Name_____Section _____ **B**

Common Exam 3 Phys 105 **Fall 2008**

Physics 105 Formula Sheet:

$W = mg$ $g = 9.8\ m/s^2$ centi=c=0.01 kilo=k=1,000 mega=M=1,000,000

For constant a: $v = v_o + at$ $x - x_o = v_o t + \frac{1}{2}at^2$ $v^2 - v_o^2 = 2a\cdot(x - x_o)$ $x - x_o = \frac{1}{2}(v + v_o)t$

$F_{net} = ma$ $\Sigma\mathbf{F} = m\mathbf{a}$ $F_{st,max} = \mu_s N$ $F_k = \mu_k N$

Work: $W = \vec{F}\bullet\vec{d} = \left|\vec{F}\right|\left|\vec{d}\right|\cos\theta_{F,d}$, $W_{grav} = -\ mg\cdot(y-y_0)$, $W_{spring} = -1/2k(x^2-x_0^2)$, $W_{frict} = -F_k d$,

Work-Energy Theorem: $W_{tot} = K_f - K_i$

Kinetical Energy: $K = 1/2mv^2$, Power: $P = W/\Delta t = \mathbf{F}\cdot\mathbf{v}$

Potential Energy for gravity $U_g = mg\cdot(y-y_0)$, $\Delta U_g = -W_g$

Potential Energy for spring: $F = -kx$, $U_s = \frac{1}{2}kx^2$, $\Delta U_s = -W_s$

Mechnical Energy: $E_m = U + K$.

Conservation of mechnical energy: $\Delta E_m = \Delta U + \Delta K = 0$ if conservative forces are the only forces that do work on the system.

Work done by non-conservative forces: $W_{nc} = E_{m,f} - E_{m,i}$

Vectors: Components: $a_x = a\cdot\cos(\theta)$ $a_y = a\cdot\sin(\theta)$ $a = a_x\mathbf{i} + a_y\mathbf{j}$ $|a| = \sqrt{a_x^2 + a_y^2}$ $\theta = \tan^{-1}(a_y/a_x)$

Addition: $\mathbf{a} + \mathbf{b} = \mathbf{c}$ implies $c_x = a_x + b_x$, $c_y = a_y + b_y$

Dot product: $\mathbf{a}\cdot\mathbf{b} = a\cdot b\cdot\cos(\phi) = a_x b_x + a_y b_y + a_z b_z$ unit vectors: $\mathbf{i}\cdot\mathbf{i} = \mathbf{j}\cdot\mathbf{j} = \mathbf{k}\cdot\mathbf{k} = 1$; $\mathbf{i}\cdot\mathbf{j} = \mathbf{i}\cdot\mathbf{k} = \mathbf{j}\cdot\mathbf{k} = 0$

Physics 105 Exam 3 11/21/2008 Name_____ **B**

As a student at NJIT I will conduct myself in a professional manner and will comply with the provisions of the NJIT Academic Honor Code. I also understand that I must subscribe to the following pledge: On my honor, I pledge that I _____ have not violated the provisions of the NJIT Academic Honor Code.

Multiple Choice: *(15 questions, 1pt. each) Identify the letter of the choice that best answers the question.*

____ 1. If both mass and velocity of a ball are tripled, the kinetic energy is increased by a factor of:
a. 9.
b. 27.
c. 6.
d. 3.
e. 81.

____ 2. I use a rope 2.00 m long to swing a 10.0-kg weight around my head. The tension in the rope is 20.0 N. In half a revolution how much work is done by the rope on the weight?
a. 251 J
b. 126 J
c. 0
d. 40.0 J
e. None of the above.

____ 3. When an object is dropped from a tower, what is the effect of the air resistance as it falls?
a. increases the object's kinetic energy
b. does positive work
c. increases the object's potential energy
d. increases the total energy of the object
e. None of the above choices are valid.

____ 4. Preston pushes a wheelbarrow weighing 500 N to the top of a 50.0-m ramp, inclined at 20.0° with the horizontal, and leaves it. Tamara accidentally bumps the wheelbarrow. It slides back down the ramp, during which an 80.0-N frictional force acts on it over the 50.0 m. What is the wheelbarrow's kinetic energy at the bottom at of the ramp? (g = 9.8 m/s^2)
a. 8 150 J
b. 14 300 J
c. 6 550 J
d. 13 100 J
e. 4 550 J

____ 5. A professional skier reaches a speed of 56 m/s on a 30° ski slope. Ignoring friction, what was the minimum distance along the slope the skier would have had to travel, starting from rest?
a. 320 m
b. 640 m
c. 110 m
d. 720 m
e. 160 m

____ 6. A very light cart holding a 300-N box is moved at constant velocity across a 15-m level surface. What is the net work done in the process?
a. 20 J
b. 2 000 J
c. 1/20 J
d. 4500 J
e. Zero

____ 7. A parachutist of mass 50.0 kg jumps out of an airplane at a height of 1 000 m. The parachute deploys, and she lands on the ground with a speed of 5.0 m/s. How much energy was lost to air friction during this jump?
a. 49 400 J
b. 98 700 J
c. 489 000 J
d. 198 000 J
e. 534 000 J

____ 8. A 7.00-kg bowling ball falls from a 2.00-m shelf. Just before hitting the floor, what will be its kinetic energy? (g = 9.80 m/s^2 and assume air resistance is negligible)
a. 29.4 J
b. 156 J
c. 19.6 J
d. 137 J
e. 14.0 J

____ 9. The SI units for k, the spring constant, are equivalent to:
a. kg / s^2.
b. J.
c. J / N.
d. kg / s.
e. None of the above.

____ 10. Old Faithful geyser in Yellowstone Park shoots water hourly to a height of 40 m. With what velocity does the water leave the ground?
a. 34 m/s
b. 14 m/s
c. 7.0 m/s
d. 28 m/s
e. 20 m/s

____ 11. A worker pushes a wheelbarrow with a force of 40 N over a level distance of 6.0 m. If a frictional force of 24 N acts on the wheelbarrow in a direction opposite to that of the worker, what net work is done on the wheelbarrow?
a. 96 J
b. 75 J
c. 144 J
d. 240 J
e. 216 J

____ 12. I drop a 60-g golf ball from 2.0 m high. It rebounds to 1.5 m. How much energy is lost?
a. 0.50 J
b. 1.1 J
c. 1.0 J
d. 0.88 J
e. 0.29 J

____ 13. A horizontal force of 100 N is applied to move a 45-kg cart across a 9.0-m level surface. What work is done by the 100-N force?
a. 4 500 J
b. 900 J
c. 500 J
d. 5600 J
e. 405 J

____ 14. A Hooke's law spring is compressed 12.0 cm from equilibrium and the potential energy stored is 72.0 J. What is the spring constant in this case?
a. 1 200 N/m
b. 1 000 N/m
c. 5 000 N/m
d. No answer is correct.
e. 10 000 N/m

____ 15. An amount of work equal to 1.5 J is required to compress the spring in a spring-gun. What is the "launch speed" of a 15-g marble?
a. 23 m/s
b. 15 m/s
c. 14 m/s
d. 18 m/s
e. 21 m/s