Dimensional Analysis - Practice Problems

1. How many cm are in 1 km? How many km are in 1 cm?

2. Convert 100 mL to gallons, given:
   
   \[
   \begin{align*}
   1 \text{ fl. oz.} &= 29.57 \text{ mL} \\
   1 \text{ cup} &= 8 \text{ fl. oz.} \\
   1 \text{ pint} &= 2 \text{ cups} \\
   1 \text{ quart} &= 2 \text{ pints} \\
   1 \text{ gallon} &= 4 \text{ quarts}
   \end{align*}
   \]

3. The mass of a proton is \(1.67263 \times 10^{-24}\) g, and the mass of an electron is \(9.10939 \times 10^{-28}\) g. A molecule of H\(_2\) has two protons and two electrons. Find its mass.

4. In 2009, Usain Bolt ran the 100m dash in 9.58s. Find his average velocity in miles/hour. (You may find it useful to know that 1m = 39.37 inches, 1 foot = 12 inches, and 1 mile = 5,280 feet.)

5. (a) Convert \(3.2 \times 10^7\) m to cm.
   
   (b) Convert \(3.2 \times 10^7\) m\(^3\) to cm\(^3\).

6. The speed of light, \(c\), is approximately \(2.9979 \times 10^8\) m/s. The distance from the sun to the earth is approximately \(1.511 \times 10^8\) km. How many seconds does it take for light to travel from the sun to the earth?