EXP: 4

11-11-2012

VELOCITY OF A PULSE

Aim:-

To determine the velocity of a pulse propagated through a stretched slinky.

Apparatus required:-

A flat wire coiled slinky of copper, about 10 cm long and 7.5 cm in diameter, a meter rod, a stopwatch, a small wooden board.

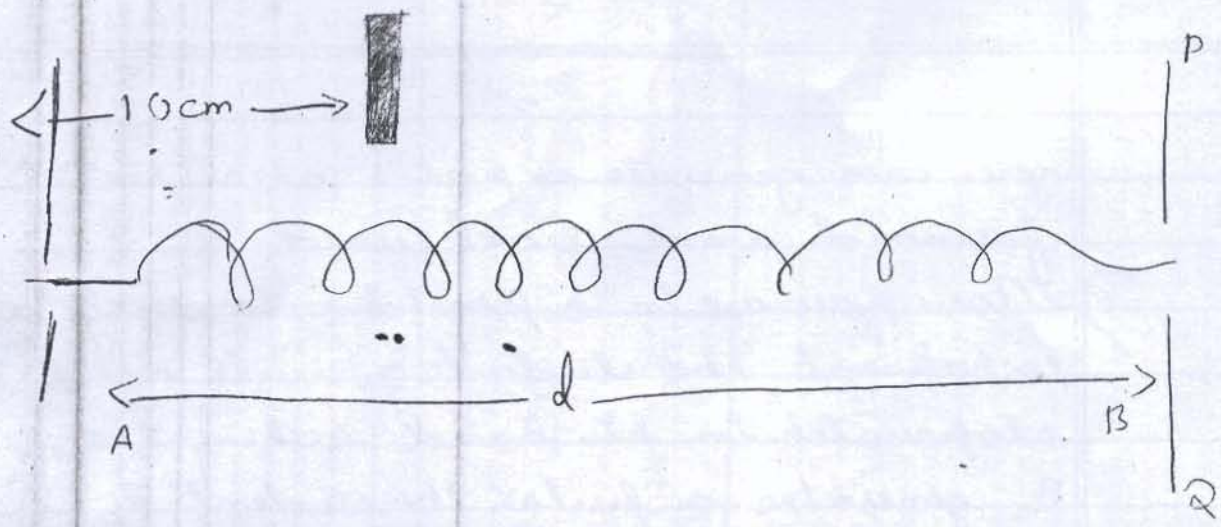
Theory:-

1) A wave produced by a single disturbance in a medium is known as pulse.
2) When the particles of a medium oscillate in the same direction in which the wave is being propagated, then the wave so produced is called longitudinal wave.
3) Longitudinal waves can be produced in solids, liquids and gases.

Procedure:-

1) Mark a line on the floor. From this line measure a distance of 6m with the help of metre rod and mark another line PQ on the floor.
2) Let one of the student's (Say S_1) hold the slinky at Point A.
3) Let the othe student (Say S_2) stretch the slinky to point B.
4) At the point A, let the student S_1 place a wooden ~~place~~ block parallel to the end of the slinky. This wooden block acts as stopper.
5) Let the student S_1 pull the slinky to the position C, which is 10cm from A and then give it a sharp push towards A, such that the motion of his hand stops at A, because of wooden block. A pulse is produced in the slinky, which travels towards B. It is then reflected towards A and again towards B.

Practise it 5 to 10 times, till you are sure that


10cm
P
d
A
B
Q

you can generate a pulse and see it moving forward and backward.

6) Now you are in a position to carry out the experiment. The student S_2 will hold the stopwatch in his hand. When the student S_1 generates a pulse the student S_2 will watch the pulse to travel toward him. When the pulse reaches at B, the student S_2 will start the stopwatch. This on reflection will move towards point A and again towards point B. As soon as the pulse again reaches B, the student S_2 will stop the stopwatch and will record the time for the pulse to travel from B to A and then back to B.

7) The experiment is repeated 4 more times. The velocity of pulse is calculated by the formula:-

$$\text{velocity of pulse} = \frac{\text{Total distance travelled by pulse}}{\text{Total time taken}}$$

$$= \frac{2d}{t}$$

Observations & Calculations:-

S.No	Lengths between Points A & B	Total Distance Travelled by the Pulse from 'B' to 'A' and Back	Time Taken	Velocity of Pulse = Total Distance / Total Time Taken
1.	1.5 m	2 x 1.5 m = 3 m	1 s	$V_1 = \frac{3}{1} = 3$ m/s
2	2 m	2 x 2 m = 4 m	1.3 s	$V_2 = \frac{4}{1.3} = 3.07$ m/s
3	2.5 m	2x 2.5 m = 5 m	1.6 s	$V_3 = \frac{5}{1.6} = 3.12$ m/s
4	3.57 m	2x 3.57 m = 7.14 m	2 s	$V_4 = \frac{7.14}{2} = 3.57$ m/s

Average velocity of pulse $= \frac{V_1+V_2+V_3+V_4}{4} = \frac{12.76 \text{ m/s}}{4} = 3.19$ m/s.

