

56. (a) The distance from the Earth to the Moon is $d_{em} = 3.82 \times 10^8$ m (see Appendix C). Thus, the time required is given by

$$t = \frac{2d_{em}}{c} = \frac{2(3.82 \times 10^8 \text{ m})}{2.998 \times 10^8 \text{ m/s}} = 2.55 \text{ s} .$$

- (b) We denote the uncertainty in time measurement as δt and let $2\delta d_{es} = 15$ cm. Then, since $d_{em} \propto t$, $\delta t/t = \delta d_{em}/d_{em}$. We solve for δt :

$$\delta t = \frac{t\delta d_{em}}{d_{em}} = \frac{(2.55 \text{ s})(0.15 \text{ m})}{2(3.82 \times 10^8 \text{ m})} = 5.0 \times 10^{-10} \text{ s} .$$