ICSE CLASS 10 EXAMINATION

PRACTICE QUESTION PAPER

PHYSICS

Chapter 7 : SOUND

(Echoes and SONAR · Natural, Damped and Forced Vibrations · Resonance · Loudness, Pitch and Quality · Music and Noise)

Maximum Marks: 40 **Time allowed: One hour**

1. Answers to this Paper must be written on the paper provided separately.

2. You will not be allowed to write during the first 5 minutes. This time is to be spent in reading the question paper.

3. The time given at the head of this Paper is the time allowed for writing the answers.

*4. **Section A** is compulsory. Attempt **all** questions from Section A and **any two** questions from Section B.*

5. The intended marks for questions or parts of questions are given in brackets [ ].

6. Unless stated otherwise, take the speed of sound in air as 340 m s^{-1}. Figures are for reading, completion and labelling on the answer sheet.

SECTION A (20 Marks)

(Attempt all questions from this Section.)

Question 1

Choose the correct answers to the questions from the given options. *(Do not copy the question, write the correct answers only.)* **[8]**

(i) A sound of frequency 25 kHz is:

(a) ultrasonic (b) infrasonic

(c) audible (d) electromagnetic

(ii) The minimum distance of the reflector from the source of sound in air (speed 340 m s^{-1}) for hearing a distinct echo is:

(a) 34 m (b) 17 m

(c) 10 m (d) 340 m

(iii) The pitch of a sound depends on its:

(a) amplitude (b) wave form

(c) frequency (d) intensity

(iv) If the intensity of a sound is made 100 times the minimum audible intensity, the sound level is:

(a) 2 dB (b) 20 dB

(c) 10 dB (d) 100 dB

(v) Assertion (A): Soldiers are asked to break step while crossing a bridge.

Reason (R): The frequency of their steps may become equal to the natural frequency of the bridge and cause resonance.

(a) (A) is true and (R) is false.

(b) (A) is false and (R) is true.

(c) Both (A) and (R) are true, and (R) is the correct explanation for (A).

(d) Both (A) and (R) are true, but (R) is not the correct explanation for (A).

(vi) When the amplitude of a sound wave is doubled, its loudness becomes:

(a) double (b) four times

(c) half (d) unchanged

(vii) Two sounds of the same loudness and the same pitch from two different instruments differ in their:

(a) amplitude (b) speed

(c) frequency (d) wave form

(viii) The amplitude of damped vibrations of a body in a medium:

(a) remains constant (b) increases

(c) becomes zero at once (d) decreases gradually

Question 2

(a) What is an echo? State one condition necessary for hearing an echo distinctly. **[2]**

(b) Fig. 1(a) shows the displacement–time graph and Fig. 1(b) shows the displacement–distance graph of the same wave travelling in a medium. **[3]**

(i) Use graph (a) to find the time period and the frequency of the wave. **[1]**

(ii) Use graph (b) to find the wavelength of the wave. **[1]**

(iii) Calculate the speed of the wave. **[1]**

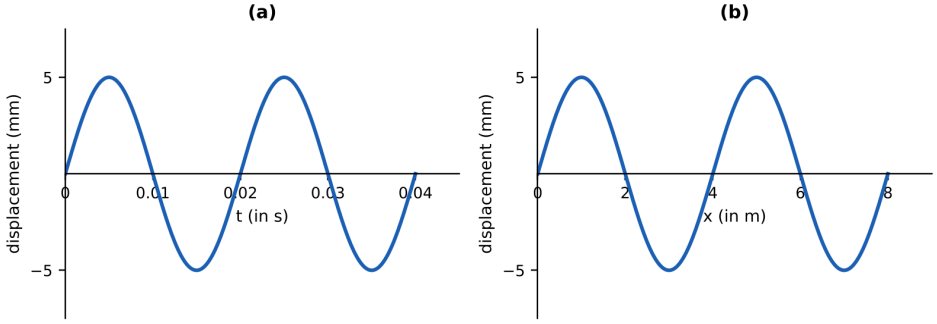


Fig. 1

(c) Name the unit in which the sound level is measured and state the safe upper limit of sound level for our ears. **[1]**

Question 3

(a) A man stands 51 m in front of a cliff and claps his hands. (i) After what time does he hear the echo? (ii) Will the echo be heard distinctly? Give a reason. (iii) At what distance from the cliff should he stand to hear the echo after 0.5 s? **[3]**

(b) Fig. 2 shows a man M standing between two vertical cliffs A and B, 170 m from the cliff A. He fires a gun and hears the first echo after 1 s and the second echo 1.5 s after the first. **[3]**

(i) Calculate the speed of sound. **[1]**

(ii) Calculate the distance d_2 of the cliff B from the man. **[1]**

(iii) Find the distance between the two cliffs. **[1]**

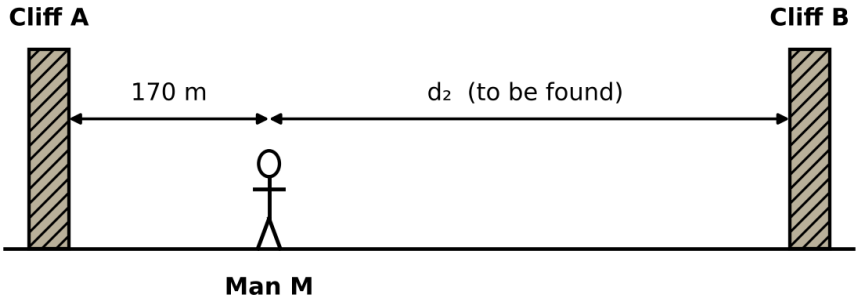


Fig. 2

SECTION B (20 Marks)

(Attempt any two questions from this Section.)

