University of Baghdad

College of Science for women Physics department

Mechanics laboratory for preliminary studies

Department of Physics / first stage

The second course

For the academic year 2023/2024

Mechanics laboratory teachers

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Names of practical experiments

First experience
Surface Tension - Set the surface tension For a liquid using Scarle's Balance

Devices used

- A glass container, a
- box of weights, a
- little concentrated nitric acid, a concentrated solution of caustic soda, a Searle
- surface tension balance

(the device shown in Figure 41).

This device consists of a flexible wire fastened tightly at both ends, carrying metal arms from its middle on its short end slides the rider of the equation, the cuff suspended at the other end of the arm. The end of this end is a that acts as an indicator that moves in front of a scale. This end is carried by a weight cuff attached to its end. Bottom glass microscope slide

FIGURE 41

The theory

The liquid molecules located on its surface have potential energy, and since the potential energy of any device is at its minimum, so the liquid

It tries to make the number of molecules that fall on its surface as small as possible by reducing the area occupied by its surface, so the surface of the liquid is in a constant state of tension. If we imagine a straight line located at the level of the surface of the liquid, the molecules located on one side of it pull themselves away from those located on the other side, so the line is under the influence of a equilibrium vertical pull.

The amount of surface force acting perpendicularly per unit length placed on the surface of the liquid is called the surface tension of the liquid. If the force of contact with the liquid is greater than the force of cohesion of the liquid molecules, for example, a glass slide in water, and then it is withdrawn after touching the surface, it is possible to observe the force that the liquid shows along the surface area. If the length of the slide used is (L) and its thickness is (t),figure - 42 –

The length of the part in contact with the surface of the liquid was equal to the cross-sectional circumference of the slide, i.e. 2 (L+ t). If the surface tension of the liquid was (T), it was a force

The tension exerted on the slide by the surface of the liquid is equal to 2t (L+t). This force can be measured with the balance shown in Figure - 41

by adding masses in the balance cuff to its scale equating the effect of this force. If we assume that the amount of masses necessary to

flow (mg), it is: 2 T (L+t)=mg, from which the surface mass of

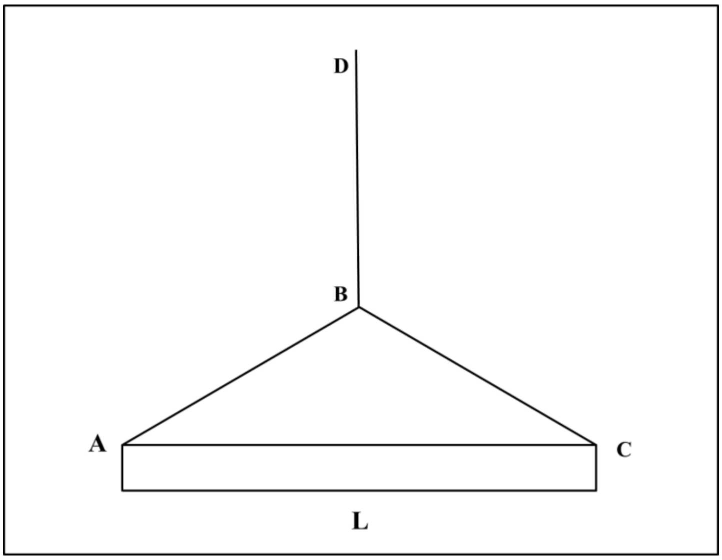


Figure - 42

the liquid can be calculated ,Figure - 42

The method

(1) Clean the container and the glass slide with concentrated nitric acid, then With running water, then with concentrated caustic soda solution, and finally with running water.

(2) hang On the glass slide at the bottom of the cuff vertically, so that the component Its lower edge is horizontal. Adjust the rider's position until the arm becomes horizontal ,The cursor is in front of its scale.

(3) Place the liquid in the container and arrange its height so that the slide is parallel

To the surface of the liquid without touching it. Read what the indicator records on its training.

(4) Lift the pot slowly and carefully until it touches the edge of the bottom slice

The surface of the liquid. Lower the vessel slowly and constantly monitor the reading of the indicator. Continue lowering the vessel and observing the indicator.

The chip separates from the surface of the liquid, then the indicator records the largest deviation. Write down this reading

(5) Remove the container, dry the slide, then gradually place weights on the cuff until the indicator records the same reading that you recorded in the step Previous .

Record the amount of these weights.

(6) Repeat the process several times, find the rate of added mass .

(7) Record the temperature of the liquid

(8) Measure the thickness of the slice (1) from the edge that touched the surface of the liquid From several positions using a micrometer, find the rate (t).

(9) Measure the length (L) of the edge of the slide that touched the surface of the liquid using venire

(10) Use the mentioned relationship to find the surface tension of the given liquid.

Also talk about the experience

A - Avoid touching the inside of the chip or container with your hand after cleaning it. Use tweezers whenever necessary.

2- It is preferable to place the container on top of a screw lifter to raise and lower it accurately and slowly

Questions

1 - What is meant by surface tension and what amounts does it depend on?

2 - Does the size of the part of the slide submerged in the liquid have an effect on... Experience, how?

3 - What should be the characteristics of the liquids whose surface tension is required to be determined?

Using this method?

4- The Searle balance is sometimes called the Torsion Balance. Does this name have any meaning in the device?

Second experience
Young's modulus of a wire

The purpose of the experiment :

1- Finding the Young's modulus.

2- Study of stress and strain

Devices used:-

1 - Metric scale.

2- Micrometer.

3- Weights.

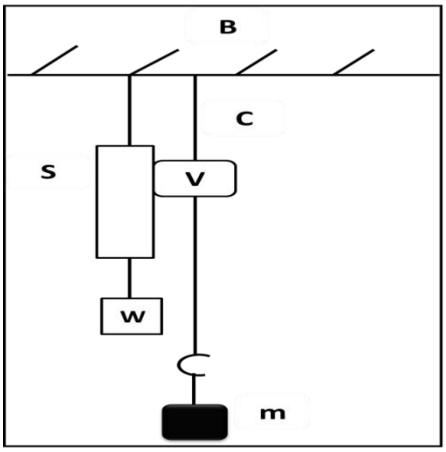
4- The young device is usually installed in the laboratory and consists of two long wires of the same

material suspended from a single support vertically, one of which carries a scale (s) and a weight (w)

sufficient to keep the wire tense. As for the other wire, it is the test wire and carries a vernier (v)

that moves on the fixed scale (s). This wire is gradually carried with weights equal to each of them.

