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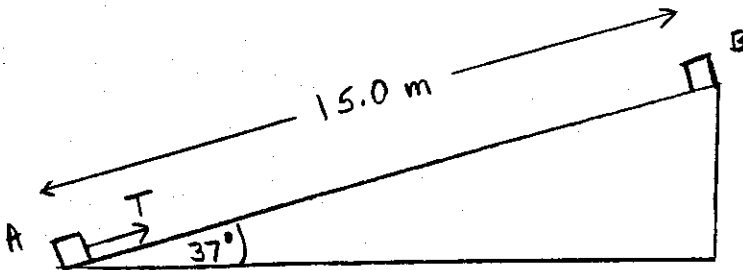
Name (signature as on ID) _____

Lab Section _____

Exam 2 Chaps. 6, 7, 8 In Young&Geller

Show all your work. Partial credit will be given if earned. Write your answers in the blanks provided.

(15 pts) 1. A box with mass 5.0 kg is pulled up a frictionless ramp that is inclined at 37° above the horizontal. The box is pulled up by a rope that is parallel to the ramp. The tension T in the rope is a constant 36 N. Calculate the work done by each of the following forces, when the box moves from point A at the bottom of the ramp to point B at the top of the ramp. The distance between points A and B , measured along the ramp, is 15.0 m. In each case, be sure to indicate whether the work is positive or negative.



a) the tension in the rope

Ans. +540J

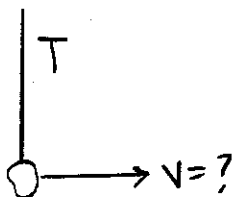
b) the gravity force acting on the box

Ans. -442J

c) the normal force acting on the box

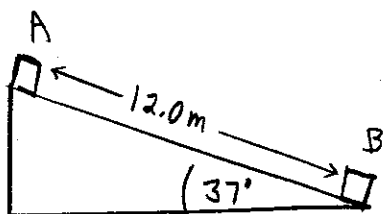
Ans. 0

(16 pts) 2. A small stone of mass 0.20 kg is attached to a string and whirled in a vertical circle of radius 1.5 m. When the stone is at the lowest point in its path, the tension in the string is $T = 3.6$ N. What is the speed of the stone at this point?



Ans. 3.51 m/s

(18 pts) 3. A 5.0 kg box is released from rest at the top of a 37° incline. The box slides from point A at the top of the incline to point B at the bottom. The distance, measured along the incline, from A to B is 12.0 m. For the motion from A to B , the work done by friction is -120 J. What is the speed of the box when it reaches point B ?



Ans. 9.67 m/s

(17 pts) 4. Your spaceship lands on an unknown planet. You release a small rock from rest at a point 8.0 m above the surface of the planet and you find that the rock has a speed of 5.0 m/s just before it strikes the surface. The mass of the planet is 5.0×10^{23} kg. The planet is a uniform sphere and has no atmosphere.

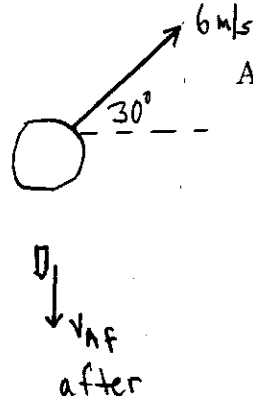
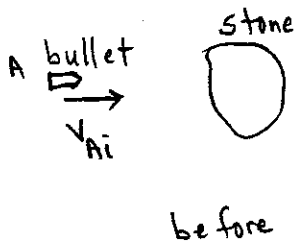
a) What is the radius of the planet?

Ans. 4.62×10^6 m

b) A communications satellite is in a circular orbit around the planet. In its orbit the satellite is a distance of 8.0×10^6 m above the surface of the planet. What is the speed of the satellite as it orbits the planet?

Ans. 1.63×10^3 m/s

(16 pts) 5. A stone with mass 0.200 kg rests on a frictionless horizontal surface. A bullet with mass 5.0×10^{-3} kg traveling horizontally at speed v_{Ai} strikes the stone and rebounds horizontally at a speed of v_{Af} in a direction perpendicular to its original motion. After being hit by the bullet, the stone is moving at 6.0 m/s, at 30° from the original direction of motion of the bullet. What are the speeds v_{Ai} and v_{Af} of the bullet before and after the collision?



Ans. v_{Ai} 208 m/s
 v_{Af} 120 m/s

(18 pts) 6. A 5.0 kg lump of clay is sliding at 15.0 m/s on a horizontal surface. It collides with and sticks to a 10.0 kg lump of clay that is initially at rest on the horizontal surface. The combined object then slides up an incline. What height above the horizontal surface will the combined object reach before it starts to slide back down? There is no friction for any of the surfaces.

Ans. 1.28 m

