

Contemporary Physics I – HW 3

HW 3

Due October 14, 2007

Please answer all questions clearly and concisely. While you need not transcribe the question completely, it should be clear from your answer alone what you are talking about.

You are strongly encouraged to discuss the homework with your classmates, but you must complete the written homework by yourself, and of course, the material you submit must be your own.

Remember, show all of your work!

1. You have a spring with constant $k = 200\text{N}/\text{m}$ attached to a 3kg mass. What is the:
 - (a) Angular frequency?
 - (b) Frequency?
 - (c) Period?
 - (d) How long would you have to make a pendulum such that it swung at exactly the same rate as the oscillator?
 - (e) If you hung the mass from the spring, how much would the spring stretch?
2. Consider a spring of unstretched length 1m, with a spring constant 500N/m. You then attach a 2kg mass to the end of the spring and spin it around horizontally (ignore gravity) with a frequency of 1Hz (1 revolution per second). How long will the spring be if the mass revolves at a constant rate?

Note: This is a toughy, so give it some thought, and don't be afraid to ask Travis or me for some pointers.
3. Air pressure is approximately $10^5\text{N}/\text{m}^2$. Assuming the surface of the earth to be smooth and gravitational acceleration= g ($9.8\text{ m}/\text{s}^2$ over all of the atmosphere):
 - (a) The earth has a radius of $6.4 \times 10^6\text{m}$. What is the surface area of the earth?
 - (b) What is the total Force of the atmosphere on the surface of the earth?
 - (c) Since the net momentum of the atmosphere is constant (zero, actually), there must be no net force, and thus, by Newton's 3rd law, the force on the atmosphere from the earth must be equal and opposite to your answer in part b). Also, since the only other game in town in gravity – what's the total mass of the atmosphere?
4. 4.HW.75
5. 4.HW.78
6. 4.HW.86
7. 4.HW.101