(lkg) for example. As shown in Figure (1).



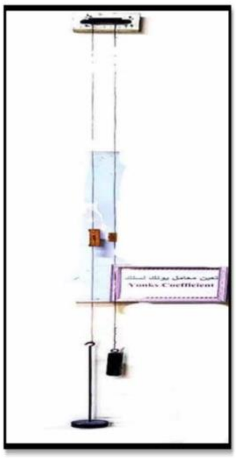


Figure 1

Slightly in the direction of the force and result in very small separations when combined in the direction of the length of the penis
To the observed elongation.

Young's modulus

This coefficient is used to describe situations that resemble the elongation of the tube shown in Figure (..4). The importance
of this coefficient becomes clear when one wants to calculate the elongation of a wire under the influence of a force.
Tension and from the definition we find that:
Young's modulus = stress / Compliance

FIGURE 4

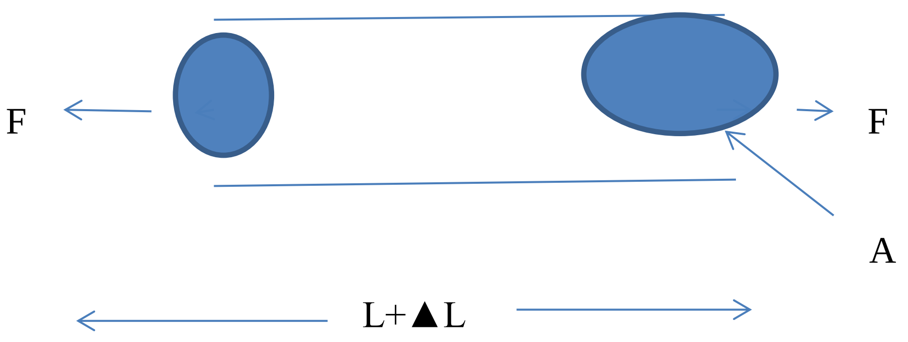


Figure No. (4)
Stress is defined as the force exerted on a unit area of the surface on which the force is applied.
Stress units are (N/m^2)

strees =force/area 1

The strain of a body, or its ductility, is defined as the deformation of this body divided by its original dimension before Deformation

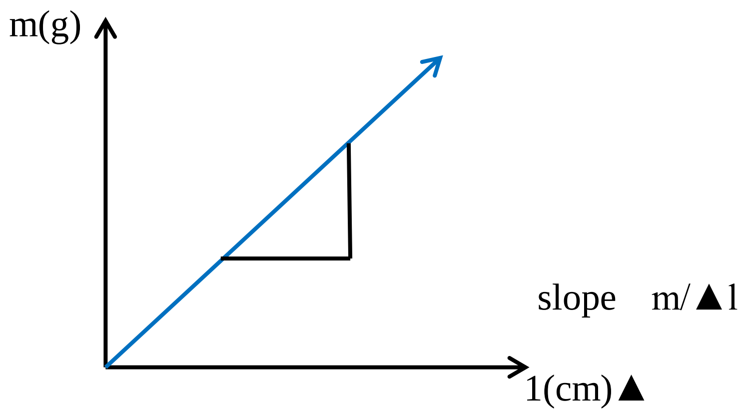
Calculations and results :

1- After taking the readings and arranging the results in Table (1), draw a graph between the values of

elongation (▲L) on the x-axis and the corresponding values of transport (m) on the y- axis, a straight line will be obtained that passes through the origin point. The slope of the graph is used to calculate

Young's coefficient according to equation (2) as follows:

2 - The laboratory results are compared with the value obtained from the tables after identifying a substance the wire under experiment



Third experience

Pfeller's Pendulum, Part One

purpose of the experiment

1- Study of the properties of the Pfeller pendulum.

2- Finding the moment of inertia of a rod in two ways.

A - The change in oscillation time with the distance (d) between the two suspended threads.

B- The change in oscillation time with the length (L) of the hanging thread (with d constant).

Devices used

1-A metal rod with a circular or rectangular section and approximately one meter long.

2-metric ruler.

3-Thread.

4-Stopwatch.

5-Two armrests.

6-Iron mask.

Theory

Suppose that a bar with mass M and its moment of inertia around an axis perpendicular to its length and passing through its center of gravity is I, and it is suspended by two parallel walls AC and BD, and the length of each of them is L cm and the distance between them is d cm, as in Figure (1), and that the tension in the two strings is 1/2 Mg .

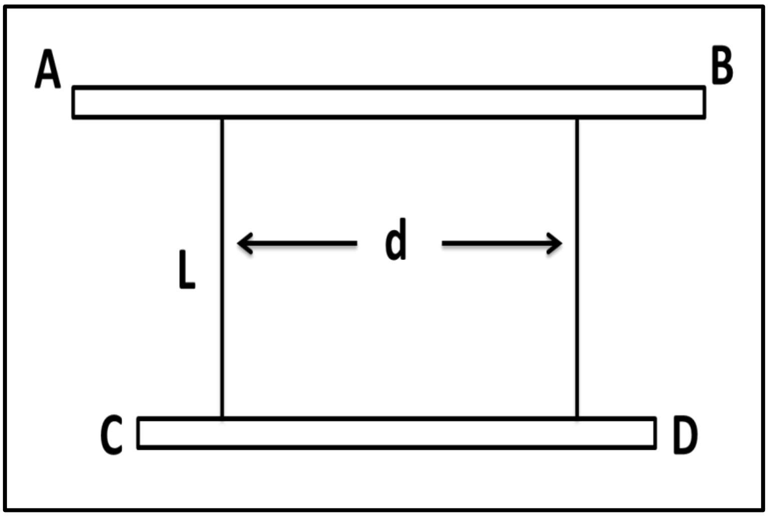


Figure (1)

If the rod is displaced from its stable position C,D to position C,D at a small angle around its central axis, it will lead to the displacement of each of the two strings by an angle of θ, as in Figure (2).

