

PHYSICS 111 HOME WORK PROBLEMS

Chapter 1 Problems

5. (I) What is the percent uncertainty in the measurement 2.26 ± 0.25 m?
7. (I) Time intervals measured with a stopwatch typically have an uncertainty of about a half second, due to human reaction time at the start and stop moments. What is the percent uncertainty of a hand-timed measurement of (a) 5 s, (b) 50 s, (c) 5 min?
12. (I) Express the following using the prefixes of Table 1-4: (a) 10^6 volts, (b) 10^{-6} meters, (c) 5×10^3 days, (d) 8×10^2 bucks, and (e) 8×10^{-9} pieces.
26. (II) Estimate the number of times a human heart beats in a lifetime.
31. (III) The rubber worn from tires mostly enters the atmosphere as particulate pollution. Estimate how much rubber (in kg) is put into the air in the United States every year. To get you started, a good estimate for a tire tread's depth is 1 cm when new, and the density of rubber is about 1200 kg/m^3 .
37. Estimate the number of gumballs in the machine shown in Fig. 1-11.

FIGURE 1-11 Problem 37. Estimate the number of gumballs in the machine.

Table 1-4

TABLE 1-1
Metric (SI) Prefixes[†]

Prefix	Abbreviation	Value
tera	T	10^{12}
giga	G	10^9
mega	M	10^6
kilo	k	10^3
hecto	h	10^2
deka	da	10^1
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro [‡]	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}
femto	f	10^{-15}

[†] See also inside the front cover.

[‡] μ is the Greek letter "mu."

13. (I) Write the following as full (decimal) numbers with standard units: (a) 86.6 mm, (b) $35 \mu\text{V}$, (c) 860 mg, (d) 600 picoseconds, (e) 12.5 femtometers, (f) 250 gigavolts.
17. (II) A typical atom has a diameter of about 1.0×10^{-10} m. (a) What is this in inches? (b) How many atoms are there along a 1.0-cm line?
21. (II) A *light-year* is the distance light (speed = 2.998×10^8 m/s) travels in 1.00 year. (a) How many meters are there in 1.00 light-year? (b) An astronomical unit (AU) is the average distance from the Sun to Earth, 1.50×10^8 km. How many AU are there in 1.00 light-year? (c) What is the speed of light in AU/h?
38. An average family of four uses roughly 1200 liters (about 300 gallons) of water per day. (One liter = 1000 cm^3 .) How much depth would a lake lose per year if it uniformly covered an area of 50 square kilometers and supplied a local town with a population of 40,000 people? Consider only population uses, and neglect evaporation and so on.
39. How big is a ton? That is, what is the volume of something that weighs a ton? To be specific, estimate the diameter of a 1-ton rock, but first make a wild guess: will it be 1 ft across, 3 ft, or the size of a car? [Hint: Rock has mass per volume about 3 times that of water, which is 1 kg per liter (10^3 cm^3) or 62 lbs per cubic foot.]

