| AEPHY2024  **Narrogin SHS Year 11 ATAR PHYSICS Name:** | |
| --- | --- |
| Task No: | 11 |
| Task Type: | Test |
| Content: | Waves |
| Task Description: | Complete the attached questions in the spaces provided.  Marks will be awarded for presentation and working.  **Test conditions (60 minutes).**  *Formulae and data booklet provided.*  *Non-programmable calculator permitted.* |
| Total Marks: | 44 |
| Weighting: | 6% |
| Materials required | pens, pencils (including coloured), sharpener, correction fluid, eraser, ruler, highlighters, scientific calculator |
| Due Date: |  |

Question 1(3 marks)

Two waves are travelling on a string. The directions and amplitude of each wave is shown in the figure below.

(a) On the line on the right, draw resulting wave when the two waves meet. (1 mark)

A red line with a black line

Description automatically generatedA close-up of a text

Description automatically generated

(b) When the two waves meet, calculate the amplitude of the resulting wave. (2 marks)

A white horizontal line with black lines

Description automatically generated with medium confidence

Question 2 (5 marks)

The diagram below shows two ways in which a wave can travel along a slinky spring.

A diagram of a wave

Description automatically generated

(a) State and explain which wave is longitudinal. (2 marks) A white line with red text

Description automatically generated

(b) On the diagram: (3 marks)

i. clearly indicate and label the wavelength of wave B (between any two points on the diagram)

ii. use arrows to show the direction in which the points P and Q are about to move as each wave moves past these points.

Question 3 (3 marks)

The ear canal acts as a closed column of air 1.70 cm in length from the outer ear to the ear drum. Calculate the fundamental resonant frequency of the ear canal.

A diagram of a number of objects

Description automatically generated with medium confidence

Question 4 (3 marks)

You are attend attending a concert night rehearsal and taking sound intensity measurements of Leo playing his saxophone. At the back of the concert hall 21.0 m from Leo you measure an intensity of

1.30 x 10-6 Wm-2 . Calculate the distance from Leo where the measurement would be

1.17x 10-5 Wm-2 .

A red circles with numbers and a number on it

Description automatically generated

Question 5 (9 marks)

An instrument maker understands that he can use either a closed or an open pipe to produce a note of the same frequency.

1. Calculate the ratio of the length of a closed pipe to an open pipe if they are to produce the same frequency. (3 marks)

A white background with red text

Description automatically generated

The instrument maker manufactures a 2.46 m pipe that can be used to create standing waves in either an open or closed mode by a pedal that opens or closes an aperture at the bottom of the pipe.

1. Determine the frequencies of the first three harmonics of the pipe if it is left open at both ends.

(3 marks)

A red circles with numbers and symbols

Description automatically generated

1. Determine the frequencies of the first three harmonics of the pipe if it is closed at one end.

(3 marks)

A red circles with black text

Description automatically generated

Question 6 (6 marks)

The diagram below shows 6 wave fronts approaching a boundary from water to air. The speed of sound in water is 4.30 times greater than the speed of sound in air.

1. Draw four wave-fronts below to show how the path of a sound wave changes as it moves from water to air.

(3 marks)

A diagram of lines and arrows

Description automatically generated

The equation that relates the properties of the wave as it passes through a boundary of different wave speeds is known as Snell’s Law:

A math equations with numbers and symbols

Description automatically generated with medium confidence

(b) If the wavelength in air is measured to be 0.170 m, calculate the wavelength of the sound wave when it was moving through the water. (3 marks)

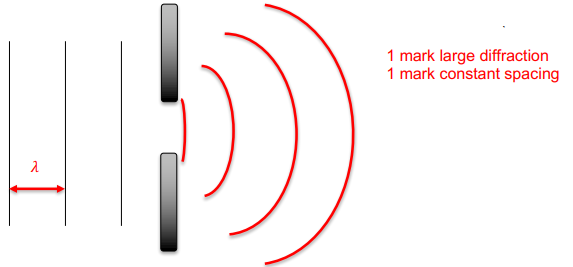
A math equations with circles and numbers

Description automatically generated

Question 7 (7 marks)

A student is playing with a ripple tank that produces uniform linear wave fronts. Barriers can be placed in the path of the wave fronts in order to observe wave phenomena. Complete the two diagrams (drawn to scale) by drawing 4 complete wave fronts as they pass through the barriers.

1. (2 marks)



1. (2 narks)

A close-up of a sign

Description automatically generated

1. If the frequency of the source in a) is set to 5.60 Hz, use the diagram to estimate the speed of the

wave fronts. (3 marks)

A white background with red text

Description automatically generated

Question 8 (8 marks)

A tuning fork on a white background

Description automatically generatedA tuning fork and a wood block

Description automatically generatedWhen a tuning fork is struck it oscillates at a set frequency with a low volume. When the tuning fork is connected to a wooden box similar to the one shown in the diagram and then struck, the same frequency is heard at a much louder volume.

(a) Explain this observation (3 marks)

• The tuning fork oscillates (driving frequency) at the same natural frequency of the wooden box.

• which causes the box to resonate.

• the larger surface area of the box displaces more are particles, hence a louder volume.

(b) State one other scenario where this phenomenon can be observed. (1 mark)

voice/throat, guitar, rubbing wine glass, acoustic guitar

(c) If the box has a length that corresponds to the first harmonic, calculate the optimum length of the box if the frequency of the tuning fork is 512 Hz and the speed of sound in air is measured to be 338 ms-1

(3 marks)

A math equations and numbers

Description automatically generated

(d) On the diagram, draw in a labelled pressure wave envelope for the first harmonic. (1 mark)

A black and white object with a white background

Description automatically generated with medium confidence