

- 15 The human ear can only hear two sounds as separate frequencies when the difference in frequency between the sounds is greater than 0.3%.

Sounds with a difference in frequency less than 0.3% are heard as the same frequency.

- (a) Two sounds with frequencies of 880 Hz and 882 Hz are produced.

- (i) Show that the person hears these two sounds as the same frequency.

(2)

- \*(ii) When listening to these two sounds at the same time, the loudness of the sound increases and decreases repeatedly.

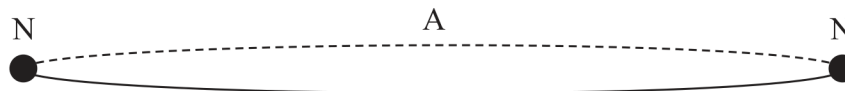
Explain why. Your answer should refer to coherence and phase difference.

(6)



- (b) A wire is stretched between two fixed points. The wire is made to vibrate and a stationary wave is created. This produces a sound wave in the air.

The fixed ends of the wire act as nodes (N). There is an antinode (A) in the middle of the wire, as shown.



A wire of length 18.7 cm produces a sound with a frequency of 882 Hz.  
The tension in the wire is adjusted until the frequency of the sound is 880 Hz.

Calculate the decrease in tension required to cause this change in frequency.

mass per unit length of wire =  $5.08 \times 10^{-3} \text{ kg m}^{-1}$

(4)

Decrease in tension = .....

(Total for Question 15 = 12 marks)