

Physics 101: Major Concepts in Physics I

Fall 2017

Homework 1 on Chapter 1

Go to “Problems” at the end of Chapter 1 beginning on page 19.

(1) 1.4, which stands for the 4th problem in Chapter 1.

A spherical balloon is partially blown up and its surface area is measured. More air is then added, increasing the volume of the balloon. If the surface area of the balloon expands by a factor of 2.0 during this procedure, by what factor does the radius of the balloon change?

(2) 1.44, which stands for the 44th problem in Chapter 1.

One equation involving force states that $F_{net} = ma$, where F_{net} is in newtons (N), m is in kg , and a is in $m s^{-2}$. Another equation states that $F = kx$, where F is in newtons, k is in $kg s^{-2}$, and x is in m . (a) Analyze the dimensions of ma and kx to show they are equivalent. (b) What are the dimensions of the force unit newton?

(3) 1.60

You have just performed an experiment in which you measured many values of two quantities, A and B . According to theory, $A = cB^3 + A_0$. You want to verify that the values of c and A_0 are correct by making a graph of your data that enables you to determine their values from a slope and a vertical axis intercept. What quantities do you put on the vertical and horizontal axes of the plot?

(4) 1.72

The smallest living thing is probably a type of infectious agent known as a viroid. Viroids are plant pathogens that consist of a circular loop of single-stranded RNA, containing about 300 bases. (Think of the bases as beads strung on a circular RNA string.) The distance from one base to the next (measured along the circumference of the circular loop) is about $0.35 nm$. What is the diameter of a viroid in (a) m , (b) μm , and (c) in ?

(5) 1.90

Find the order of magnitude of the number of cups of water required to fill a bathtub.

DUE: Wednesday, September 6, 2017 at the beginning of lecture