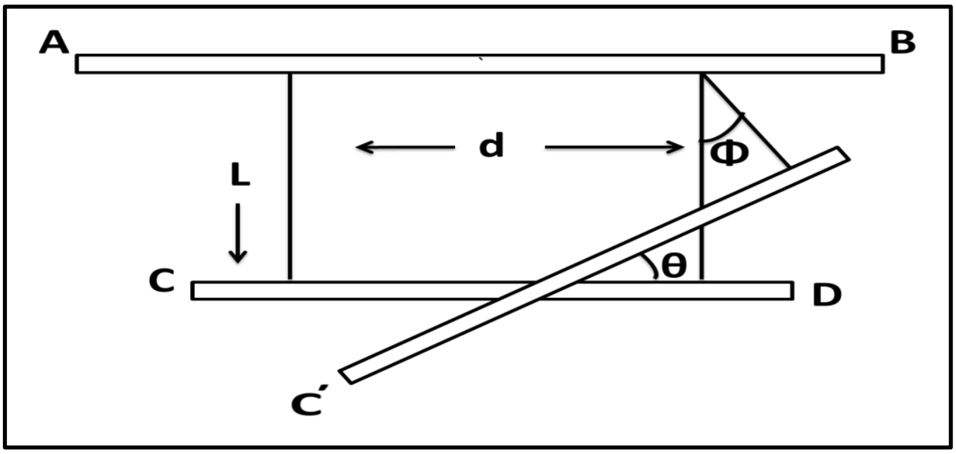


Figure (2)

Since both θ and θ are small, then L$\phi = 1/2\Theta d$

In position CD, a restoring force arises that attempts to return the rod to its original position, and this force is equal to the horizontal component of either of the two strings, which is;

1/2 Mg sin$\vartheta = 1/2Mg\phi$

Because the value is small, it
means $\theta = \theta$

1/2Mg$\vartheta = Mgd\theta/4L$

The reference torque = force
* displacement, that is

Mgd/4L $\vartheta.d = \frac{Mgd2}{4L}.\vartheta$

I$\vartheta = \frac{Mgd2}{4L}\theta.$

$$\theta + \frac{Mgd2}{4LI}.\theta = 0$$

The previous equation represents a simple harmonic motion equation whose oscillation time is as follows

$$T=2\pi\sqrt{4IL/Mgd2}$$

$$K=2\pi\sqrt{4IL/Mg}$$

$$T=K/d$$

Method of work

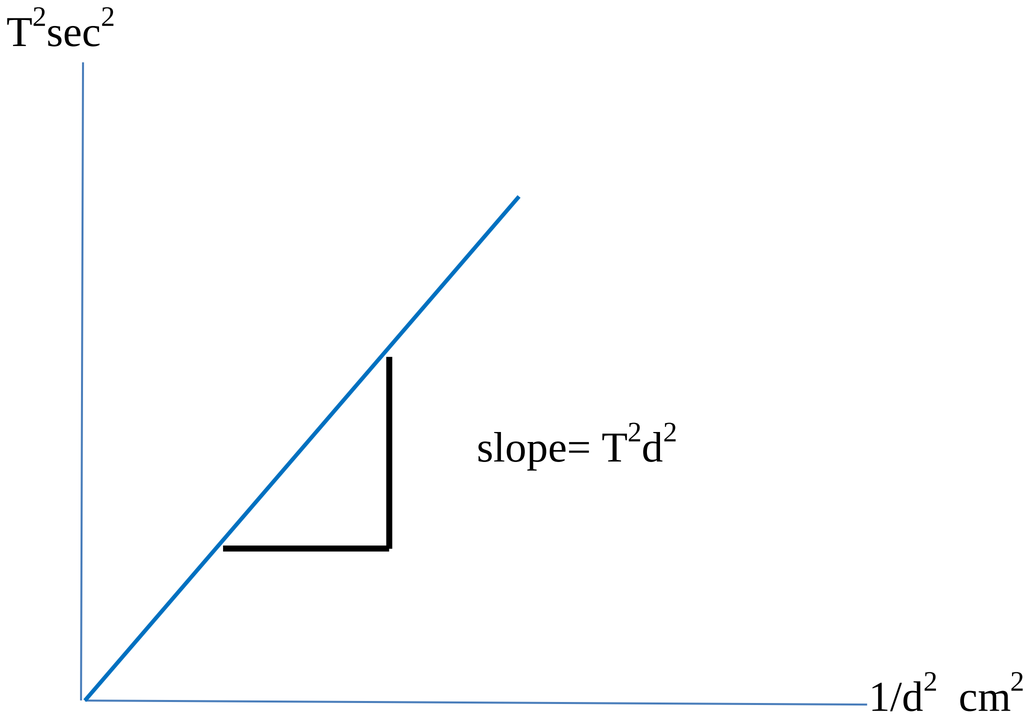
A - When L is constant and d is variable

1-The rod is suspended in a horizontal position so that each of the two threads is vertical using a right-angled triangle and in a symmetrical position with respect to the ends of the rod. The length of each of the two threads is .measured and is constant until the end of the experiment

2- Make the distance d between the two strings 70 cm, and the rod is displaced by a small amount and left to vibrate in a horizontal plane. The time of 30 oscillations is measured using a stopwatch, then the time of one oscillation T is calculated.

