Chapter D

Waves

$^{8}/_{10}$

D1 Amplitude and Intensity

D1.1 5.0 W of light from a lamp shines on a 2.0 m × 3.0 m wall. Calculate the intensity.

D1.2 A 0.50 W laser is shone on a wall, making a circular spot of diameter 1.0 mm. Work out the intensity.

D1.3 Work out the power of the source needed to cover a 7.0 m × 7.0 m stage with light to an intensity of 300 W m^{-2}.

D1.4 If one day the solar intensity incident on a part of England is 400 W m^{-2}, work out the total energy that would arrive in one minute on a square piece of land 2.0 km × 2.0 km.

D1.5
a) One laser emits light that has amplitude 200 V m^{-1} and intensity 0.26 W m^{-2}. Another laser emits light of amplitude 300 V m^{-1}. In all other respects it is identical. Work out its intensity.

b) A third similar laser emits light with intensity 1.5 W m^{-2}. Work out the amplitude of the light.

D1.6 Three sets of ripples on the surface of a pond have amplitudes 1.5 cm, 2.25 cm and 3.0 cm respectively. Work out the ratios of the intensities of these three waves.

D1.7 The light from a bulb shines equally in all directions.

a) If 20 W of light is given off, what will the intensity be 12 m from the lamp? (Consider the shape of the region illuminated if the light hits this surface after travelling 12 m in all directions.)

b) What will the intensity be at a distance of 24 m?

D1.8 The Sun is 1.5×10^{11} m from the Earth. If the power incident on Earth is approximately 1.0 kW m^{-2}, calculate the total power (luminosity) of the Sun.