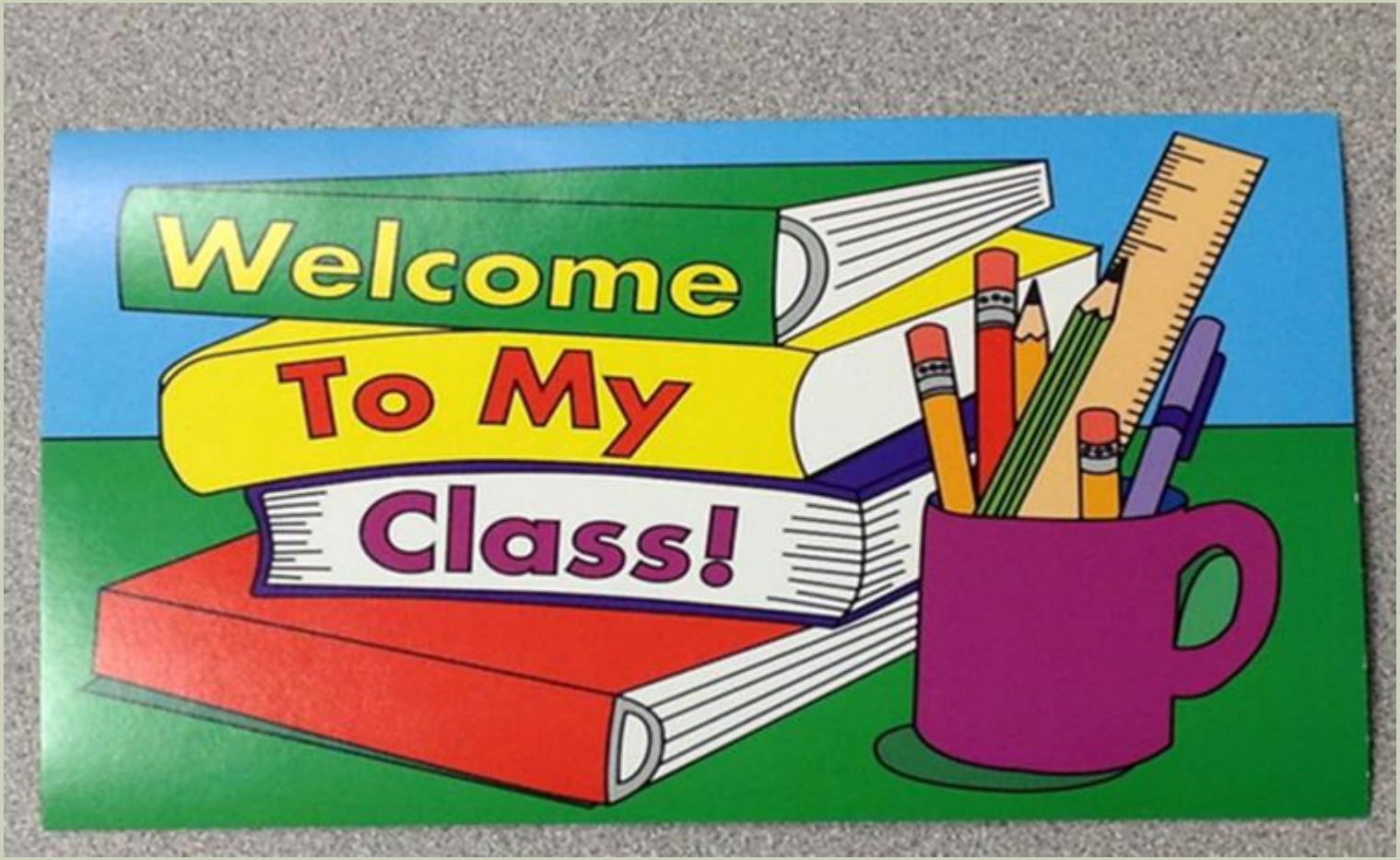
Pakistan School
Kingdom of Bahrain

CLASS: 10
SUBJECT : PHYSICS



ENGAGING STARTER

In which area the intensity of sound is highest? Why?

TOPIC

- Intensity level
- Echo

OBJECTIVE

At the end of this lesson students will be able to :

1.Derive the formula for sound intensity level

2.Solve the problems related to sound waves.