3- Repeat step (2) several times for several distances d (30, 40, 50, 60 cm) and arrange the results in the following table.

d cm	Time of 30 oscillations		Average time of 30 oscillationsTav= $\frac{t1+t2}{2}$	Time of one oscillation T=tav/30 sec	T^2	$1/d^2$
	t1sec	t2sec				



4- Draw a graph in which the values of (T2) are represented on the Y axis and the values of 1/d2 are represented on the X axis

5-The graph is used to calculate the moment of inertia of the rod I from the equation as follows.

$$I=\frac{Mg}{16\pi 2l} \quad * \quad \text{Slope}$$

6- The value of I is calculated theoretically from the following equation: I=1/12 Md2

M is the mass

Fourth experience

Pfeller Pendulum (Part Two)

B- The change in oscillation time with the length of the hanging string L

1- Place the knot 10 cm away from each end of the rod, and change the length L between 20-40 cm. Two readings are taken for a period .of 30 oscillations for each length L

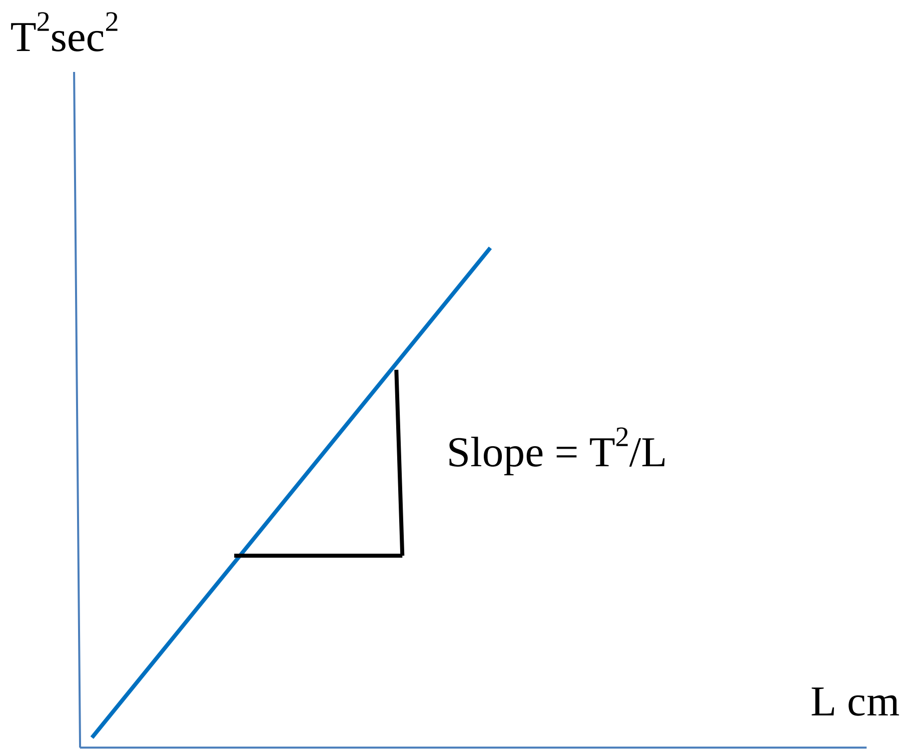
The results are arranged as in the table below

Vertical thread length Lcm	Time of 30 oscillations		Average time 30 oscillations	Time of one oscillation T=tav/30 sec	T^2 Sec^2
	t1 sec	t2sec	Tav=t1+t2/2 Sec		

2- Draw a curve between the values of T2 sec2 on the Y axis and

3-The moment of inertia is calculated from the inclination according to the following equation.

$$L=\frac{Mgd2}{16\pi 2} \quad *slope$$



Questions

1-Why should the amplitude of the oscillation be small?

2-Why is it preferable to have a large number of oscillations?

3-Why are the results more accurate at large values of length L?

4-Why are the results more accurate at small values of the distance d?

Seventh experience

Find the ground acceleration using a compound pendulum

(Part One)

The purpose of the experiment

1. Finding ground acceleration using a compound pendulum
2. Finding the radius of rotation of the compound pendulum around the axis passing through its center of gravity and perpendicular to its length

The devices used / Tools

1. A metal ruler perforated longitudinally with holes at equal dimensions
2. A hinge fixed to the wall and equipped with a knife edge to hang the ruler on
3. A metric ruler or tape measure
4. Stopwatch

The theory

Figure (1) represents a solid body with mass (m) suspended by a horizontal axis that passes through the point (O) which is distance(h) from its center of gravity(G). When the body is displaced from a place of stability by a small oscillatory angle of ϴ, a reference torque is generated that attempts to return the body to its place of stability, with a magnitude of

$$\mathbf{M = mgh\ sin = \theta = -\ mgh\ \theta}$$

where θ = sin θ

when θ is small and measured in radians (radians), then if L is the same as the moment of inertia of the body about the axis passing through o, α for angular acceleration of a body's motion

$$\boldsymbol{\alpha = d^2\theta \quad /dt = d\theta/dt}$$

Where θ is the angular displacement. The equation of motion of the body is:

$$-mgh\,\theta = I\,\alpha \qquad \text{..........(1)}$$

This equation represents a simple harmonic motion with its oscillation time

$$T = 2\pi\sqrt{1/mgh} \qquad \text{... ....}\,(2)$$

If we symbolize the moment of inertia of the body around the center of gravity as I∘, then it is

$$I = I_{\circ} + Mh^2$$

Where M is the mass of the point where the body's mass is centered and is equal to m according to the theory of parallel axes. But

$$I_{\circ} = MK^2$$

Where K represents the radius of vortex of the body around its center of gravity G

$$I = MK^2 + Mh^2$$

By substituting into equation (2), we get:

$$T = 2\pi\sqrt{K^2 + h^2/gh} \qquad \text{.........(3)}$$

But the time of oscillation of the simple pendulum is

$$T = 2\pi\sqrt{L/g} \qquad \text{... ... .}\,(4)$$

By comparing equations (3) and (4), we see that the oscillation time of the compound pendulum is equal to the oscillation time of the simple pendulum :when

$L = K^2 + h^2/h$

The method of work

1. The pendulum is suspended from the first hole near one end, such as end (A), as shown in Figure (1), then it is displaced a small distance from its place of stability and left to oscillate. Then the time of 20 complete oscillations is calculated, and from it the time of one oscillation is calculated

