

e.g. 31-1. wavelength of EM waves.

22-1

(a). $f = 60 \text{ Hz}$. [AC power line]

$$c = \lambda f, \quad \lambda = \frac{c}{f}, \quad c = 3.0 \times 10^8 \text{ m/s}$$

$$\lambda = \frac{3 \times 10^8}{60} = 5 \times 10^6 \text{ m} = 5000 \text{ km}.$$

(b). $f = 93.3 \text{ MHz} = 9.33 \times 10^7 \text{ Hz}$. [FM radio].

$$\lambda = \frac{c}{f} = 3.22 \text{ m}$$

(c). $f = 4.74 \times 10^{14} \text{ Hz}$. [visible light — Red]

$$\lambda = \frac{c}{f} = 6.33 \times 10^{-7} \text{ m} = 633 \text{ nm} \quad (\text{He-Ne laser})$$

e.g. 31-2. cell phone antenna.

$$l = \frac{\lambda}{4} = 8.5 \text{ cm} = 8.5 \times 10^{-2} \text{ m}.$$

$$\lambda = 4 \times 8.5 \times 10^{-2} \text{ m} = 3.4 \times 10^{-1} \text{ m} = 0.34 \text{ m}.$$

$$f = \frac{c}{\lambda} = \frac{3 \times 10^8}{0.34} = 8.8 \times 10^8 \text{ Hz} = 880 \text{ MHz}.$$