SOUND INTENSITY LEVEL

The human ear responds to intensities ranging from

10^{-12} Wm^{-2} to 1 Wm^{-2}

ZERO BEL

The faintest intensity of sound is taken as reference intensity called zero bel. i.e. 10^{-12} Wm^{-2}

DERIVATION OF INTENSITY LEVEL

The loudness L of sound is directly proportional to logarithm of intensity .i.e.

$L \propto \log I$

$L = K \log I$

K=.....

EQUATION FOR FAINTEST INTENSITY

Let $L_\circ$ is the loudness of faintest sound intensity $I_\circ$ and L be the loudness of unknown sound of intensity I

$L_\circ = K \log I_\circ$ .....(1)

$L = K \log I$.....(2)

DERIVATION

$L_\circ$ = K log $I_\circ$ .....(1)

L= K log I.....(2)

Subtracting equation 1 from equation 2

L- $L_\circ$ = K (log I – log $I_\circ$)

L- $L_\circ$ = K log I/$I_\circ$

Where L- $L_\circ$ is called intensity level of unknown sound .

SOUND LEVEL

L- $L_\circ$ = K log I/$I_\circ$

Sound level = K log I/ $I_\circ$

If K= 1 for the value I= 10 $I_\circ$

Sound level = log I/ $I_\circ$ (bel)

Where bel is the unit

Sub unit decibel

Sound level in decibel is

Sound level = 10 log I/ $I_\circ$ (dB)

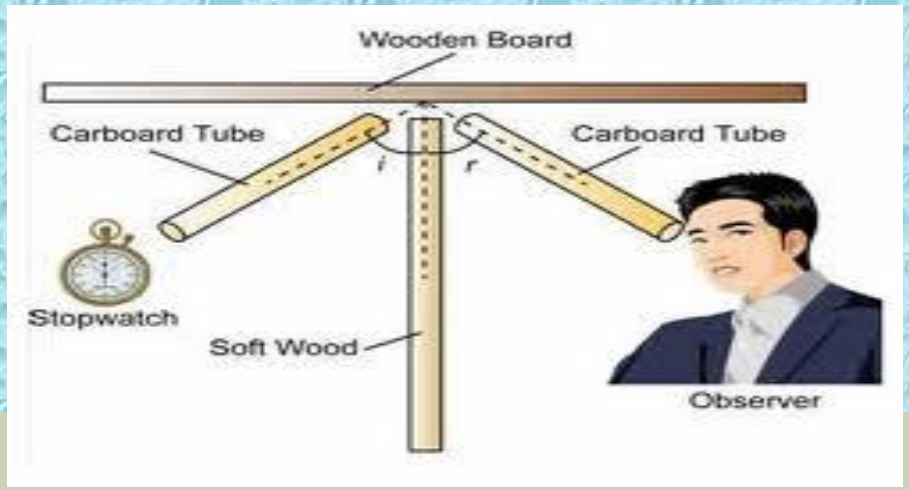
dB = decibel scale

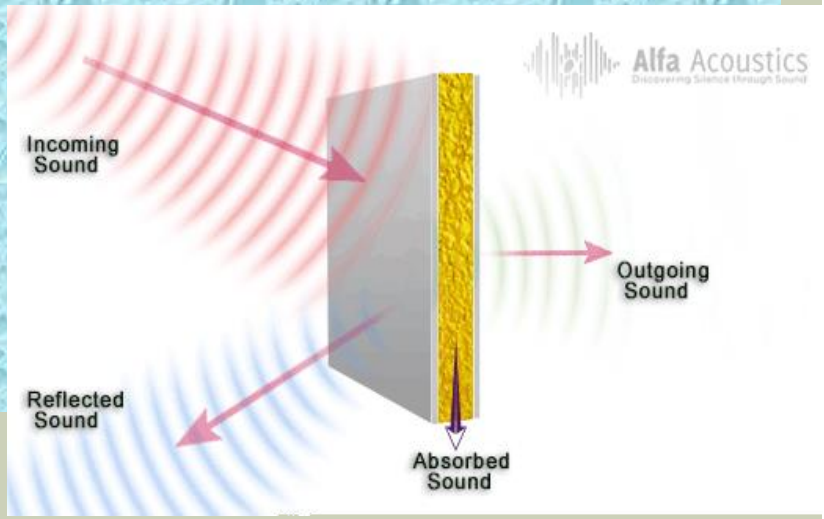
ECHO

When sound is incident on the surface of medium , it bounces back into the first medium .This phenomenon is called echo or reflection of sound .

