فيزياء / عملي
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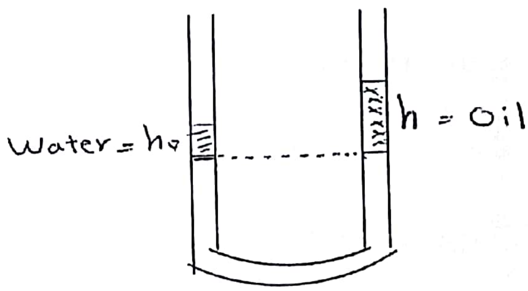
To Compare the Densities of Two Liquids by Using U tube

Apparatus:

Two liquids, (wide-bore glass U-tube).

Method:

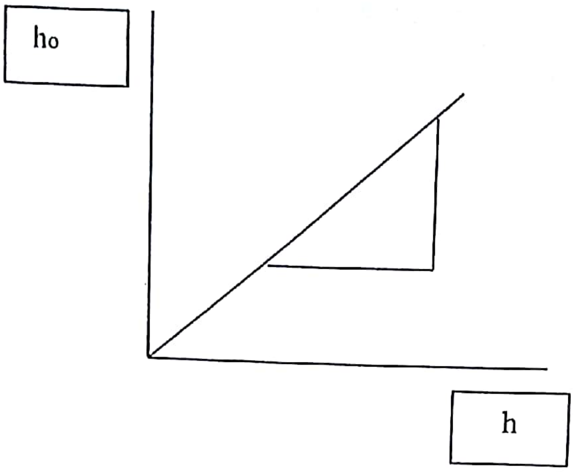
1-Clamp the U-tube in an upright position on the bench in a retort stand.
2-Half fill the U-tube with water and then pour a little of the liquid (oil), which is less dense than water in to one side.



3-Measure and record the heights of:
a-The free water surface.
b-The free liquid(oil) surface.
c-The common water-oil surface.
4-From this measurements determine the head of water column (h_o) and oil column (h) above the common surface where they meet, and calculate the density of the oil.
5-Add more oil to its column in the U-tube and repeat the experiment and calculation.
6-Tabulate the results and find the mean value of (h_o/h)

h_o (cm)	h (cm)

7-Draw a graph with values of (h_o) against values of (h), this graph will be a straight line [draw the best straight line through the points plotted].



Calculation:

Let the height of the water and oil be (h_o and h) respectively and let the densities of water and oil be (ρ_o and)

Since pressure in a liquid = depth (height) * density

$$= h * \rho$$

$$h_o \rho_o = h \rho$$

$$\frac{h_o}{h} = \frac{\rho}{\rho_o}$$

Slope= h_o / h

The density of water (ρ_o) = 1 gm/cm³

Slope =(h_o / h) = ρ.

Specific Gravity of

a-A solid which sinks in water.
b-A solid which floats in water.
c-A liquid

Apparatus:

: beaker, electric balance, thread, water, liquid, sinks body, floats body (or cork)

Theory:

$$\text{Specific gravity of any body} = \frac{\text{weight body in the air}}{\text{weight displaced water from the same body}}$$

Method:

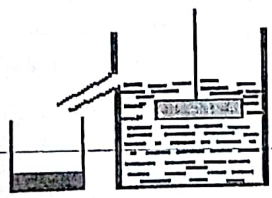
a-specific gravity of sinks body:

1-Weight the sinks body in the air (S) gm.
2-Weight the beaker (M) gm.
3-[Weight the beaker + water displaced from the sinks body](W_1) gm.

The weight of water displaced from sinks body(W_2) = (W_1–M) gm

Note: when you put the sinks body in the beaker you must take care that the body dose not touch the sides of the beaker, and the surface of The water.

$$\text{Specific gravity of the sinks body} = \frac{S}{W_2}$$

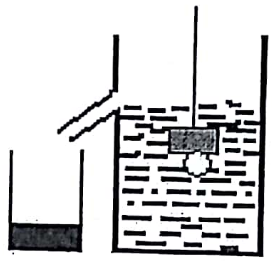


b-Specific gravity of a cork:

1- Weight the cork in the air (W_o).
2-tie the sinker to the cork and put both together in water.
3-[Weight the water displaced from the sinker and cork + weight beaker] (W_3).
4- the weight of water displaced from the cork and sinker (W_4)=(W_3- M).
5-Weight the water displaced from the cork =(W_4- W_2).

$$\text{Specific gravity of the cork} = \frac{W_o}{W_4 - W_2}$$

Note: M and W_2 from part a.



