Work, Energy, and Momentum Review

Concepts

1. Energy – (Kinetic, Gravitational Potential, Spring)
2. Momentum
3. Collisions
   1. Elastic
   2. Inelastic
   3. Multi-dimensional collisions (hint: use vectors)
4. Work
5. Power
6. Impulse

Example problems:

1. Elastic Collision

A .450 kg ice puck, sliding across the ice with a speed of 3.00 m/s, has a head-on collision with a 0.900 kg puck initially at rest. Assuming a perfectly elastic collision, what is the final speed of the 0.900 kg puck if the .450 kg puck ends at rest?

1. Inelastic Collision

A person on ice skates with a mass of 61 kg is standing still. A ball with a mass of 3.0 kg is moving at 4.2 m/s at the person. The person catches the ball, and what is the resultant velocity?

1. Multi-dimensional collision

Ball A is moving at 4.8 m/s E before it collides elastically with ball B. Ball B is initially at rest and after the collision moves SE (45o) with respect to its initial position. If ball B and ball A have the same mass, what is the velocity of ball A after the collision?

1. Power

Calculate the power of gravity when a ball of 4.8 kg is dropped from a height of 9.2 m.

1. Work

A 45 kg block is sliding down a slope of 30o at a constant velocity. The length of the slope is 14 m. Calculate the work down by friction if the blocks slides down the length of the slope.

1. Potential – Kinetic

A 8.1 kg ball is held 3.8 m above the ground. If the ball rebounds off the ground at 6.8 m/s, what is the energy lost into the ground?

1. Kinetic – Potential

Hank is on a roller coaster cart. The cart is moving at 20.6 m/s at the bottom of the slope as it starts to climb up the slope. What is the maximum height of the slope?

1. Spring

A system has a spring constant of 1420 N/m. How much work must be done on the spring to compress it 0.49 m?

1. Efficiency

Using the spring question from above, if a lever is used to compress the spring has an efficiency of 0.78, how much work must be done on the lever?