

Mathematical Problems CH-07 part-02/01

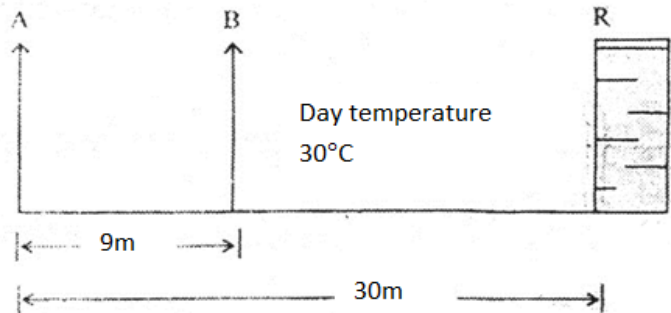
Don't forget the 3 steps method for equations – YOU MUST DO THIS TO GET FULL EXAM MARKS!!

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⇒NCTB⇒GRADE-IX OR X⇒IX-X-MP-CH-07 I PART-02 I

Problem:



Wahir produces a sound of frequency **200 Hz** standing at 'A', and his friend standing at 'B' hears the echo.

- | | |
|--|---|
| a. What is called intensity of sound? | 1 |
| b. Why sound is one kind of wave? Explain. | 2 |
| c. Determine the wavelength of the produced sound. | 3 |
| d. Is it possible to hear echo by his friend at 'B' at temperature 40°C for the same produced sound? Explain by your logic. | 4 |

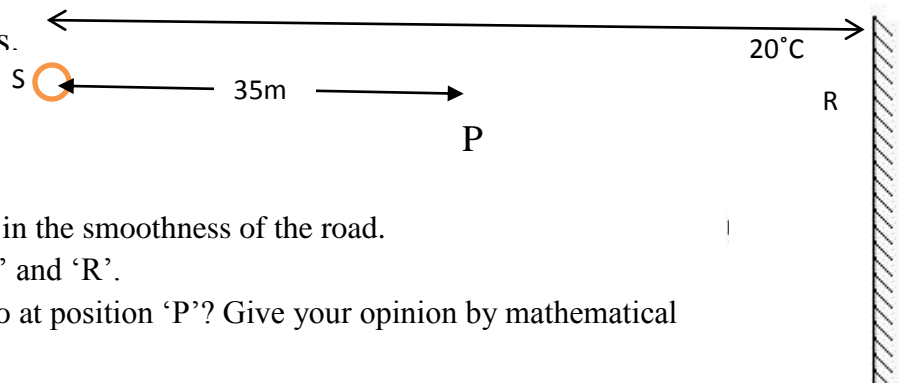
Problem: One day Naeema and Shaz was standing in front of a hill. Shaz shot a bullet with the gun in her hand. Though Shaz couldn't hear the echo Naeema easily heard it after 101ms staying behind 2 meter. The temperature of air on that day was 25°C .

- a. What is Amplitude? 1
- b. Why sound can be heard faster in the rainy season than in winter? 2
- c. Determine the distance between Naeema and the hill. 3
- d. Find the minimum increase of temperature in which Shaz could hear the echo?

Analyze mathematically.

Problem:

The echo is heard after 0.3s.



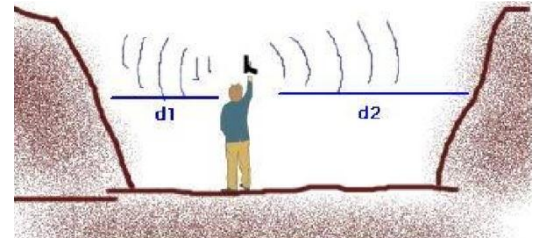
- What is sound?
- Explain the effect of friction in the smoothness of the road.
- Find the distance between 'S' and 'R'.
- Could it possible to hear echo at position 'P'? Give your opinion by mathematical analysis.

Problem: The frequency of Fabiha's vocal cord is 750Hz. She called a boatman who was keep waiting at the middle of the river. Fabiha heard the echo of her voice after 1.6s which is reflected from the other side of the river. That day the temperature was 50°C.

- a. What is called wave length?
- b. Why the tone of female is sharper than male? Explain.
- c. Calculate the wavelength of Fabiha's sound wave.
- d. Does the boatman hear echo? Explain with mathematical logic.

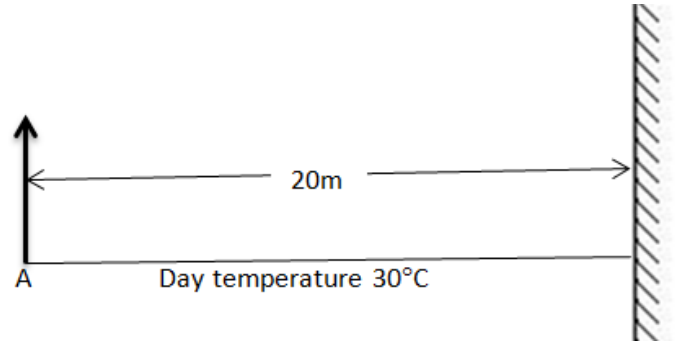
Problem: Araf fired a bullet from his gun by standing between two parallel hills. He heard first echo after 1.8s and second echo after 2.2s. That day the temperature was 30°C.

