Chapter 1: Introduction & Background Review

End of Chapter Questions

1. What are the necessary steps of the “Scientific Method”?

2. How do you determine whether a hypothesis is scientific or not?

3. Calculate the average speed with which the earth revolves around the sun. Use the data given in this chapter, and the fact that speed is distance divided by time. Express your answer in

   (a) m/s using the scientific notation,
   (b) m/s in conventional form, and
   (c) km/h in conventional form.

   ![Circumference = 2 * \pi * Radius](image)

4. Answer the following in conventional form as well as the scientific notation. (a) Your cordless phone works on a frequency of 900,000,000 Hz (or cycles per second). How many MHz is that? (b) Thickness of a single strand of human hair is about 50 \text{ nm}. How many meters is that? (c) How many ns are there in 0.5 \text{ s}?

   \begin{align*}
   \text{Circumference} &= 2 \pi \cdot \text{Radius} \\
   \end{align*}

Answers

1. Observation and measurement; forming hypothesis; making prediction based on hypothesis; testing prediction.
2. If there is no way to prove the hypothesis right or wrong, it is not scientific.
3. Distance to the sun is 1.5 x 10^{11} \text{ m} so earth travels a distance equal to 2 \pi (1.5 x 10^{11}) \text{ m} in one year or (365 x 24 x 60 x 60) \text{ seconds}. Therefore the average speed is (a) 2.9886 x 10^{4} \text{ m/s}, (b) 29,886 \text{ m/s}, (c) 29.886 \text{ km/h} or (29.886 x 60 x 60) \text{ km/h} or 107,590 \text{ km/h}.
4. (a) 900 MHz, (b) 5 \times 10^{-6} \text{ m}, (c) (0.5 \times 10^{9}/10^{3}) or 500 \text{ ns}