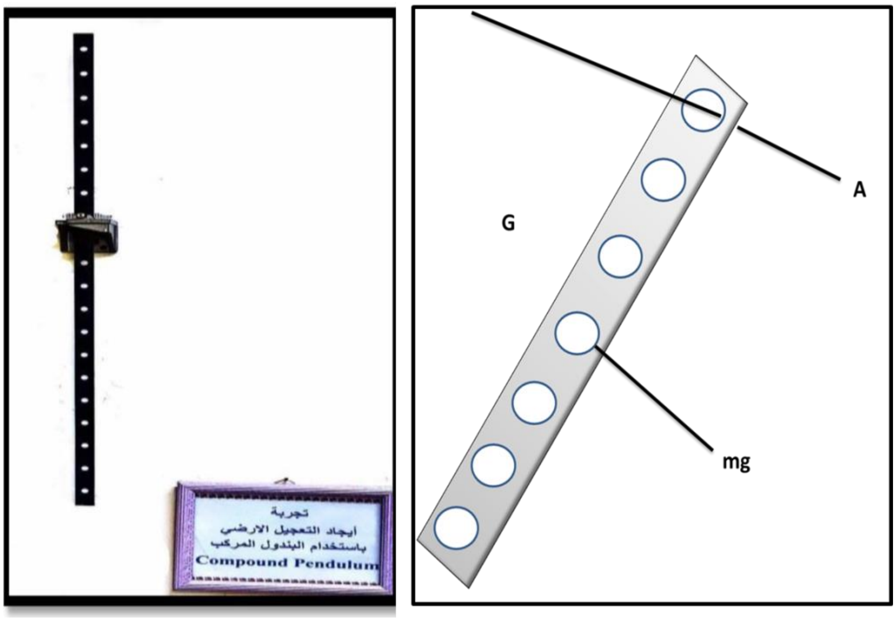


Figure (1)

2. We repeat step (1) for all holes of the pendulum, starting from end A and ending with the last hole,It is close to end B
3. The distance h is measured between each hole and end A

Results and calculations:

1. Arrange the results as in the following table

N	Hole distance h (cm)	Time of 20 oscillations		The average $t_{av}=\frac{t_1+t_2}{2}$ (sec)	Time of one oscillation $T=\frac{t_{av}}{10\ sec}$
		$t_1 sec$	$t_2 sec$		
1					
2					
3					
4					
5					
6					
7					
8					
9					

- **Find value of g**
- **Find the percentage error for the value of g**

- **Calculate the value (K) of the radius of spin.**

2. A graphic line is drawn between the time of one oscillation T on the y-axis and the distance h on the x-axis, so we obtain a symmetrical curve about the line that passes through the center of gravity Pendulum G in which T equals infinity. As shown in Figure (2)

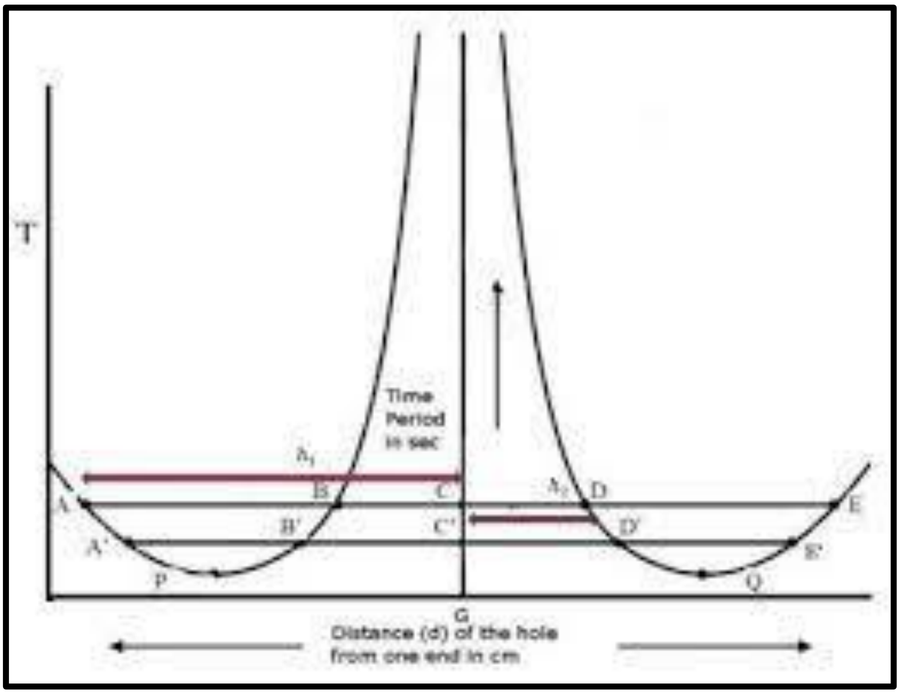


Figure (2)

3. Draw a horizontal line parallel to the x-axis so that it intersects the curve at four points, for example straight A, B, C, D
4. The distances CA and BD are measured and their average is calculated, which is equal to L because: -

$$\mathbf{h_1=BH-HC}$$

$$\mathbf{h_2-AH-HD}$$

$$\mathbf{h_1+h_2-AC-BD}$$

And since $\mathbf{L= h_1+h_2}$

$$L=\frac{AC+BD}{2}$$

But $\mathbf{g=4\pi L/T^2}$

From equation (4) and by substitution can find g.

5. Calculate the value of K from the dimensions of the rod (pendulum) from the relationship.

$$K= \frac{L}{\sqrt{12}}$$

Warnings to avoid error

1. The knife edge must be carefully kept on a solid, horizontal support so that the pendulum swings in a vertical plane.
2. The pendulum angle shift must be less than (5), otherwise there will be an error in the result. 3- The location of the pendulum must be carefully noted at the start and end of timing.

Questions

1. What happens to a ball when it is placed in a hole that passes through the center of the Earth, starting with a surface of the earth from one side to the surface of the earth from the other side?
2. Define g and what are its units?
3. How does g it change from one site to another?
4. What is a compound pendulum?
5. What will be the duration of the oscillation of the compound pendulum when it is suspended from its center of gravity?

Compound Pendulum (Part Two)

Compound pendulum

Any solid body, regardless of its shape, that is capable of oscillating around any horizontal axis that passes through it is called a compound pendulum. If we take a particle with an irregular shape, it can rotate around a smooth horizontal axis that passes through a point, which is called the suspension point.

Results and calculations:

1. Arrange the results as in the following table

N	Hole distance h (cm)	Time of 20 oscillations		The average $t_{av} = \frac{t_1 + t_2}{2}$ (sec)	Time of one oscillation $T = \frac{t_{av}}{10\ sec}$
		$t_1 sec$	$t_2 sec$		
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

- **Find value of g**
- **Find the percentage error for the value of g**
- **Calculate the value (K) of the radius of spin**.

