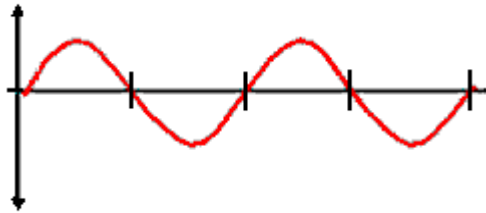


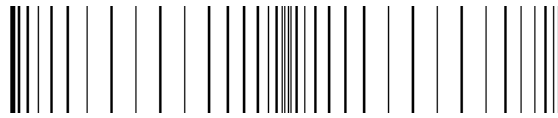
SOLUTIONS:

1. Period is the time for a complete vibration (“there and back”), frequency is the number of times this happens per second, and wavelength is the distance the wave propagates during this time.

2. Transverse



- Longitudinal



3. Frequency defines pitch, amplitude defines volume.

4. $f = 1.54 \times 10^7 \text{ Hz}$

$$T = \frac{1}{f} = \frac{1}{1.54 \times 10^7} = 6.49 \times 10^{-8} \text{ s}$$

5. $f = \frac{1}{T} = \frac{1}{0.023} = 43 \text{ Hz}$

6. $v = f \lambda$

$$\therefore \lambda = \frac{v}{f} = \frac{16.2}{0.354} = 45.8 \text{ m}$$

7. $f = \frac{1}{T} = \frac{1}{0.500} = 2.00 \text{ s}$

$$v = f \lambda = 2.00 \times 170 = 340 \text{ ms}^{-1}$$

8. Two waves of equal amplitude and frequency travelling in opposite directions experience interference resulting in nodes (points of constant zero amplitude) and antinodes (points which oscillate from positive to negative at twice the amplitude of one original wave).
9. When a source is moving through the medium it creates waves in, it is leaving the waves behind it more quickly and almost catching up to the waves it produces in front, since the waves travel a constant speed in the medium (i.e. not relative to the speed of the object producing them). This means the waves in front are produced closer together (higher frequency) and the waves behind are produced further apart (lower frequency).
10. The wave with wavelength 1m. (Since it has a higher frequency therefore vibrates faster).
11. The mirror is microscopically smooth while the paper is not. When light reflects off the paper it does so in many directions, and mixes together to make white. (The paper exhibits diffuse reflection, the mirror exhibits specular reflection).
12. Their angles to the normal (right angles to the surface) are equal.
13. $n_1 \sin \theta_1 = n_2 \sin \theta_2$

$$14. n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\therefore \sin \theta_2 = \frac{n_1 \sin \theta_1}{n_2}$$

$$\therefore \theta_2 = \sin^{-1} \left(\frac{n_1 \sin \theta_1}{n_2} \right)$$

$$= \sin^{-1} \left(\frac{1.33 \times \sin 32.0^\circ}{1.54} \right)$$

$$= 27.2^\circ$$

$$15. n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\therefore n_1 = \frac{n_2 \sin \theta_2}{\sin \theta_1}$$

$$= \frac{1.003 \times \sin 22.30^\circ}{\sin 45.21^\circ}$$

$$= 0.5363$$

16. Pure white is made up of all colours of visible light, so if the lighting is slightly yellow then the complementary colour of yellow (blue) must to some extent be missing from the light source. In the shops some of the blue colour from clothing will be missing, so the clothes will look more blue in the sunlight and more yellow in the shop.

17. A white page would look yellow.

A blue page would look black.