Physics 201 MWF9:10 Fall 2006 (Ford)

Name (printed)_____

Name (signature as on ID)_____

Lab Section Number_____

Exam I Chapts. 1-5 in Young&Geller

The formula sheet is the last page of the exam. It can be torn off from the rest of the exam and doesn't have to be turned in.

Multiple Choice questions. Circle the correct answer. No work needs to be shown.

(5 pts) 1. A small rock is thrown from ground level with a velocity that has magnitude 20 m/s and direction 53° above the horizontal. Air resistance can be neglected. The speed of the rock at its maximum height is

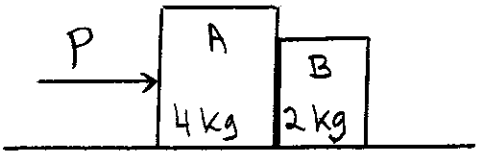
(a) zero
(b) 20 m/s
C (c) 12 m/s
(d) 16 m/s

(5 pts) 2. A small rock is thrown straight up with an initial speed of 40 m/s. Neglect air resistance. At the instant when the rock is at its maximum height, its acceleration is

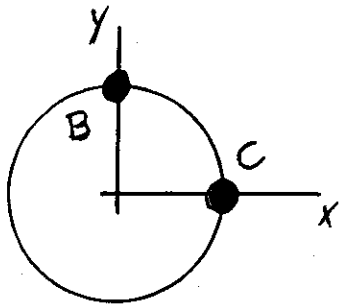
(a) zero
C (b) 9.8 m/s^2, upward
(c) 9.8 m/s^2, downward
(d) 40 m/s^2, upward
(e) 40 m/s^2, downward

(5 pts) 3. Two boxes, A and B, are accelerated across a horizontal floor by a worker who applies a horizontal force P. Box A has mass 4 kg and box B has mass 2 kg. Box A exerts a force of magnitude 8 N on box B. Which one of the following statements is correct?

(a) The force that box B exerts on box A is larger than 8 N.
C (b) The force that box B exerts on box A is smaller than 8 N.
(c) The force that box B exerts on box A is equal to 8 N.
(d) The force that box B exerts on box A is zero.



(5 pts) 4. A car travels at a constant speed of 5.0 m/s around the circular track shown in the figure. It takes the car 10.0 s to travel from point B to point C. The y-component of the average acceleration of the car for its motion from B to C is



(a) zero
(b) $+0.50\ \mathrm{m/s^2}$
(c) $+2.50\ \mathrm{m/s^2}$
(d) $-0.50\ \mathrm{m/s^2}$
(e) $-2.50\ \mathrm{m/s^2}$
(f) none of the above answers

On the following four problems show all your work. Partial credit will be given if earned. Write your answers in the blanks provided.

(18 pts) 5. At the instant the traffic light turns green, a car that has been stopped at an intersection starts to move forward with constant acceleration a. At the same instant, a truck traveling with a constant speed of 12.0 m/s passes the car.

a) What must be the acceleration a of the car if it comes alongside the truck after traveling a distance of 480 m?

Ans. $0.60\ \mathrm{m/s^2}$

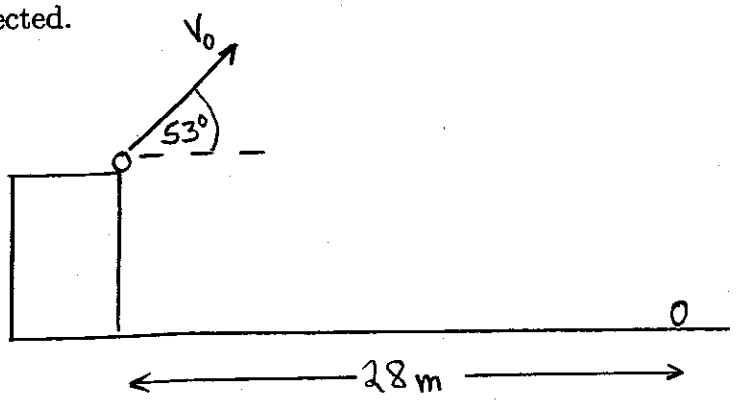
b) What is the speed of the car at the instant that it catches up with and overtakes the truck?

Ans. $24\ \mathrm{m/s}$

(18 pts) 6. A physics student is walking on flat ground. She walks 40.0 m due west and then 80.0 m in a direction 37.0° north of east. How far and in what direction must she walk to return to her starting point by the shortest route?

Ans. 53.7m, 26.4°

(22 pts) 7. A small stone is thrown from the roof of a building. The initial velocity of the stone has magnitude $v_0 = 15$ m/s and is directed at 53° above the horizontal. The stone travels a horizontal distance of 28 m before it strikes the ground. Air resistance can be neglected.



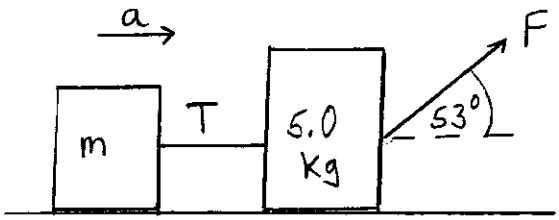
a) What is the height of the building?

Ans. 10.1 m

b) What is the speed of the rock just before it strikes the ground?

Ans. 20.6 m/s

(22 pts) 8. Two boxes connected by a light horizontal rope are on a horizontal surface. The coefficient of kinetic friction between each box and the surface is $\mu_k = 0.30$. One box has mass 5.0 kg and the other box has mass m. A force F with magnitude 40 N and direction 53° above the horizontal is applied to the 5.0 kg box and both boxes move to the right with $a = 1.50$ m/s^2.



a) What is the magnitude of the kinetic friction force that acts on the 5.0 kg box?

Ans. 5.13N

b) What is the tension T in the rope that connects the boxes?

Ans. 11.5N

c) What is the mass m of the second box?

Ans. 2.59kg