C-The specific gravity of a liquid:

1-wight the sinker in the air (S)[from part a].
2-Weight the water displaced from the sinker (W_2) [from part a].
3-[weight the liquid displaced from the sinker + weight beaker](W_5).
4-The weight of liquid displaced =(W_5 – M).

$$\text{The specific gravity of the liquid} = \frac{\text{Weight of the liquid displaced from body}}{\text{Weight of the water displaced from body}}$$

$$= \frac{W_5 - M}{W_2}$$

Specific Heat of Solid by The Method of Mixtures

Theory:

The specific heat(Cs) defined as the amount of energy needed to raise the temperature of the sample by 1c°.
From this definition we can relate the energy(Q)transferred between a sample of mass(m) of a material and it is surrounding to a temperature change(Δt) as

$$Q = m\, Cs\, \Delta t$$

Cs =specific heat of solid

Apparatus:

copper calorimeter with outer jacket, stirrer, thermometer, heater, solid body, water bath, electric balance.

Method:

1-After weighting the solid body(M), put it in the water bath with the thermometer ,read the temperature of the solid body until the temperature is fixed record this temperature(θ C°).
2-Weight the calorimeter with the stirrer(M_o),1\3 full with cold water and weight again(M_1).
3-Place the calorimeter in its outer jacket and leave it to stand until the temperature of the water fixed, record this temperature(θ_1 C°),
4-Now take the temperature of the water in the calorimeter and make quick transfer of the hot solid from the steam chamber to the calorimeter. Stir continuously and record the highest temperature attained by the water(θ_2 C°).

Readings:

Weight of calorimeter+ stirrer = M_o gm
Weight of calorimeter+ stirrer + water =M_1 gm
Weight of water ($M_1 - M_o$) gm
Weight of solid =M gm
Temperature of hot solid = θ C°
Initial temperature of cold water = θ_1 C°
Final temperature of mixtures = θ_2 C°

Working:

let the specific heat of the solid body be (Cs cal\ gm.c°).
Taking the specific heat of calorimeter as(Cc=0.127 cal\ gm.c°).

Heat lost by hot solid = Heat gained by colorimeter and contents

$$M\,Cs(\theta - \theta_2) = [(M_1 - M_o)\,Cw + (M_o * Cc)]\,(\theta_2 - \theta_1)$$

Cw : the specific heat of water
From the final relation we can find the specific heat of solid Cs.

Focal length of a concave mirror

Apparatus :

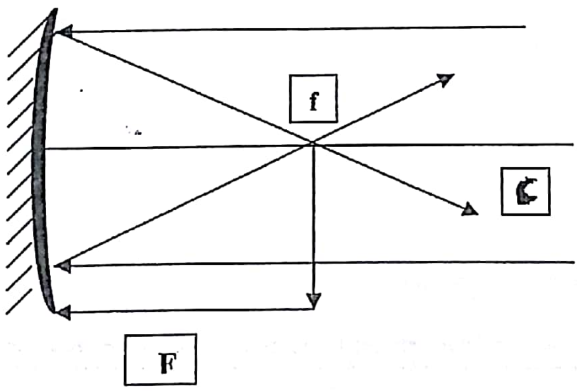
Concave mirror, holder, meter rule, light body(object).

Method:

We can find the focal length of concave mirror by :

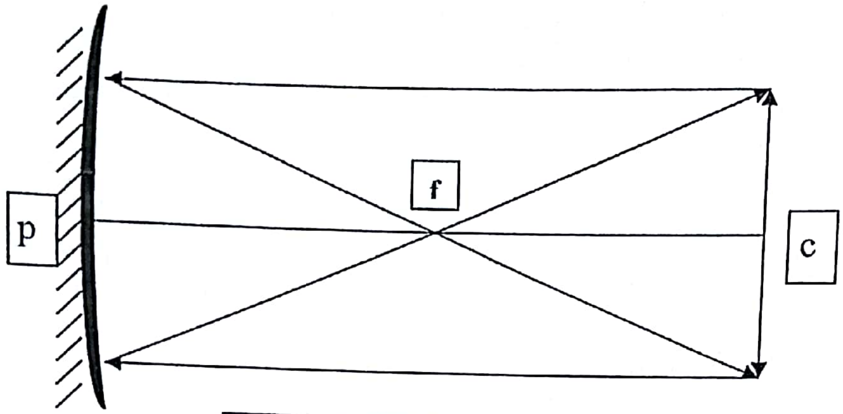
1-Direct method.

Obtain a rough value for the focal length of the mirror by focusing the image of the window obtained from infinity on to a screen ,the distance between the mirror and a screen is the focal length of mirror.



