

Name (printed) _____

Name (signature as on ID) _____

Lab Section Number _____

Exam I Chaps. 1-4 in Cutnell and Johnson

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 ball is kicked from ground level with an initial speed of 20 m/s and at an angle of 53° above the horizontal. A dog standing next to the kicker starts to run with constant speed at the instant the ball is kicked. If the dog runs straight toward where the ball will land, what minimum speed must the dog have to catch the ball just before it strikes the ground? (Neglect air resistance.

- a) 8 m/s
- b) 12 m/s
- c) 16 m/s
- d) 20 m/s
- e) 25 m/s

(5 pts) 2. Neglect air resistance in this question. A rock dropped from the roof of a building strikes the ground 2.0 s after it is dropped. If instead of being dropped the rock is thrown horizontally at 20 m/s it would strike the ground

- a) 2.0 s after being thrown
- b) less than 2.0 s after being thrown
- c) more than 2.0 s after being thrown

(5 pts) 3. A truck is traveling west and it is slowing down (its speed is decreasing). A box sits in the bed of the truck. While the truck is slowing down the friction force on the box is

- a) zero
- b) directed toward the west
- c) directed toward the east

(5 pts) 4. If vector has components $A_x = -4$ m and $A_y = +3$ m, then the magnitude of the vector is

- a) 1 m
- b) 3 m
- c) 4 m
- d) 5 m
- e) 7 m

d

(5 pts) 5. A ball is thrown from the roof of a tall building with a speed of 40 m/s and at an angle of 37° above the horizontal. Neglect air resistance. At its maximum height above the roof the acceleration of the ball is

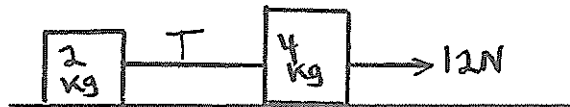
- a) zero
- b) 24 m/s
- c) 9.8 m/s^2 in the horizontal direction
- d) 9.8 m/s^2 upward
- e) 9.8 m/s^2 downward

e

(5 pts) 6. Two blocks, with masses 4 kg and 2 kg, are at rest on a horizontal frictionless surface. A constant horizontal force of 12 N is applied to the 4 kg block and the blocks start to move to the right. While the blocks are moving, the tension T in the light rope connecting the two blocks is

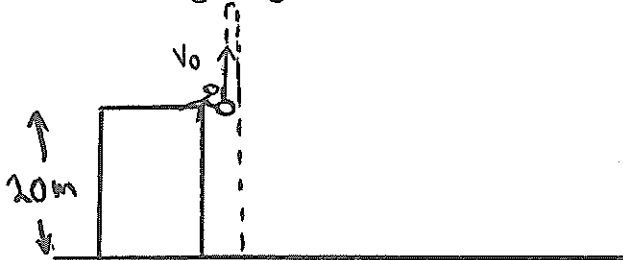
- a) 4 N
- b) 8 N
- c) 12 N
- d) zero

a



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) 7. A rock is thrown straight up with an initial speed of 15 m/s from the roof of a 20 m tall building. Neglect air resistance.



a) What is the maximum height above the roof reached by the rock?

Ans. 11.5 m

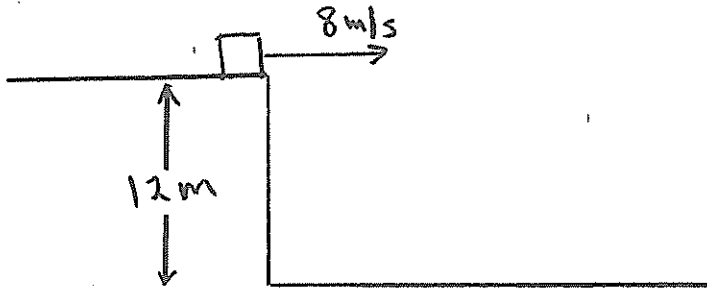
b) What is the speed of the rock just before it strikes the ground?

Ans. 24.8 m/s

c) How much time elapses, from when the rock is thrown until it strikes the ground?

Ans. 4.06 s

(17 pts) 8. A small block slides off the edge of a horizontal tabletop with an initial speed of 8.0 m/s. The edge of the tabletop is 12.0 m above the floor.



a) How much time elapses from when the block leaves the table top until it strikes the floor?

Ans. 1.56 s

b) What is the speed of the block just before it strikes the floor?

Ans. 17.3 m/s

(15 pts) 9. A train is traveling at 12.0 m/s due east, relative to the earth. Raindrops are falling vertically downward relative to the earth. Relative to the train the raindrops are moving at 30.0° west of the vertical. What is the speed of the raindrops

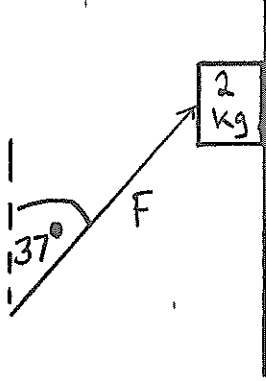
a) relative to the train?

Ans. 24 m/s

b) relative to the earth?

Ans. 20.8 m/s

(20 pts) 10. A box with mass 2.0 kg is pushed up a vertical wall by a force $F = 60$ N that is directed at 37° from the vertical, as shown in the sketch. The coefficient of kinetic friction between the box and the wall is $\mu_k = 0.40$.



a) What is the magnitude of the normal force exerted on the box by the wall?

Ans. 36 N

b) What is the magnitude of the acceleration of the box?

Ans. 7.0 m/s^2