**PHY 101 Exam #2** **Name _____**

| Problem | Points | Score |
|---|---|---|
| **1** | 9 | |
| **2** | 11 | |
| **3** | 15 | |
| **4** | 15 | |
| **Total** | 50 | |

**Instructions:**

1. Do all of your work in this booklet.
2. **Show all of your steps** in problems for full credit.
3. **Be clear and neat** in your work. Any illegible work, or scribbling in the margins, will not be graded.
4. Place you **answers in a box**.
5. If you need more space, you may **use the back of the page** and write **On back** in the problem space.

1**. Multiple Guess (9 pts)** Find the answer which best fits the question and write it in the space provided.

a. All of the following are units of energy except
a) joules; b) horsepower; c) kilowatt-hours; d) ergs;
e) none of these.

_____

b. A measure of inertia is
a) g b) apparent weight c) mass d) force e) none of these.

_____

c. The unit of force is
a) kg m/s b) kg m /$s^2$ c) kg $m^2$/s d) $kg^2$ m/s
e) none of these _____

d. The work done by friction is an example of what type of energy?
a) Nonconservative b) Conservative c) Kinetic d) Potential

_____

e. The angle of repose is
a) the angle for a properly banked track. b) the angle of an inclined plane at which a body would begin to slide. c) the proper angle for walking a tightrope. d) the angle at which you can no longer read the blackboard. e) none of these.

_____

f. Moving an object to a height of 5 ft takes _____ work along a steep ramp as opposed to one with a gentle slope.
a) more b) less c) the same amount of.

_____

g. In an inelastic collision what is conserved?
a) energy b) mass c) velocity d) momentum

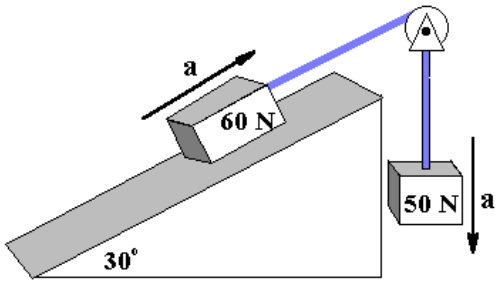
_____

h. A baseball player follows through with his swing to
a) increase the impulse imparted to the ball; b) conserve momentum; c) ensure an elastic collision; d) make the contact time with the ball as short as possible; e) none of the above.

_____

i. In the absence of a net force, an object will always
a) be at rest, b) be in motion with a constant non-zero velocity, c) be accelerated, d) none of the above. _____

2. **Definitions/Principles (11 pts)**
a. Assuming no friction, draw the forces acting on the masses in the picture. (5 pts!)




b. A 2.0 kg icicle falls from rest at a height of 20.0m. When the icicle is 10 m high, determine with reference to the ground:
i. total energy of the rock,

ii. the gravitational potential energy, and

iii. the kinetic energy.

c. Write the Impulse-Momentum Theorem?

d. Mass $m_1$, traveling at velocity $v_{1i}$, collides elastically with mass $m_2$ at rest. Write down the **exact** expressions for the final velocities of each mass.

**Bonus:**
a. Name the bomber that dropped the Hiroshima bomb.

b. What were the names of the two atomic bombs dropped on Japan?

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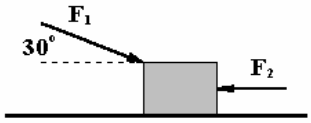
3. **Force Problems (15 pts)**

a. A 5.0 kg block hangs on a rope as shown. Draw the forces and find the tension in the rope.

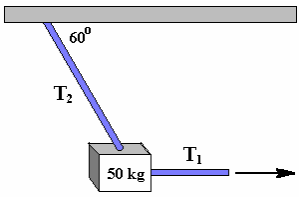
b. A 40 kg crate is at rest on a level floor. If $\mu_s = 0.50$, what horizontal force is needed to get the crate moving?

c. A block slides down a plane inclined at $30^o$ a constant velocity. What is the coefficient of kinetic friction between the block and the plane?

d. Two forces act on a 10.0 kg block as shown below. The magnitudes of the forces are $F_1 = 10.0\text{N}$ and $F_2 = 16.7\text{N}$. What is the horizontal acceleration (magnitude and direction) of the block?




e. A block is suspended on a rope and pulled to the right using another rope as shown below. Find the tensions in the ropes.




4. **Energy and Momentum (15 pts)**

a. A person pulls a toboggan for a distance of 35 m along the snow with a rope directed at $60^o$ above the snow. The tension in the rope is 100 N. How much work is done on the toboggan by the tension force?


b. A 0.150 kg baseball traveling with a horizontal speed of 4.50 m/s is hit with a bat and then moves with a speed of 35.50 m/s in the opposite direction. What is the magnitude of the change in the ball's momentum?

c. An astronaut is motionless in outer space. Upon command, the propulsion unit on his back ejects some gas with a velocity of 32 m/s and the astronaut recoils with a velocity of -0.25 m/s. After the gas is ejected, the mass of the astronaut is 160 kg. What is the mass of the ejected gas.

d. Three masses lie on a line: 10.0 g at $x$ = -1.0 m; 5.0 g at $x$ = 2.0 m; and, 10.0 g at $x$ = 5.0 m. Find the center of mass of this system.

e. A skier coasts down a 100 m high hill starting at 20 m/s. Neglecting the friction between the skies and the snow, determine how fast the skier should be moving at the bottom of the hill.