F=focal length (cm)

2- locating the centre of curvature:



Pc= r =2 F

Put the object at a twice distance of focal length ,this distance gives approximate radius of curvature ,by the method of parallax ,adjust its position until it coincides with its image .Measure the distance between the object and the center of mirror ,this distance is the radius of curvature (r) .Half of this distance give the focal length .

r= 2F , F=(r/2) cm

3- A graphical method:

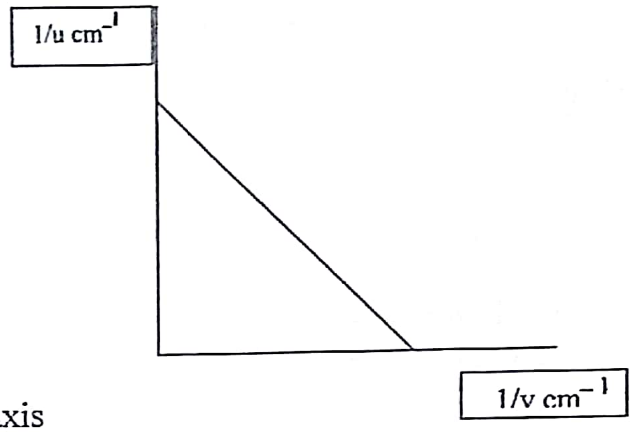
Place the object more than twice the focal length of the mirror, and then locate the position of the image by focusing the image of the object on to a screen. Then measure the distance of each object and image from the mirror, each of these distances is represent **(u)** object distance and **(v)** image distance.

Move the object to different values from the mirror and record many such reading in the form of the tables:

Distance of object from mirror U (cm)	Distance of image from mirror V(cm)	1 / U 1\cm	1/ V 1\cm

Plot a graph of (1/ u) against (1/ v) ,drown the best straight line through the points ,a straight line inclined at (45°) to each axis is obtained.

$$\frac{1}{F} = \frac{1}{U} + \frac{1}{V}$$



The intercept on the (1/u) axis

$$\frac{1}{v} = 0 \Rightarrow \frac{1}{F1} = \frac{1}{u} + 0 \Rightarrow F1 = (\text{—})cm$$

The intercept on the (1/ v) axis

$$\frac{1}{u} = o \Rightarrow \frac{1}{F2} = 0 + \frac{1}{v} \Rightarrow F2 = (\text{—})cm$$

$$F = \frac{F1 + F2}{2} = (\text{—})cm$$

The Acceleration of Free Fall by Means of the Simple Pendulum

Apparatus:

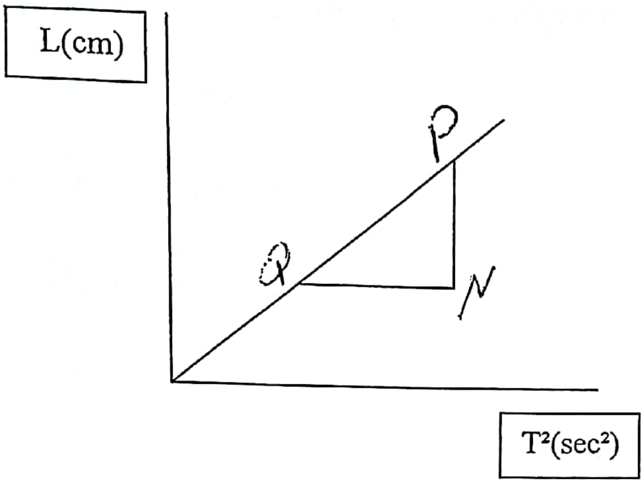
Pendulum bob , thread, stop watch, meter scale, stand and clamp.

Method :

1-Tie a meter length of the thread to the pendulum bob and suspend the thread in the clamp.
2-Set the pendulum bob swinging through a small arc of about (10°),with a stop- watch measure the time for (20) complete oscillations. later when it passes the mark in the same direction, repeat the timing and record both times.
3- Measure the length (L) of the thread from the point of suspension to the middle of the bob.
4- Shorten the length of the pendulum by successive a mounts of (10 cm) by pulling the thread
And for each new length take two observation of the time for (20) oscillations.
5- Tabulate the readings

Length of pendulum(L) cm	Time of (20)oscillation(t) sec	Time for (1) oscillation (T) sec	(T^2) sec^2

6- Plot a graph with values of (T^2 sec^2) against the values of (L cm).



$$\text{slope}=\frac{L(cm)}{T^2(\sec^2)}$$

Theory and calculation:

