HOMEWORK ASSIGNMENT #2
(Due 11:59 pm, Tuesday, January 26, 2010)

I. Questions: 5 points

Q1. The motion of an object can be described by plotting its ____________, ____________, and ____________ as a function of time.

Q2. An object in free fall experiences a constant, downward acceleration of \( g = \) ____________ m/s\(^2\).

Q3. An alternate description of the motion of an object provides its kinetic/potential energy (energy of motion) and its kinetic/potential energy (stored energy) as a function of time.

Q4. Work is done when a force is applied to an object that moves. The work done is the product of the average ____________ times the ____________ moved and has the SI unit of a ____________.

Q5. In a vibrating system, the total mechanical energy changes from ____________ energy of motion to ____________ energy and back to ____________ energy of motion during each cycle.

II. Problems: 15 points

P1. A runner covers a distance of 5.0 kilometers in 15 minutes. His average speed for this run = ____________ m/s or ____________ mi/hr.

The graph below shows the position \( x \) of an object versus the time \( t \). It applies to problems P2 \( \rightarrow \) P7.

P2. The object starts at the origin \( (x = 0) \). It also passes through the origin at time \( t = \) ____________ s and at time \( t = \) ____________ s.

P3. The object is first at rest between \( t = \) ____________ s and \( t = \) ____________ s and it is next at rest between \( t = \) ____________ s and \( t = \) ____________ s.

(over)
P4. The object has a positive velocity between $t = \underline{\quad} \text{s}$ and $t = \underline{\quad} \text{s}$.

P5. The instantaneous speed of the object at $t = 3 \text{ s}$ is $v = \underline{\quad} \text{m/s}$.

P6. The instantaneous speed of the object at $t = 10 \text{ s}$ is $v = \underline{\quad} \text{m/s}$.

P7. The average speed ($v_{av} = \text{total distance/time}$) in the time interval $0 < t < 5 \text{ s}$ is $\underline{\quad} \text{m/s}$.

P8. The kinetic energy of a 1500 kg automobile moving at a speed of 30 m/s is $\underline{\quad}$ joules.

P9. The potential energy of a 7.0 kg bowling ball held 2.0 m above the ground is $\underline{\quad}$ joules.

P10. A ball is dropped from a height of 20 m. You can use the relation between the work done by gravity and the change in the ball’s kinetic energy to determine the speed of the ball at any point in its free fall. The speed of the ball when it hits the ground is $\underline{\quad}$ m/s.

P11. A thick square steel plate has dimensions 1 cm $\times$ 50 cm $\times$ 50 cm and its mass is 20 kg. The weight ($W = mg$) of the steel plate is $\underline{\quad}$ N.

P12. A thick square steel plate has dimensions 1 cm $\times$ 50 cm $\times$ 50 cm and its mass is 20 kg. The pressure in pascals ($1 \text{ Pa} = 1 \text{ N/m}^2$) that the plate exerts on a table depends on its orientation.

- Positioned square face down, the pressure on the table is $\underline{\quad}$ Pa.
- Positioned edge down, the pressure on the table is $\underline{\quad}$ Pa.

P13. A mass of 1.0 kg hanging vertically on a spring causes its length to increase by 0.25 m.

The spring constant, $k$, of this system is $\underline{\quad}$ kg/s$^2$ (or N/m).

P14. The frequency of oscillation, $f$, [in Hertz (Hz), where 1 Hz = 1 oscillation/second] of this 1.0 kg mass-spring system with a force constant of 40 N/m is $\underline{\quad}$ Hz.

P15. A vertical mass-spring system with a force constant of 40 kg/s$^2$ (i.e., 40 N/m) is extended an additional 5.4 cm and released.

The total mechanical energy in its subsequent oscillations is $\underline{\quad}$ J.