

**Physics 100A – Fall 2009**  
**Chapter 1**

Solutions are provided only for problems from your textbook. The other problems already have so much guidance and notes that you should be able to understand where you have gone wrong.

**Problems**

**1.2) Picture the Problem:** This is simply a units conversion problem.

**Strategy:** Multiply the given number by conversion factors to obtain the desired units.

**Solution:** (a) Convert the units:  $70 \mu\text{m} \times \frac{1.0 \times 10^{-6} \text{ m}}{\mu\text{m}} = 7.0 \times 10^{-5} \text{ m}$

(b) Convert the units:  $70 \mu\text{m} \times \frac{1.0 \times 10^{-6} \text{ m}}{\mu\text{m}} \times \frac{1 \text{ km}}{1000 \text{ m}} = 7.0 \times 10^{-8} \text{ km}$

**1.17) Picture the Problem:** This is a significant figures problem.

**Strategy:** Follow the given rules regarding the calculation and display of significant figures.

**Solution:** (a) The leading zeros are not significant: 0.000054 has 2 significant figures.

(b) The middle zeros are significant:  $3.001 \times 10^5$  has 4 significant figures.

**Insight:** Zeros are the hardest part of determining significant figures. Scientific notation can remove the ambiguity of whether a zero is significant because any trailing zero to the right of the decimal point is significant.

**1.34) Picture the Problem:** This is a units conversion problem.

**Strategy:** Multiply the known quantity by appropriate conversion factors to change the units.

**Solution:** (a) Convert m/s to ft/s:  $\left(20 \frac{\text{m}}{\text{s}}\right) \left(\frac{3.28 \text{ ft}}{1 \text{ m}}\right) = 65.6 \text{ ft/s}$ .

(b) Convert m/s to mi/h:  $\left(20 \frac{\text{m}}{\text{s}}\right) \left(\frac{1 \text{ mi}}{1609 \text{ m}}\right) \left(\frac{3600 \text{ s}}{1 \text{ h}}\right) = 44.7 \text{ mi/h}$

**Insight:** Conversion factors are conceptually equal to one, even though numerically they often equal something other than one. They are often helpful in displaying a number in a convenient, useful, or easy-to-comprehend fashion.

**1.47) Picture the Problem:** This is a units conversion problem.

**Strategy:** Multiply the known quantity by appropriate conversion factors to change the units.

**Solution:** (a) Convert m/s to mi/h:  $\left(140 \frac{\text{m}}{\text{s}}\right)\left(\frac{1 \text{ mi}}{1609 \text{ m}}\right)\left(\frac{3600 \text{ s}}{1 \text{ h}}\right) = 310 \text{ mi/h}$

(b) First, convert m/s to m/ms:  $\left(140 \frac{\text{m}}{\text{s}}\right)\left(\frac{1 \times 10^{-3} \text{ s}}{1 \text{ ms}}\right) = 0.14 \text{ m/ms}$ . Then in 5.0 ms, the

impulses can travel a distance of  $\left(0.14 \frac{\text{m}}{\text{ms}}\right)(5.0 \text{ ms}) = 0.70 \text{ m}$ .