Precautions:-

1) The slinky should be of flat wire of copper.
2) Do not stretch the slinky backward for more than 10 cm.

Sources of Error:-

1) The student who starts and stops stopwatch can be slow or fast and hence may record wrong time.
2) The push should not exceed the limit of 10 cm as it will reduce the distance between points A and B.

Result:-

Velocity of pulse = 3.19 ms^{-1}

Sept 15.1.13

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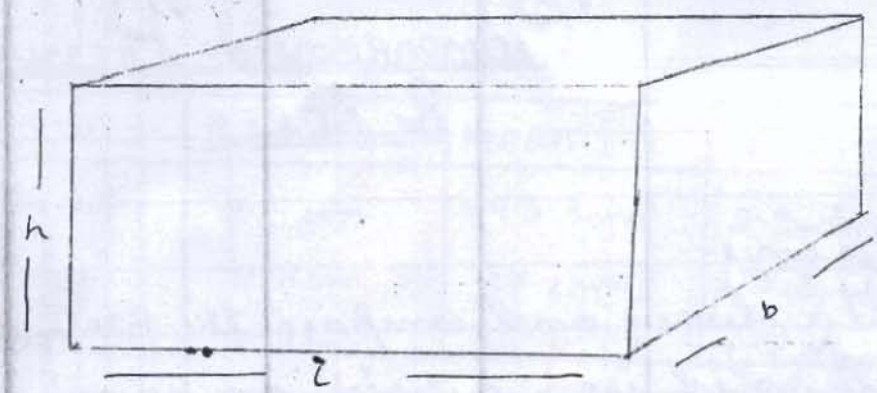

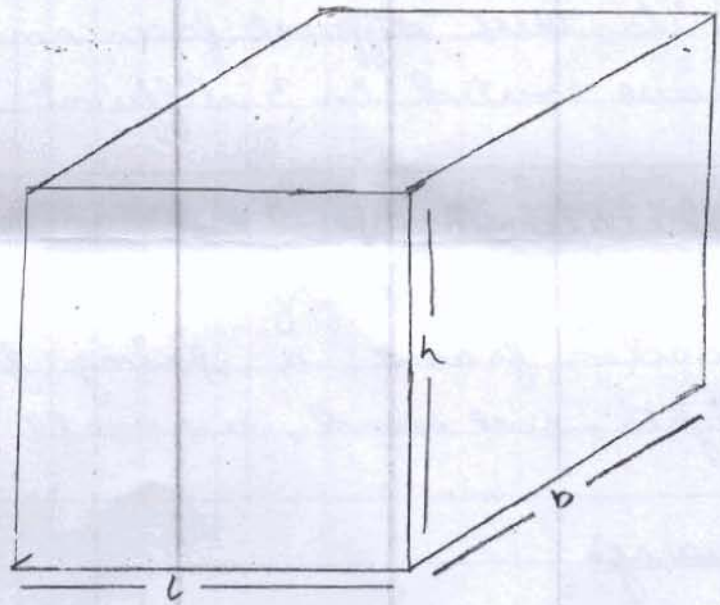

EXP: 5

6-12-2012

COMPARISON OF PRESSURE & AREA

Aim:-

To observe and compare the pressure exerted by a solid iron cuboid on sand, while resting on its three different faces and to calculate the pressure exerted in 3 different cases.

Apparatus Required:-

A solid cuboid of iron, a rectangular wooden frame, a spring balance, two 200g weights, wet sand, a small measuring scale.

Theory:-

Pressure:-

* Thrust for unit area is called pressure.
* Mathematically, Pressure = $\frac{\text{Force}}{\text{Area}}$ or $P = \frac{F}{A}$
* SI unit of pressure is Pascal (Pa), where $1\,Pa = 1\,N/m^2$.
* The pressure exerted by a body is directly proportional to the thrust, i.e., $P \propto F$
* The pressure exerted by a body is inversely proportional to the surface area in contact

Observations & Calculations:-

FACE	LENGTH	BREADTH	AREA	PRESSURE
1	14cm	6.7cm	$93.8 cm^2$	2.3 dyne/cm^2
2	14cm	4.8cm	$67.2 cm^2$	9.7 dyne/cm^2
3	6.7cm	4.8cm	$32.16 cm^2$	7.7 dyne/cm^2

i.e., $P \propto \frac{1}{A}$

Procedure :-

The weight of the given solid cuboid is measured using the spring balance. The dimensions of 3 faces of the solid cuboid are measured using a metre scale. The pressure exerted by each face is the calculated and tabulated.

Precautions :-

* Zero error of the spring balance must be noted.
* Undue pressure on the balance must be avoided.

Sources of Error :-

* Spring balance may not give accurate value.
* Error due to least count is bound to creep in.

Result :-

- ★ Pressure exerted by face 1 = 2.3 dyne/cm^2
- ★ Pressure exerted by face 2 = 3.7 dyne/cm^2
- ★ Pressure exerted by face 3 = 7.7 dyne/cm^2
- ★ The pressure exerted by a solid increases with the decrease in area of contact.

16-1-15