ACTIVITY

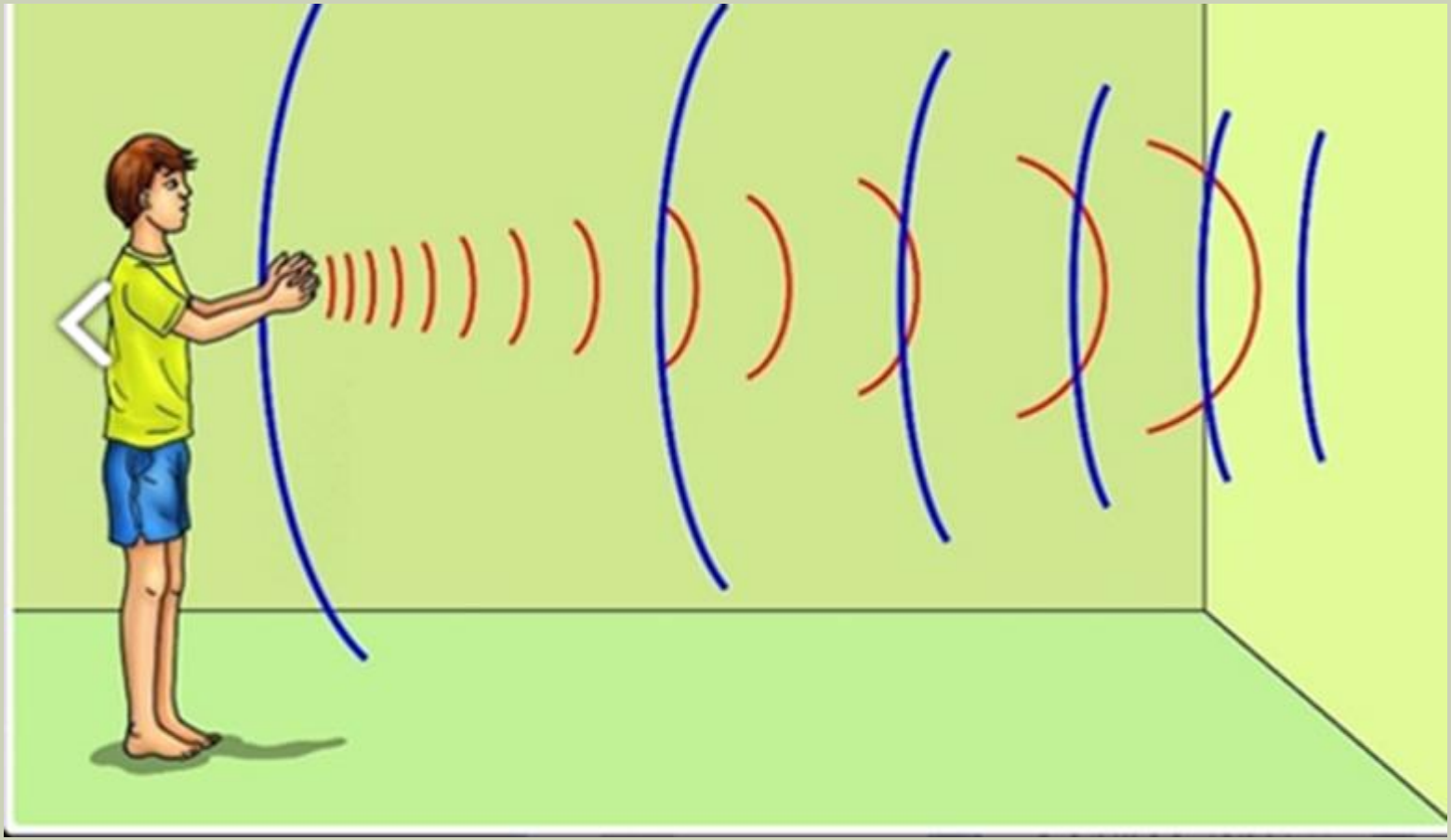
- We can observe the reflection of sound by this activity .
- Things required : clock ,cardboard tube ,wooden board
- Method: Arrange the things as shown in figure.
- Reflection of sound can be listened.





