Standing Waves Questions for A-level Physics

Basic Concepts

1. What is the phase difference between particles at adjacent nodes in a standing wave?

2. Sketch a standing wave with two nodes and two antinodes. Label each part.

3. A string is 1.2 m long and has nodes at both ends. How many nodes and antinodes are present in the second harmonic?

4. Explain why there is no energy transfer in a standing wave, despite the wave being composed of oscillating particles.

5. Describe the difference between pipe closed at both ends and a pipe open at one end, in terms of standing wave formation.

Calculation Questions

6. If a string vibrates in its fundamental mode at a frequency of 200 Hz and its length is halved, what is the new fundamental frequency?

7. Given a string with mass per unit length μ=0.020 kg/m and tension T=50 N, calculate the frequency of the fundamental mode for a string of length L=1.0 m.

8. If the tension in a string is quadrupled, by what factor does the fundamental frequency of the standing wave increase?

9. A 1.0 m string has a fundamental frequency of 100 Hz. If its mass per unit length is 0.010 kg/m, calculate the tension in the string.

10. A 0.75 m pipe closed at one end resonates at 115 Hz in its fundamental mode. Calculate the wavelength and the speed of sound.

11. Calculate the tension needed in a 1.5 m string with a mass per unit length of 0.030 kg/m to produce a fundamental frequency of 120 Hz..

12. If a 2.0 m long string has a mass per unit length of μ=0.035kg/m and a fundamental frequency of 60 Hz, calculate the tension in the string.

13. A string with a length of 1.5 m has a fundamental frequency of 90 Hz when stretched with a tension of 30 N. Find the mass of the string.

14. Calculate the length of a string with a fundamental frequency of 75 Hz, a tension of 50 N, and a mass per unit length of μ=0.010 kg/m.

15. A 100 Hz standing wave is observed on a string under 30 N tension with mass per unit length μ=0.0050 kg/m. Determine the length of the string.?