

### Physics 111, Fall 2014 Sample Test 1

- (1) A particle moving along the  $x$  axis has a position given by  $x = (24t - 2.0t^3)$  m, where  $t$  is measured in s. What is the magnitude of the acceleration of the particle at the instant when its velocity is zero?
- a.  $24 \text{ m/s}^2$
  - b. zero
  - c.  $12 \text{ m/s}^2$
  - d.  $48 \text{ m/s}^2$
  - e.  $36 \text{ m/s}^2$
- (2) A proton moving along the  $x$  axis has an initial velocity of  $4.0 \times 10^6 \text{ m/s}$  and a constant acceleration of  $6.0 \times 10^{12} \text{ m/s}^2$ . What is the velocity of the proton after it has traveled a distance of 80 cm?
- a.  $5.1 \times 10^6 \text{ m/s}$
  - b.  $6.3 \times 10^6 \text{ m/s}$
  - c.  $4.8 \times 10^6 \text{ m/s}$
  - d.  $3.9 \times 10^6 \text{ m/s}$
  - e.  $2.9 \times 10^6 \text{ m/s}$
- (3) An automobile manufacturer claims that its product will, starting from rest, travel 0.40 km in 9.0 s. What is the magnitude of the constant acceleration required to do this?
- a.  $9.9 \text{ m/s}^2$
  - b.  $8.9 \text{ m/s}^2$
  - c.  $6.6 \text{ m/s}^2$
  - d.  $5.6 \text{ m/s}^2$
  - e.  $4.6 \text{ m/s}^2$
- (4) A car travels in a flat circle of radius  $R$ . At a certain instant the speed of the car is 24 m/s, and the acceleration of the car has components of  $2.4 \text{ m/s}^2$  east and  $1.8 \text{ m/s}^2$  south. What is the radius of the circle?
- a. 0.24 km
  - b. 0.19 km
  - c. 0.32 km
  - d. 0.14 km
  - e. 0.27 km

(5) A ball is thrown horizontally from the top of a building 0.10 km high. The ball strikes the ground at a point 65 m horizontally away from and below the point of release. What is the speed of the ball just before it strikes the ground?

- a. 43 m/s
- b. 47 m/s
- c. 39 m/s
- d. 36 m/s
- e. 14 m/s

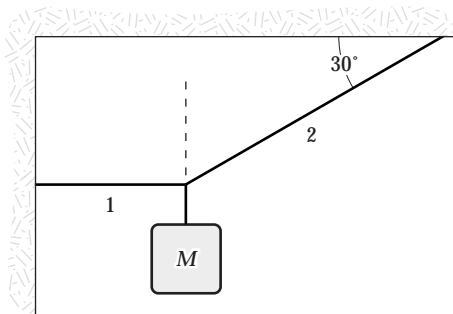
(6) The initial speed of a cannon ball is 0.20 km/s. If the ball is to strike a target that is at a horizontal distance of 3.0 km from the cannon, what is the minimum time of flight for the ball?

- a. 16 s
- b. 21 s
- c. 24 s
- d. 14 s
- e. 19 s

(7) The only two forces acting on a body have magnitudes of 20 N and 35 N and directions that differ by  $80^\circ$ . The resulting acceleration has a magnitude of  $20 \text{ m/s}^2$ . What is the mass of the body?

- a. 2.4 kg
- b. 2.2 kg
- c. 2.7 kg
- d. 3.1 kg
- e. 1.5 kg

(8) If  $M = 2.0 \text{ kg}$ , what is the tension in string 1?

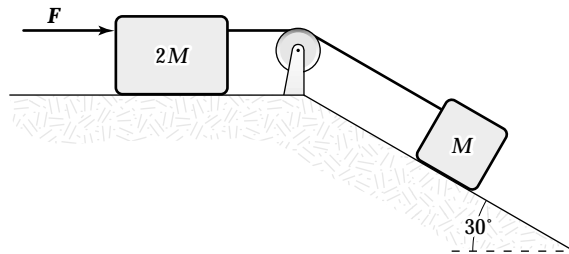


- a. 1.2 N
- b. 11 N
- c. 34 N
- d. 3.5 N
- e. 40 N

(9) A 2.0-kg block slides on a frictionless  $15^\circ$  inclined plane. A force acting parallel to the incline is applied to the block. The acceleration of the block is  $1.5 \text{ m/s}^2$  down the incline. What is the applied force?