- What is time period?
- Why velocity of sound is more in solid than liquid? Explain.
- Calculate the distance between two hills.
- Will the Araf hear 3rd and 4th echo? Explain with mathematical logic.



Problem:

A person standing at position 'A' produces a sound of wavelength 20cm and starts running with velocity 20ms^{-1} **away from** the reflector.



a. What is intensity of sound?

1

b. The particles of transverse wave are in periodic motion.—Explain.

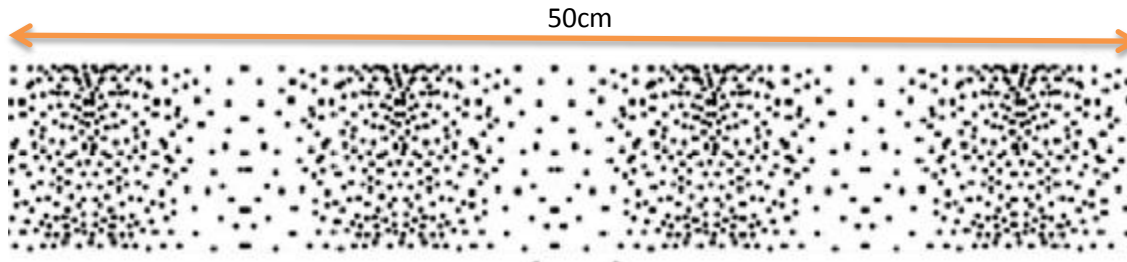
2

c. Find out the time period of sound wave?

3

d. Does the person 'A' hear the echo? Give your argument with mathematical explanation.

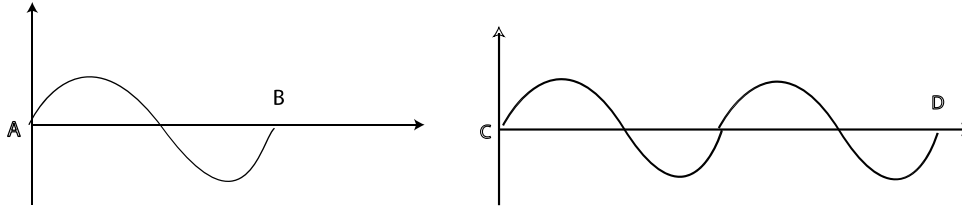
4



Day temperature
20°C

Problem: Velocity of sound in air is **330m/s** at 0°C and Velocity of sound in metallic wire is **5130m/s**.

- What is called musical sound?
- Why definite distance is necessary to hear an echo?
- Determine the frequency of sound in air medium.
- If the medium of the stem is metallic, then which quantity will change and why? Analyze mathematically.



Problem: It takes 0.1s for the first wave to reach from A to B and 0.08s for the second wave to reach from C to D. **The distance between A to B is 30m.**

- What is audibility range?
- Why two sounds are heard if a sound is created at the one end of a hollow iron pipe?
- Find the distance travelled by the first wave by **5s**.
- Compare the frequencies of both the wave?

Problem: In radiobroadcasting station folk songs are played at medium wave of 450 kHz at 10 am everyday morning. The velocity of the radio wave is 3×10^8 m/s. The wave length of another wave generated in the water is $1/100^{\text{th}}$ part of radio wave and the velocity of sound in water is 1550m/s.

- What is PHASE?
- Why the tone of WOMEN is sharper than man? Explain.
- Find the wavelength of the radio wave.
- Compare the frequency of the radio wave with the wave created in water mathematically.

Measurement of the speed of sound

Aim

The aim of this experiment is to measure the speed of sound in air using an echo method

You will need

A pair of clapper boards, a measuring tape (50m if possible), two or three stopwatches or stop clocks

Measure out a distance from a tall building – around 100 m if possible.

Snap the clapper boards together outside in front of the building and record the time it takes for the echo to return.

Repeat the experiment and find an average time.

Calculate the speed of sound from the formula:

$$\text{Speed} = \text{distance}/\text{time}$$

(Remember that it is the ‘there and back distance’ that should be used in the formula.)



Wear ear defenders.

Extended work

1. The discussion of the result should lead on to mentioning that the temperature of the air also affects the speed of sound - it being faster in hot air since the molecules are moving faster.
2. Find out the speed of sound in steel and water and explain why there is a difference.
3. Explain why the echo method eliminates certain errors in the measurement of the speed of sound.
4. Find out what is meant by the Mach effect.
5. Calculate the speed of sound in granite and hydrogen from the following data:
 Time for sound waves to travel 1km in hydrogen = 770 ms
 Time for sound waves to travel 1 km in granite = 170 ms
6. Give your reasons why you think that sound is a longitudinal wave.

In radiobroadcasting station folk songs are played at medium wave of 450 kHz at 10 am everyday morning. The velocity of the radio wave is 2.5×10^8 m/s. The wave