2. A graphic line is drawn between the time of one oscillation T on the y-axis and the distance h on the x-axis, so we obtain a symmetrical curve about the line that passes through the center of gravity Pendulum G in which T equals infinity. As shown in Figure (1)

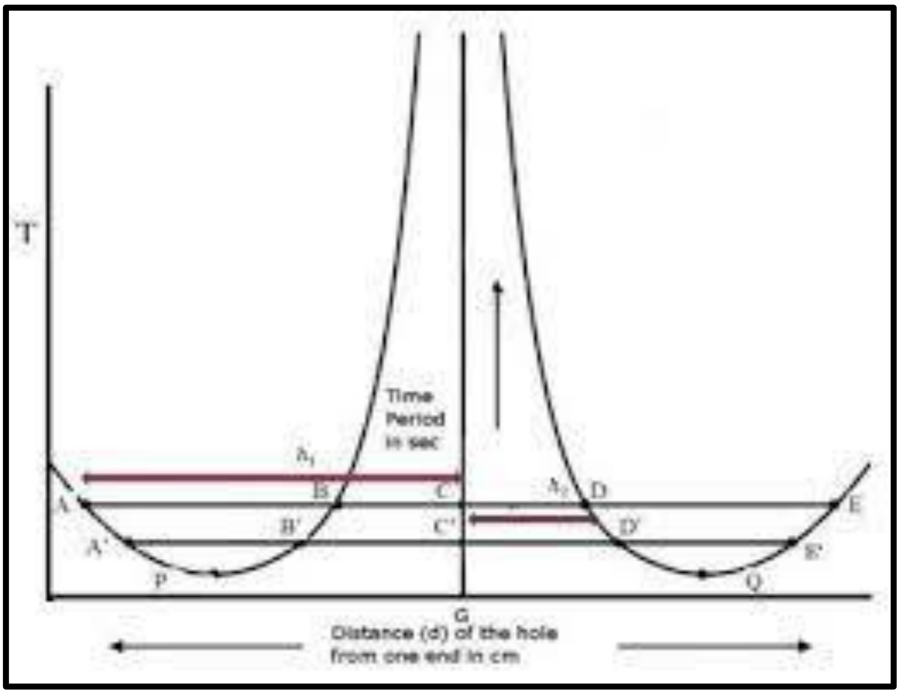


Figure (1)

3. Draw a horizontal line parallel to the x-axis so that it intersects the curve at four points, for example straight A, B, C, D.
4. The distances CA and BD are measured and their average is calculated, which is equal to L because: -

$$\mathbf{h_1=BH-HC}$$

$$\mathbf{h_2-AH-HD}$$

$$\mathbf{h_1+h_2-AC-BD}$$

And since $\mathbf{L= h_1+h_2}$

$$\mathbf{L=\frac{AC+BD}{2}}$$

But $\mathbf{g=4\pi L/T^2}$

From equation (4) and by substitution can find g.

5. Calculate the value of K from the dimensions of the rod (pendulum) from the relationship.

$$\mathbf{K=\frac{L}{\sqrt{12}}}$$

Questions:

1. What corrections must be made to obtain more accurate results in this experiment?

2. Where will the duration of the oscillation be at its lowest value?
3. When choosing the horizontal line parallel to the x-axis, the sixth step is necessary intersect the curve at four new points, why?
4. What is the relationship of the length of the equivalent simple pendulum to the compound pendulum?

Equilibrium of force

The Purpose of the experiment .

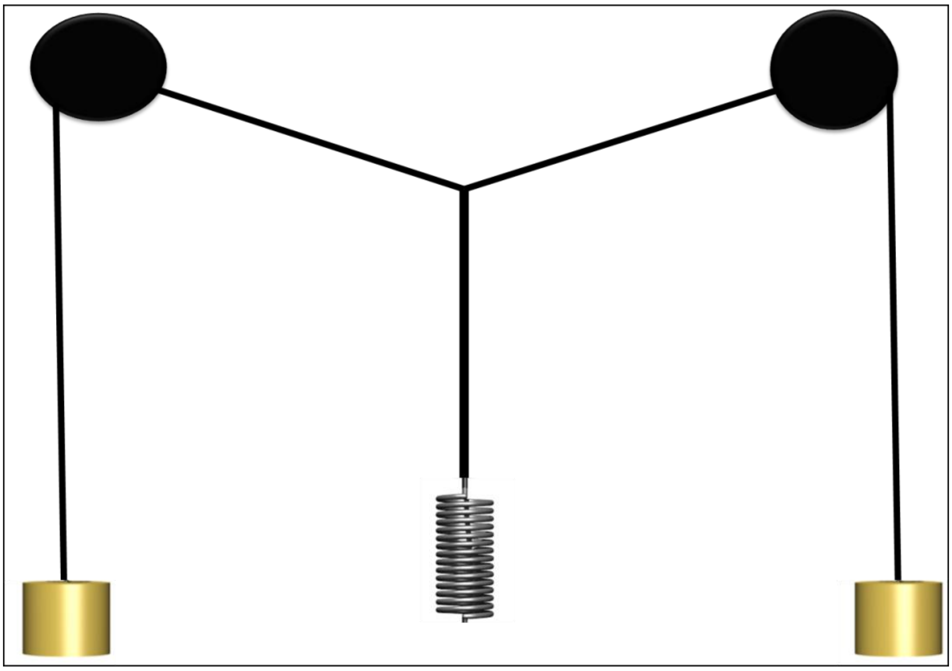
1- law verification of parallelogram of forces and (Triangle of Force)

2- Measure body weight.

3- certificate the Lamy equation.

