Question 16 (7 marks)

Standing waves are formed on a string of length 4.0 m that is fixed at both ends. The speed of the waves is 240 m s^{-1}.

a. Calculate the wavelength of the lowest frequency resonance. 2 marks

m

b. Calculate the frequency of the second-lowest frequency resonance. 2 marks

Hz

c. Explain the physics of how standing waves are formed on the string. Include a diagram in your response. 3 marks

Question 14 (6 marks)

Figure 13 shows a simple apparatus that can be used to determine the frequency of a tuning fork.

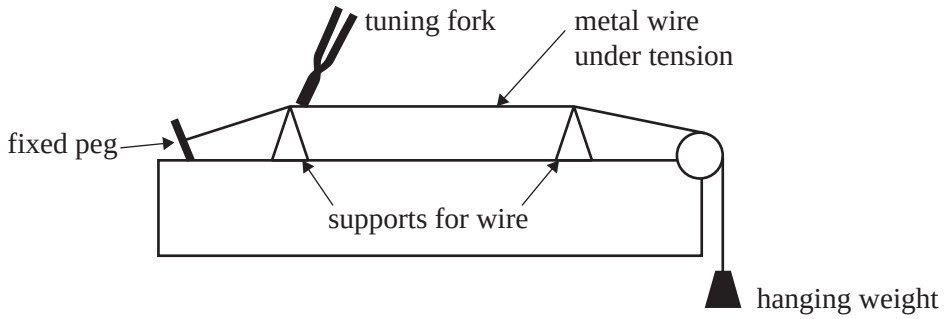

Figure 13

The apparatus consists of two supports and a metal wire that is stretched between a fixed peg and a hanging weight. The wire is under tension.

The tuning fork is set vibrating and is then touched onto the wire close to the left-hand support, which makes the wire vibrate at the same frequency as the tuning fork.

a. Draw a diagram of the simplest standing wave pattern that can exist on the vibrating section of the wire (the fundamental) between the two supports. 2 marks

b. When the distance between the supports is 0.92 m, the fundamental frequency resonates in the wire.

Calculate the wavelength of the fundamental. Show your working. 2 marks

m

c. Calculate the frequency of the tuning fork if the speed of the waves in the wire is 224 m s^{-1}. Show your working. 2 marks

Hz

Question 13 (3 marks)

In an experimental set-up used to investigate standing waves, a 6.0 m length of string is fixed at both ends, as shown in Figure 12. The string is under constant tension, ensuring that the speed of the wave pulses created is a constant 40 m s^{-1}.

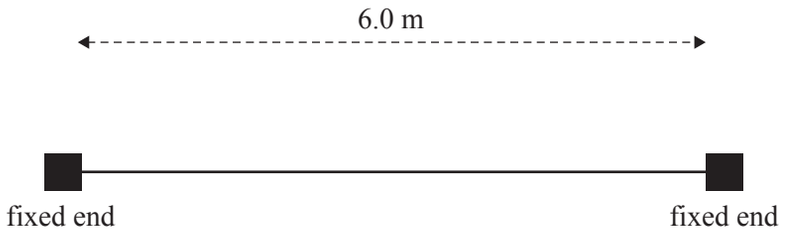

Figure 12

In an initial experiment, a continuous transverse wave of frequency 7.5 Hz is generated along the string.

a. Determine the wavelength of the transverse wave travelling along the string. 1 mark

m

b. Will a standing wave form? Give a reason for your answer. 2 marks