Answers Week 14

14-1   Sound and light waves diffract and spread out when they go through an opening. For a narrow opening the spread angle is

$$Sin\theta_1 = \frac{\lambda}{\omega}$$

where λ = wavelength
            ω = width of opening

Sound has wavelengths between 17mm and 17m, so θ_1 is large for doors and windows, hence sound spreads while going around corners. The wavelengths of light are around 10^{-7}m. Therefore, θ_1 is close to zero for large openings and there is effectively no spreading. For $\omega \gg \lambda$, light travels in straight lines (Geometrical optics).

14-3   Both involve superposition of waves. However, in Interference one is dealing with a finite number (2, 3, 4…) of coherent waves while in Diffraction essentially an infinite number of sources are effective.

14-5 $4 \times 10^{-3} < \theta_1 < 7 \times 10^{-3}$ radian

14-7 $t = 120$nm

14-9 $\omega = 1.74 \times 10^{-4}$m