

Solutions

These allocations are for the original questions on this sheet. B1 = one standalone point, M1 = one method point, A1 = one accuracy point.

2.1 Amplitude is the maximum displacement from equilibrium. Period is the time for one complete vibration.

2.2 Frequency counts cycles per second: $f = N/t = 15/12 = 1.25$ Hz. $T = 1/f = 0.80$ s. The disturbance speed is $v = f\lambda = 1.25 \times 2.4 = 3.0$ m s⁻¹.

2.3 (a) Period $T = 0.020$ s. (b) Wavelength $\lambda = 0.020$ m. The axis identifies whether the graph follows one point over time or many points at one instant.

3.1 Molecules vibrate parallel to propagation, about fixed mean positions while the disturbance travels onwards. A compression has above-equilibrium pressure/density. It occurs where neighbouring molecular displacements crowd molecules together, rather than where displacement itself is greatest.

3.2 The full time is $t = 4.0 \times 0.50 = 2.0$ ms. $T = t/N = 2.0 \times 10^{-3}/8.0 = 2.5 \times 10^{-4}$ s. $f = 1/T = 4.0 \times 10^3$ Hz. $\lambda = v/f = 340/4000 = 0.085$ m. The horizontal axis is time, so peak separation is period, not a spatial distance.

3.3 Vertical axis is displacement with centimetres; horizontal axis is distance with metres. A repeating curve reaches +2.0 and -2.0 cm. Two full cycles occupy 1.20 m, with successive crests 0.60 m apart. A point gives the displacement of a particle at that position at one common instant, rather than its whole path through time.