The periodic time (T) of a simple pendulum (L) is given by:

$$T = 2\pi\sqrt{L \backslash g}$$

$$T^2 = \frac{4\pi^2 L}{g}$$

From witch it is seen that the graph of (T^2) against (L) will be a straight line whose slop (PN\QN) measured from two convenient and well-separated points (P) and (Q) on the line is numerically equal to :

$$\frac{4\pi^2}{g}$$

Thus :

$$\frac{PN(s^2)}{QN(m)} = \frac{4\pi^2}{g}$$

$$g = 4\pi^2 \frac{QN}{PN} = 4\pi^2 * slope$$

$g = m\ s^{-2}$

The Velocity of Sound by Means of a Resonance Tube Closed at One End

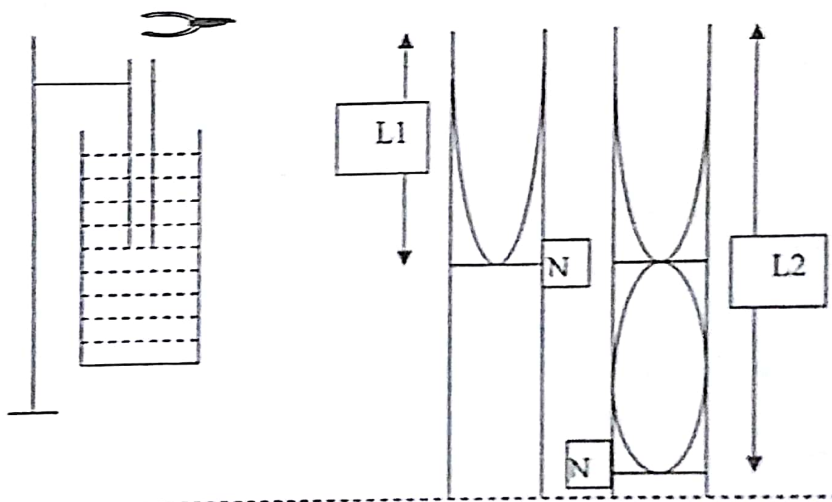
Apparatus:

Resonance tube, set of tuning forks, meter scale.

Theory:

The diagram represent the vibration of the column of air in the first two position of resonance.

A represents an antinodes and N anode,



The water surface is a node and the open end Of the tube an antinodes. Actually the antinodes At the open end is a little beyond the end and there is therefore correction .
Thus instead of our equation being

$$L_1 = 1/4\lambda \ldots\ldots(1)$$

Where λ is the wave length, where we must write

$$L_1 + \varepsilon = 1/4\lambda \ldots\ldots(2)$$

$$\lambda = C/f$$

Where: (C) velocity of the sound

$$L_1 = c/4f - \varepsilon$$

(f)= frequency

Thus the graph of values of (L_1 cm) as against values of (1/f sec) is a straight line whose slop is the numerical value of (c/4) , while the negative part on the (L_1 cm) axis is the numerical value of (ε)

Slop = PN/QN = C/4

Hence velocity of sound

C = 4 * Slop

Finally: compare the value obtained for (ε) and (C) with their theoretical values :

$$\varepsilon = 0.3 * d$$

Where (d) radius of resonance tube

And

$$c = 331\sqrt{\frac{T + 273}{273}}$$

T is the temperature of the air

$V_o = 331$ (velocity of sound at 0°C)

Method:

1-starting with the fork of highest frequency and with tube as a few cm in length .

2-strike the fork on a rubber bad.

3-Adjust the length of the air column until resonance accrue, hold near to the end tube .

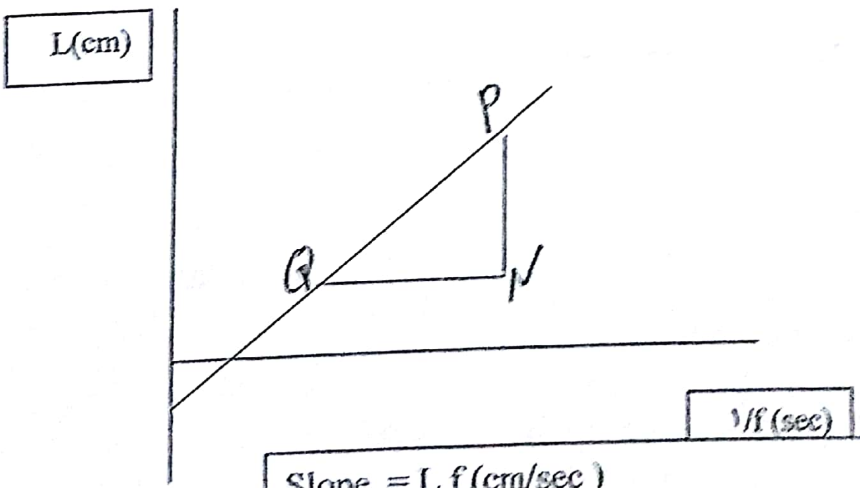
4-Measure the length of the tube and takes two determinations of this position of resonance.

5-continue the experiment with the other forks and record the results in the form of a table:

Frequency (f) HZ	Length of resonating column(L) cm	(1/f) sec

6-plot a graph with values of (l) against values of (1/f).

7-Record the room temperature.



Slope = L f (cm/sec)