

Physics 114: Problem Set #1

Department of Physics and Astronomy

Sonoma State University

Due Friday, February 8, 2008, 11:50 am (in class)

- Text: Physics for Scientists and Engineers, 7th Edition, by Raymond A. Serway, and John W. Jewett;
 - Please read chapter 1;
 - Show your work;
1. (1 point) A rectangular building lot is 120 ft by 190 ft. Determine the area of this lot in m^2 .
 2. (2 points) An auditorium measures $45.0\ m \times 20.0\ m \times 5.0\ m$. The density of air is $1.20\ kg/m^3$.
 - (a) What is the volume of the room in cubic feet?
 - (b) What is the weight of air in the room in pounds?
 3. (1 point) A standard 1 kilogram weight is a cylinder $52.0\ mm$ in height and $49.5\ mm$ in diameter. What is the density of the material? Note: Density = $\frac{mass}{volume}$, and the volume of a cylinder is $V = \pi r^2 h$ where r is the radius of the base, and h is the height of the cylinder.
 4. (1 point) Newton's law of universal gravitation is represented by the following equation: $F = \frac{GMm}{r^2}$, where F is the magnitude of the gravitational force in newtons (1 newton = $1\ kg \cdot m/s^2$) exerted by one object (mass= m) on another (mass = M), and r is the distance between these two objects. What are the SI units of the proportionality constant G ?
 - (a) $m^2/(kg \cdot s^2)$
 - (b) $m/(kg \cdot s^2)$
 - (c) $(kg \cdot s^2)/m^3$
 - (d) s^2/m^3

(e) $(kg \cdot s^2)/m$

(f) $(kg \cdot s^2)/m^2$

(g) m^3/s^2

(h) $m^3/(kg \cdot s^2)$

5. (1 point) One cubic meter ($1.00 m^3$) of aluminum has a mass of $2.70 \times 10^3 kg$, and the same volume of iron has a mass of $7.86 \times 10^3 kg$. Find the radius of a solid aluminum sphere in cm that will balance a solid iron sphere of radius $2.30 cm$ on an equal-arm balance. Note: the volume of a sphere of radius r is $V = \frac{4\pi r^3}{3}$.
6. (4 points) How many significant figures are there in the following numbers?
- (a) 84.0
- (b) 3.516×10^6
- (c) 4.35×10^{-5}
- (d) 0.00504
7. (1 point) A child is surprised that she must pay 1.42 dollars for a toy marked 1.24 dollars because of sales tax. What is the effective tax rate on this purchase?
8. (2 points) Find every angle θ between 0° and 360° for which the ratio of $\sin\theta$ to $\cos\theta$ is -3.00 . (Round your answer to the nearest degree.)
9. An automobile tire is rated to last for 45,000 miles. To an order of magnitude, through how many revolutions will it turn?