Devices used

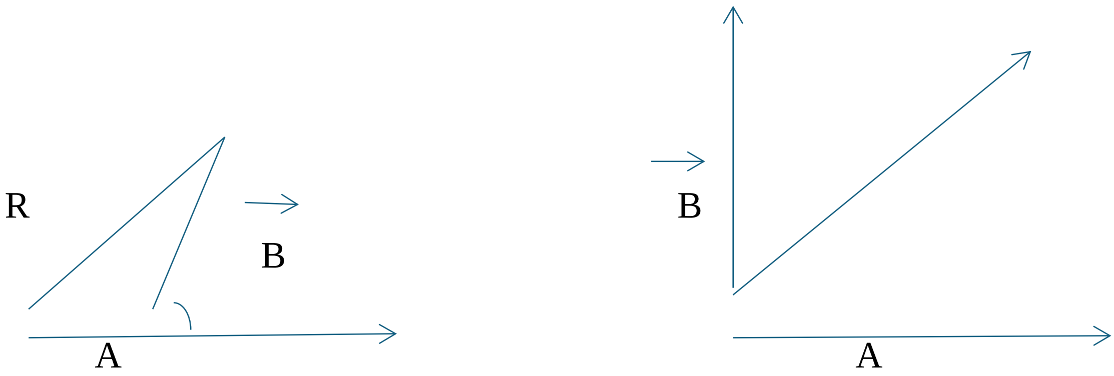
1- drawing board with 2 easels and clips to hold them
2- two light, frictionless pulleys
3- weights.
4- Three weight stands.
5- bar.
6- plane mirror.
7- Thread



Theory

Physical quantities are divided into two parts: vectors and algebraic (non directional) quantities (scalars), and these are combined algebraically. While the directional quantities add up in a directional sum, this is done by using the principle of the parallelogram of forces or the force triangle. If there are A , B two directional values with an angle between them, BA, and the like. The two vectors are marked with two arrows, as shown in Figure (11), and complete the parallelogram. The diameter (R) will represent the resultant magnitude and direction, and its value can be found mathematically. The value can be found mathematically by applying the following relationship (Law of Sines).

$R^2=A^2+B^2+2AB\cos$



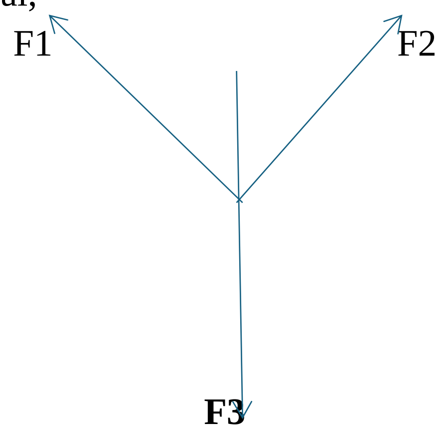
ب FIGURE1 ا

The resultant A and B can also be found by drawing a power triangle, which represents two adjacent sides drawn in a periodic order. As represented in Figure (1) b) the side that completes the triangle in a direction opposite to the direction of the arrangement taken represents the resultant in magnitude and direction

IN Lamy's rule:-

Lamy's rule states that in the case of parallel forces, the force is equal to the sine of the angle opposite it Equal,

$$\frac{F_1}{\sin\theta_1} = \frac{F_2}{\sin\theta_2} = \frac{F_3}{\sin\theta_3}$$



The Method of Work

1. A large drawing sheet is fixed on the vertical board and two fixed Frollers are fixed on it. 2. Three threads of appropriate length are taken and a knot is formed from which the three threads branch. It is tied to the end of each thread Weight with the help of a weight bearer.

3. He passes the two of the three threads over the two pulleys, leaving the third loose from which the third weight hangs.

4. Wait until the knot, which represents the meeting of the three forces, is balanced. Mark the directions of these forces on the drawing paper This is done by drawing the location of each thread on the paper using mirror tape. The weight of each hanging weight is recorded On the thread it represents.

5 Raise the paper and draw the extension of the three lines that should meet at a point that is the location of the knot on the paper. An appropriate drawing scale is taken and three arrows are drawn from the point of

intersection of the lines. Each arrow represents the corresponding force Amount and direction.

6. Take two arrows from them and make them two adjacent sides of a parallelogram and draw the diameter passing through a point The intersection, then this vector is compared to the arrow representing the third power in terms of magnitude, direction, and line of action.

Question: What should the results be if the work is correct?

7. The angle between these two forces is measured and the parallelogram law is applied to obtain an estimated value of R. compare This result is to the third power and the result obtained above.

8- Take these two forces and make them two sides of the force triangle. The triangle is completed and then the resultant is taken Then the result is compared to the third power.

Verification of Lamy's rule

To achieve Lamy's rule, the three angles (1,2,3) are measured, then Lamy's rule is applied.

<u>Finding body weight:-</u>

1. To measure the weight of an object, three strings are taken and the unknown object is tied to one of them and attached to the second and third Weights of known magnitude and attached to the group, as stated above, draw the parallelogram of forces that represent Its heavy, hanging ribs. The diameter of a parallelogram is measured as it represents the unknown weight.

2 -To ensure the validity of the result, the body weight is measured using a scale and the results are compared

Moment of inertia of a wheel

The purpose of the experiment:

Finding the moment of inertia of the wheel rotating around its main axis.

Devices used:

1. Spinning wheel
2. Weights
3. String
4. Vernier scale
5. metric ruler.
6. Stopwatch.

Description of the Spinning wheel :

The rotating wheel, as shown in Figure (1), consists of a heavy disc, usually made of iron, with a large diameter, mounted with a relatively small diameter shaft, and the ends of the axis are mounted on a roller bearing.(ball-bearings) fixed firmly on the wall, and to calculate the number of revolutions of the wheel, a counter is usually used, and sometimes, as in our experience, a mark on the wheel is used instead of a counter, as the speed rotation is relatively slow.