Question 4

(a) A wave of frequency 500 Hz and wavelength 0.68 m travels in air. Calculate (i) the speed of the wave, (ii) its time period, and (iii) its wavelength in water, where its speed is 1450 m s^{-1}. **[3]**

(b) Give a reason for each of the following: (i) Ultrasonic waves are used for echo depth sounding. (ii) Stringed instruments like the guitar are provided with a hollow sound box. (iii) A troop of soldiers is asked to break step while crossing a suspension bridge. **[3]**

(c) Fig. 3 shows a ship sending an ultrasonic pulse from the transmitter T to a submarine below it. The receiver R is placed close to T. The speed of ultrasonic waves in sea water is 1450 m s^{-1}. **[4]**

(i) Complete the diagram to show the path of the pulse sent from T and of the pulse received at R. **[1]**

(ii) Write the full form of SONAR and name the principle on which it is based. **[1]**

(iii) The echo is received 1.2 s after the pulse is sent. Calculate the depth d of the submarine. **[2]**

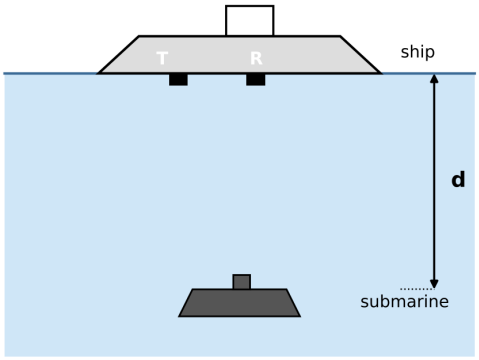


Fig. 3

Question 5

(a) State three differences between natural vibrations and damped vibrations. **[3]**

(b) Fig. 4 shows three modes of vibration P, Q and R of a stretched string of length l fixed at both ends. **[3]**

(i) Which mode gives the principal note? State its wavelength in terms of l. **[1]**

(ii) Write the ratio of the frequencies of P, Q and R. **[1]**

(iii) Which mode produces the most shrill sound? Give a reason. **[1]**

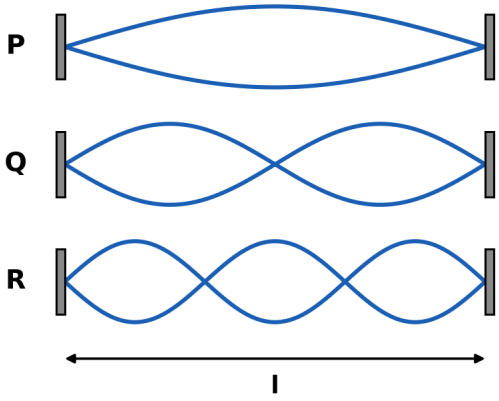


Fig. 4

(c) Fig. 5 shows four test tubes A, B, C and D, each 20 cm tall, filled with water up to 6 cm, 10 cm, 14 cm and 18 cm respectively. A vibrating tuning fork held over the mouth of tube D produces a loud sound. **[4]**

(i) Which other tube will also produce a loud sound with the same fork? Give a reason. **[2]**

(ii) Name the phenomenon responsible. **[1]**

(iii) State the condition necessary for this phenomenon. **[1]**

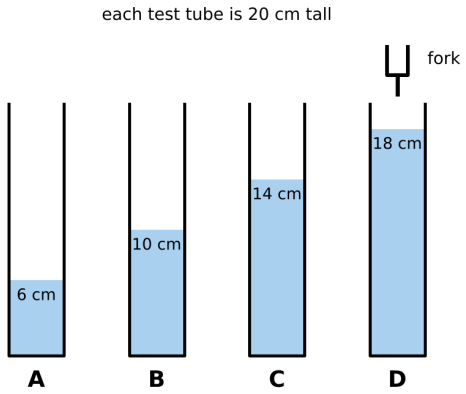


Fig. 5

Question 6

(a) (i) State the S.I. unit of the intensity of sound. (ii) The amplitudes of two sound waves are in the ratio 2 : 5. Find the ratio of (1) their loudness and (2) their pitch. **[3]**

(b) State three differences between a musical sound and noise. **[3]**

(c) Fig. 6 shows the traces A, B, C and D of four sounds displayed on a C.R.O. screen over the same interval of time. The amplitude of B is twice the amplitude of A. **[4]**

(i) Which two sounds have the same pitch but different loudness? **[1]**

(ii) Which sound has the highest pitch? Give a reason. **[1]**

(iii) Which two sounds have the same loudness and pitch but differ in quality? **[1]**

(iv) Find the ratio of the loudness of B to that of A. **[1]**

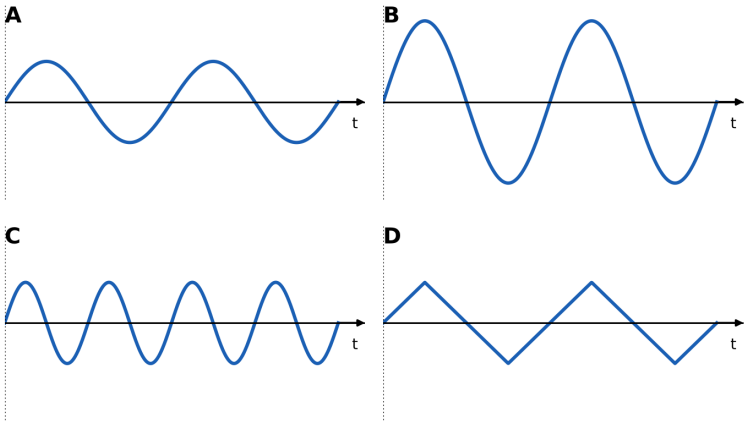


Fig. 6

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