; let its mass be ml.

3- The specific gravity of the body is given by:

Note that the specific gravity of the body equals its density since

$$\rho_{Solid} = \frac{m}{m - m_1}$$

4- Repeat the above steps with the spiral wire to find its specific gravity where,

$$\rho_{spiral} = \frac{m`}{m` - m`_1}$$

Where, m` and m`$_1$ are the masses of the spiral wire in air and in water respectively.

B- Determination of the volume of a solid body:

Method:

1 - Use the vernier caliper to measure dimensions of the solid body L_1, L_2 and L_3 then get its volume V = L_1 x L_2 x L_3

2- Compare this volume with the volume which obtained from Archimedes' principle as:

$$V = \frac{m - m_1}{\rho_w}$$

C- Determination the specific gravity of a liquid:

Method:

1- Weigh the solid body in air; let its mass be m.

2- Weigh the solid body when immersed completely in water; let its mass be m.

3- Weigh the solid body when immersed completely in the liquid; let its mass be m.

4- The specific gravity of the liquid is given by:

$$\rho_L = \frac{m - m_2}{m - m_1}$$

5- Repeat the above steps with the spiral spring in order to verify the result which obtained above.

D- Determination of the length of a spiral wire:

Method:

1- Use the micrometer to measure the diameter of the spiral wire and hence its radiusr. If y is the length of the wire then its volume will be given by:

$$V = \pi r^2 \ell \ldots\ldots\ldots \quad (1)$$

2- Weigh the spiral wire in air; let its mass be m`.

3- Weigh the spiral wire when it is completely immersed in water; let its mass be m`. The volume of the spiral wire is then given by:

$$V = m` - m`_1 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

4- From equations (1) and (2)

$$\ell = \frac{m`-m`_1}{\pi r^2} \quad \ldots\ldots\ldots\ldots \quad (3)$$

Results:

The mass of solid body in air m =

The mass of solid body in water ml =

The mass of solid body in liquid m2 =

The mass of spiral wire in air m` =

The mass of spiral wire in water m`1 =

The mass of spiral wire in liquid m2 =

The dimensions of the body L1 =

The radius of the spiral wire r =

The specific gravity of solid:

$$\rho_{Solid} = \frac{m}{m - m_1} =$$

The specific gravity of spiral wire:

$$\rho_{spiral} = \frac{m`}{m`-m`_1}$$

The volume of the solid body:

$$V_{Sol} = L_1 x L_2 x L_3 =$$

$$V_{Sol} = \frac{m - m_1}{m} =$$

The specific gravity of the liquid:

$$\rho_L = \frac{m - m_2}{m - m_1} =$$

$$\rho_L = \frac{m' - m'_2}{m' - m'_1} =$$

The length of the spiral wire:

$$\ell = \frac{m` - m`_1}{\pi r^2}$$