**Physics Unit 2 Yr 11: Topic Test : Waves 2016**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (40 marks)

1. The following shows the oscillation of a travelling wave on a string.. What is the amplitude and wavelength of the wave the string creates. (2 marks)

Amplitude \_\_35cm\_\_\_\_\_\_\_\_\_\_\_\_

Wavelength \_ 5 cm\_\_\_\_\_\_\_\_\_\_\_\_\_

1. If the wave in the graph for question (1) is travelling at 4.00 ms-1, what is the period of the wave? (3 marks)

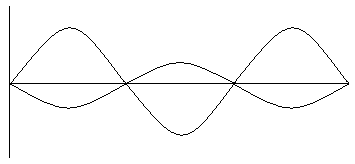
f= v/ λ = 4/.05 = 80 Hz

T = 1/f = 1/80 = 0.0125 sec

1. Complete the following: (3 marks)
2. In a region of stationary waves on a string, nodes indicate \_\_\_\_\_\_minimun\_\_\_\_\_\_\_\_\_\_\_\_ vibration of particles.
3. The number of waves in a given time. \_frequency\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. The distance between two crests on a displacement / time graph is called the \_period\_\_\_.
5. Waves can travel as longitudinal waves or transverse waves. Fully explain the difference giving one example of each. (4 marks) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_longitudinal; compressions and rarefactions in the direction of propagation : P waves in earthquakes, sound

Transverse – vibrations perpendicular to the direction of travel ; Ocean waves, light, S waves in earthquakes\_\_



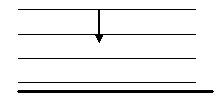
1. A student has set up two waves on a dual beam CRO. She then adds them together.

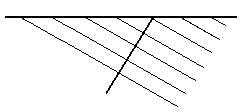
Draw the resultant wave. (2 marks)

1. Bending of waves due to passing around or through openings is called \_diffraction\_\_

(1 mark)

1. Complete the following diagrams for reflection of waves at harbour wall and refraction of sound of bell above water. (3 marks)

 air



water

Harbour wall Bell

1. The Tacoma Bridge collapsed due to only wind gusts of 70kmh-1. What is the name of this phenomenon. Explain why the bridge collapsed using appropriate terminology. (3 marks)

(3 marks)

\_\_Resonance\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_The forcing frequency created by the wind gusts matched the natural frequency of the bridge gusts

This maximised energy transfer to the bridge and caused the large oscillations

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1. Andrew is blowing air over the end of a pipe. When he blows softly across the end, a microphone connected to a C.R.O. shows a frequency of 256 Hz. When he blows over the pipe much harder, a frequency of 1024 Hz is shown on the screen. The speed of sound on the day is 332 ms-1.
   1. Is the pipe open at both ends or open at one end and closed at the other? (1 marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_open\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. Fully explain the answer you gave. (3 marks) \_\_\_\_\_\_\_\_\_\_\_f2 = 4xf1

Therefore λ1 = \_\_4 x λ2

They are even multiples therefore must be open

A pipe closed at one end can only have odd multiples \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. What is the length of the pipe assuming the 256 Hz is the fundamental frequency?

(2 marks)

λ1 = v/ f1 = 332/ 256 = 1.297 m

L = 2λ1 = 2x 1.297 = 2.594 m

1. a) A pipe open at both ends, is 40.0 cm long and is made to vibrate in its fundamental frequency. What is the period of the wave? (3 marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ λ = L/2

λ1 = 0 .4/2 = 0.2m

f= v/ λ1 = 332/0.2 = 1660Hz

T= 1/f = 1/1660 = 6.02 x 10-3 secs

b) The same pipe is then closed off at one end, what will be the frequency of next harmonic after the harmonic? ( 4marks)

L = λ1/4

L = 3 λ3/4 ( 1 mark for identifying 3 rd harmonic)

λ3 = 4L /3 ( 1 mark correct equation)

0 .4/2 = 0.2m λ3 = 4x0.4/3 =0.53m (1)

f3= v/ λ3 = 332/0.53 = 626.4Hz (1)

\_\_\_\_\_\_\_\_\_\_\_

1. The two speakers below are producing a 680 Hz note. Assume the speed of sound in air is 340 ms-1. Point P is 10.00 m from speaker A and 12.75 m from speaker B.

**P**

A 10.00 m

12.75 m

B

Determine if there is a node or anti-node at point P and what would be hear at this point. You must justify your answer to receive any marks. The wave position next to the speakers is at positive maximum displacement. Use a diagram to assist your answer. (You may need to complete this on the back of this page). (4 marks)

λ= v/ f = 340/ 680 = 0.5 m

In 10.0 m there will be 20 complete wavelengths, therefore starting at positive maximum displacement the wave will finish at positive maximum displacement therefore there will be a node or destructive interference at P

In 12.75 m there will 25 and ½ wavelengths therefore the wave will have negative max displacement.

This will cause destructive intereference and hence a node.