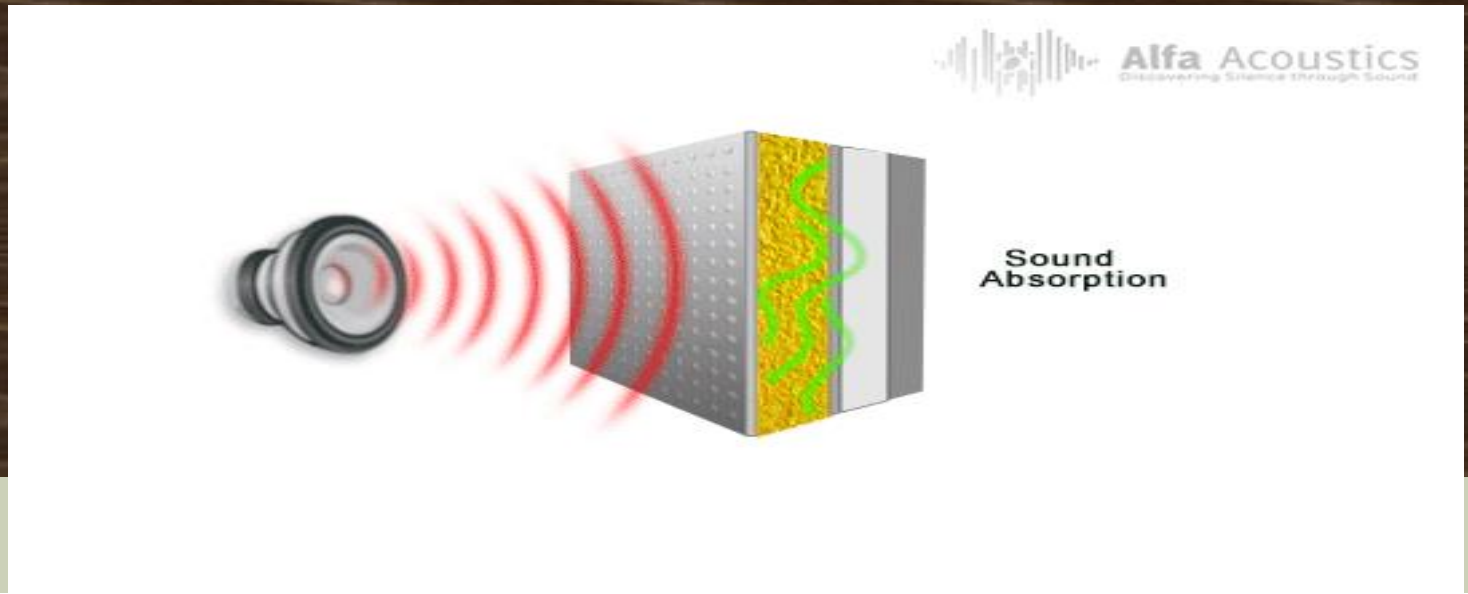
ACTIVITY 2

- Describe the given picture



ACOUSTICS PROTECTION

- The technique or method used to absorb undesirable sounds by soft and porous surface is called acoustic protection.
- Soft and porous objects can be used in noisy places to reduce noise pollution.



REVERBERATIONS

Sometimes the sound reflect more than one time (from wall ceiling and floor) it becomes garbled . This type of multiple reflection of sound is called reverberations.

NUMERICAL

A doctor counts 72 heartbeats in 1 min. Calculate the frequency and time period of the heartbeats.

Given:

Counts of heartbeats = …….

Time taken = t = ……..

To

Frequency = ?

Time period = ?

Solution

Using formula : f = waves/time

f= ….. - …../….

f=

Time period = T = 1/…. =1/….. So T = ……..s

NUMERICAL

A ship receives an echo 1.5s later. The speed of sound in sea water is 1500m/s. Find depth of sea.

Given

Speed = v = 1500m/s

Time taken = t = 1.5s

To find = ……= ?

Solution

Using formula

S = ……..

S = ……..x ……..

S = …….. m

HOME WORK

- Chapter 11 page number 35
- Solve Numerical 11.6 in your notebook.

MESSAGE

- Allah Hafiz