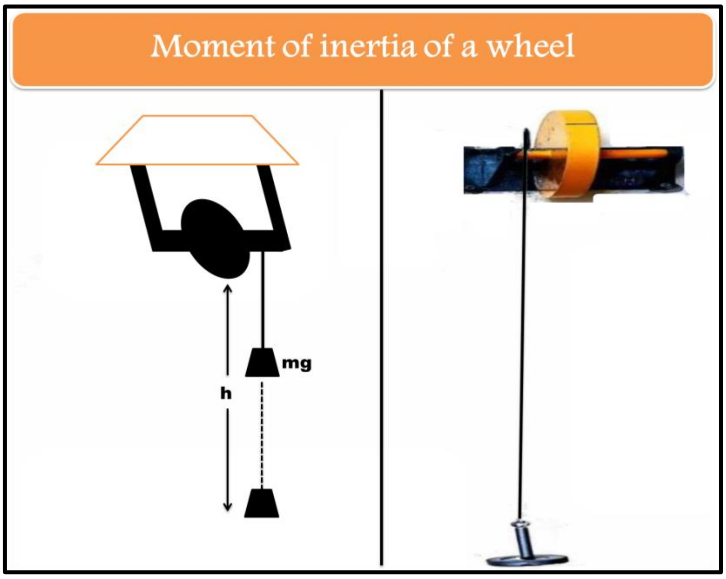


Figure (1)

The theory

A string is taken and a suitable mass **m** is fixed at one end, then the second end is fixed loosely in the axle of the wheel. After that, the wheel rotates to wind the string on the axis. Let the number of spokes be n_1 When the mass **m** is released, it falls due to gravity, and the string begins to untie its coils from the axle. After the wheel is made of n_1 spokes, The second end of the previously fixed string separates loosely from the axis, and let the height moved by the weight in this process be equal to **h**, so we have a law

The potential energy lost by a falling body	**=**	**The kinetic energy gained by the falling body and the acceleration**	**+**	**Work done against friction in ball bearings**

$$\mathbf{mg\,h = \frac{1}{2}\,mv^2 + \frac{1}{2}\,I\omega^2 + n_1 W \ldots\ldots\ldots\ldots (1)}$$

Where:

v: Mass speed m

ω: The angular velocity of the wheel around its axis.

W: The work done against friction per revolution in ball bearings.

After the thread separates from the axle, the kinetic energy of the wheel will be $\frac{1}{2}\,\mathbf{I\omega^2}$, and the wheel will continue to rotate for $\mathbf{n_2}$ revolutions until this energy is lost in overcoming the friction of the bearings, and accordingly it will be

$$\frac{1}{2}\,\mathbf{I\omega^2} = \mathbf{n_2}$$

$$\mathbf{W} = \frac{\mathbf{I\,\omega^2}}{\mathbf{2n_2}}$$

When we substitute the value of W and in equation 1, we get:

$$\mathbf{mg\,h} = \frac{1}{2}\,\mathbf{mv^2} + \frac{1}{2}\,\mathbf{I\omega^2} + \frac{1}{2}\,\mathbf{I\,\omega^2}\frac{\mathbf{n_1}}{\mathbf{n_2}}$$

$$\mathbf{I} = \frac{\mathbf{2mg\,h - mv^2}}{\mathbf{\omega^2(1 + n_1/n_2)}}$$

$$\mathbf{I} = \frac{\mathbf{2mg\,h - m(r\omega)^2}}{\mathbf{\omega^2(1 + n_1/n_2)}}$$

This is because v= rω ,where r is the radius of the axis.

$$\mathbf{I} = \frac{\mathbf{m}\left[\left(\frac{\mathbf{2\,g\,h}}{\mathbf{w^2}}\right) - \boldsymbol{r^2}\right]}{\left(\mathbf{1} + \frac{\mathbf{n_1}}{\mathbf{n_2}}\right)} \ldots\ldots\ldots\ldots(\mathbf{2})$$

At the moment the string separates from the axis, the wheel has a maximum angular velocity $\boldsymbol{\omega}$ and after making$\mathbf{n_2}$ several revolutions in a period of t second, its velocity becomes zero, even if we assume that the friction was constant during this period, the average angular velocity over t second will be $\frac{\boldsymbol{\omega}}{\mathbf{2}} = \frac{(\boldsymbol{\omega}+\mathbf{0})}{\mathbf{2}}$.

That is $\frac{\omega}{2} = \frac{2\pi n_2}{t}$

$$\omega = \frac{4\pi n_2}{t} \dots\dots\dots.(3)$$

Substituting equation 3 into equation 2 we get:

$$I = \frac{m\left[\left(\frac{2\,g\,h\,t^2}{16\pi^2 n_2^2}\right) - r^2\right]}{(1 + \frac{n_1}{n_2})} \dots\dots\dots\dots(4)$$

The method of work

1. A string is taken a little shorter than the distance between the wheel axis and the ground, then it is tied loosely to.the axis is made by making a loop at its upper end.
2. A mass of **m** is fixed at the second end
3. The string is wound uniformly around the axis and the $\mathbf{n_1}$ languages wound on the axis are counted
4. Now the mass **m** is released and as the string slides along the axis the stopwatch is started
5. Note the number of $\mathbf{n_2}$ revolutions that the wheel makes, as well as the time required to do this revolutions, that is, until the wheel reaches rest (it is preferable to do each measurement separately)
6. The diameter of the wheel is measured from several places using the Vernier scale then the average is calculated.
7. The experiment is repeated twice using other values for the mass m.

Results and calculations:

1. After taking the measurements and calculating the results, they are arranged in a table as follows

Suspended weight m (g)	Height h (cm)	Number of turns of rope or string n_1	The number of revolutions of the wheel after the weight falls n_2	The time required to make n_2 cycles	avarage $\frac{n_2}{t}$	Angulaer speed ω $= \frac{4\pi n_2}{t}$ rev/sec	Squer of angulaer speed ω^2	Moment of inertia I $= \frac{m\left[\left(\frac{2\,g\,h}{w^2}\right) - r^2\right]}{(1+\frac{n_1}{n_2})}$
500								
500								

2. The moment of inertia of the wheel is calculated from the law in the table above after calculzating the angular velocity $\boldsymbol{\omega}$.

Warnings to avoid error

1. The thread must be light and strong so that it can bear the weight of the hanging.
2. The thread must be wrapped around the axis so that the windings do not overlap one another.
3. The stopwatch must be started at the moment the thread slips off the axis, otherwise there will be an error.

4. It must be measured correctly and accurately.
5. When deriving the final formula, we assumed that friction remains constant when the angular velocity changes from value ω to the value of zero, but this borrowing is incorrect, as friction depends on the value of the angular velocity of the wheel is therefore another source of error.

Questions

1. Define the moment of inertia ?
2. Define the radius of vortex ?

3.Where do you use the spinning wheel ?

- ✓ (Ans)It is used in machines to remove dead spots, such as car machines and other machines.

4. What happens to the potential energy when the string begins to uncoil itself from the axis ?

What are the possible sources of error in this experiment ?