PH 111 EXAM II-warm-up
April 12, 2012

1) The work done by the normal force when sliding a book across a level table is zero?
2) The forces of friction and gravity are both conservative?
3) To keep moving in a circle, one must overcome the centrifugal force?
4) To either stretch or compress a spring, one must do positive work?
5) Power is the rate of doing work?
6) How can various forces do either negative, positive or zero work....?
7) The change in momentum for any object in a closed system must be zero?
8) Can KE be negative; how about work; how about potential energy?
9) The total work done by the sun on a comet for one elliptical orbit is zero?
10) To lift a 10 kilogram rock upwards 10 meters in one second requires about 100 Watts?
11) The energy something has because of its position is called its potential energy?
12) Is it theoretically possible to rotate a large cylindrical space station at just the proper speed so that the people inside will experience a force that feels just like gravity? A preview for the next test.
13) Because the Earth & Moon are attracted towards each other, they will eventually hit? Preview….
14) What does "conservative" mean with respect to forces; which are and which are not?
15) Is total energy always conserved; total momentum? What is your system?
16) Explain neutral, stable, and unstable equilibrium. What happens to some mass at these various locations, and why.
17) A baseball pitcher throws a baseball and the batter hits it. During the hit, the baseball receives a greater impulse than the bat.
18) A perfectly elastic superball is dropped and bounces to the same height. Momentum is conserved for the following reason: The speed of the ball is the same just before and after the collision with the ground, and because its mass is constant, the value of m times v is the same.
19) Airbags protect people by decreasing the impulse suffered during crashes?
20) When a baseball is hit by a bat, it is possible for the ball to accelerate at several hundred g^s.
21) One day you will be telling your kids with their new drivers licenses that speed kills and to please be careful. If they respond that 75 mph is not that much faster than 55 mph, **can you** properly say that there is nearly 200% as much energy to do work on their bodies at that higher speed as at 55?

The next page contains example of the Multiple Choice Questions. {The numbers in these brackets represent a subjective, relative difficulty on scale of 1-easy to 5-hard}

22) Drop a one kilogram mass from a height of 2 meters onto a vertically oriented spring (with spring constant k = 100). Find the maximum compression distance, and the compression at equilibrium when the mass is at rest. {4}

23) Now orient the spring horizontally on a flat and level table top. Fix one end of the spring to a wall. Compress the other end with the one kilogram mass by 25 cm. How far will the mass slide on the table with mu (static) = 0.4 and mu (kinetic) = 0.35? The mass and spring are not connected, and the mass of the spring is negligible. {3}

24) What is the total work done by friction in problem # 32? {2!!}

25) What can be said about the potential energy vs. position graph shown? What is the fate of an object that is in this potential and has an energy of this or that? {4}

26) A horizontal spring is compressed a distance x = L as shown. The spring is responsible, along with friction, for holding two objects in place against the walls without touching the floor. Find a relationship between mu-static and the spring constant k. {3}

27) An escalator is used to carry 20 people every minute from one floor to another five meters up. If each person has a mass of 60 kg, the required power is about: {2}

28) Right now there are 6 astronauts in orbit traveling at nearly 8000 m/s. The other nearly 7 billion people on Earth are moving with an average speed somewhat under 0.5 m/s. This means about 10% of all the kinetic energy possessed by all the peoples of the world belongs to these 6 energetic astronauts.

29) A bullet (mass = 15 grams, speed = 300 m/s) imbeds itself in a stationary block of wood (m=1500 grams). What is the final speed of the wood assuming no loss of material for either substance? How high up a frictionless incline could the mass climb? How far could the mass skid on a level table with a static mu of 0.7 and a kinetic mu of 0.5? {4}

30) A bullet (mass = 15 grams, speed = 300 m/s) hits a stationary block of steel (m=1500 grams). The bullet bounces straight back off of the steel with a speed of 50 m/s. What is the final speed of the steel assuming no loss of material for either substance? {3}

31) Two ice skaters (zero friction) push off of each other while initially standing still. The 80 kg. skater is then moving north at 4.3 m/s. What is the 60 kg. skater doing? {2}

32) The 15 balls on a pool table are put into the triangle, and the cue ball is used to "break". If the mass of each ball is the same 0.4 kg., and the initial speed of the cue ball is 6 m/s immediately before the collision, what is the total momentum of all 16 balls immediately after the collision? What, if anything, can you say about the total momentum 2 seconds after the break? {3}