PHYSICS 1570
Homework #1

(Due Feb. 1, 2023, 6:00 pm)

Always show your work. Do NOT just write down the answers.

1. What is the numerical value of the acceleration due to gravity on the surface of the Moon? ($g = 9.8$ m/s$^2 = 32$ ft/s^2 on Earth.)

2. How much would an astronaut weighing 180 lb on Earth weigh on the Moon?

3. An open cylindrical container has a height of 8.0 cm and a diameter of 6.0 cm (inside measurements). What are (a) the inside surface area of the cylinder, and (b) its volume in mL?

4. A solid sphere of radius 8.0 cm has a mass of 1000 g. What is the density of the material making up the sphere?

5. Mercury has a density of 13.6 g/cm^3. What would be the volume of 68 g of mercury?

6. A conical pile of sand near a construction site has a base circumference of 31.4 ft and a height of 4.5 ft. If the sand has a density of 75 lb/ft^3, how many tons of sand are in the pile?

7. Perform the following conversions:

  (a) 60 mm to inches

  (b) 16.0 m to feet

  (c) 16.0 cm to inches

  (d) 20 km to miles

8. How many cubic centimeters (cm^3) are there in one cubic meter?

9. A person in a foreign country measures the dimensions of a floor to be 8.00 m × 10.0 m. He orders tile from an American supplier who sells it in ft^2. How many square feet should the supplier send?

10. True story: I was in Iceland a few years ago to attend the annual World Esperanto Congress, and noticed that the price of gasoline at the local Nesti station in Reykjavík was posted as 252.9 Icelandic krónur (kr.) per liter. I wondered what the price was in U.S. dollars per gallon. I could not remember the conversion factor between liters and gallons, but I *could* remember the following facts:

- The exchange rate: 1 kr. = 0.825764¢.

- 1 gallon = 231 cubic inches.

- 1 inch = 2.54 cm.

- 1 cm^3 = 1 milliliter.

- $1 = 100¢.

Using *only* these facts, convert 252.9 kr./liter to find the price of gas in Iceland in dollars per gallon. Compute your answer to the nearest penny per gallon. (*Do not* look up the liters-to-gallons conversion factor to work this problem.)

11. Estimate the number of teaspoons of water in the Chesapeake Bay. The Bay has an area of 4479 square miles, and an average depth of 7.7 fathoms. (This type of problems is what physicist call a "back of the envelope problem." Refer to Appendix J of the class notes for appropriate conversions factors. The volume of the Bay will be its area times its depth.)

12. The nearest star to the Earth is the red dwarf star Proxima Centauri, at a distance of 4.218 light-years. Convert this distance to barleycorns. (1 barleycorn = 1/3 inch.)

13. If Peter Piper picks a peck of pickled peppers per picosecond, then how many pints of pickled peppers does Peter Piper pick per year? (See Appendix J of the course notes for conversion factors. Assume pints are US dry pints: 1 peck = 2 dry gallons = 16 dry pints.)