- a. 8.1 N down the incline
- b. 3.0 N down the incline
- c. 2.1 N up the incline
- d. 3.0 N up the incline
- e. 8.1 N up the incline

(10) In the figure, if  $F = 2.0 \text{ N}$  and  $M = 1.0 \text{ kg}$ , what is the tension in the connecting string? The pulley and all surfaces are frictionless.

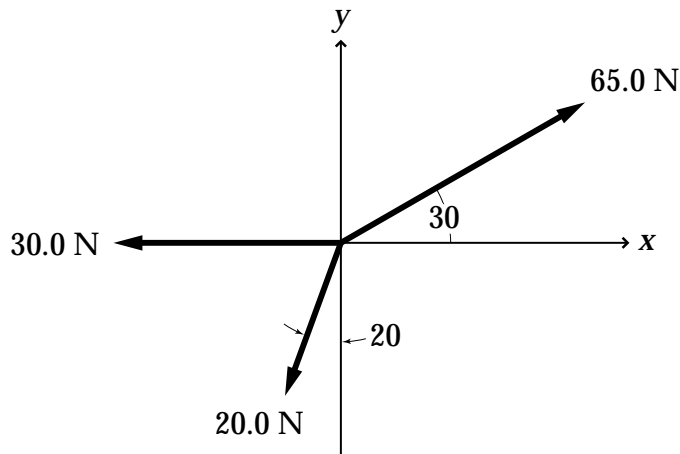


- a. 2.6 N
- b. 1.1 N
- c. 2.1 N
- d. 1.6 N
- e. 3.7 N

(11) If vector  $\vec{C}$  is added to vector  $\vec{D}$ , the result is a third vector that is perpendicular to  $\vec{D}$  and has a magnitude equal to  $3\vec{D}$ . What is the ratio of the magnitude of  $\vec{C}$  to that of  $\vec{D}$ ?

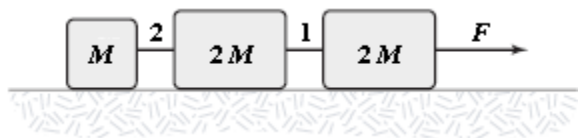
- a. 1.8
- b. 2.2
- c. 3.2
- d. 1.3
- e. 1.6

- (12) The three forces shown act on a particle. What is the direction of the resultant of these three forces?



- a.  $35^\circ$
  - b.  $45^\circ$
  - c.  $65^\circ$
  - d.  $55^\circ$
  - e.  $85^\circ$
13. At  $t = 0$ , a particle leaves the origin with a velocity of 12 m/s in the positive  $x$  direction and moves in the  $xy$  plane with a constant acceleration of  $(-2.0\hat{i} + 4.0\hat{j}) \text{ m/s}^2$ . At the instant the  $y$  coordinate of the particle is 18 m, what is the  $x$  coordinate of the particle?
- a. 30 m
  - b. 21 m
  - c. 27 m
  - d. 24 m
  - e. 45 m
14. A rock is projected from the edge of the top of a building with an initial velocity of 12.2 m/s at an angle of  $53^\circ$  above the horizontal. The rock strikes the ground a horizontal distance of 25 m from the base of the building. Assume that the ground is level and that the side of the building is vertical. How tall is the building?
- a. 25.3 m
  - b. 29.6 m
  - c. 27.4 m
  - d. 23.6 m
  - e. 18.9 m

15. The horizontal surface on which the objects slide is frictionless. If  $M = 2.0$  kg, the tension in string 1 is 12 N. Determine  $F$ .



- a. 25 N
- b. 20 N
- c. 30N
  
- d. 35 N
- e. 40 N

## Answer Key

- (1) a
- (2) a
- (3) a
- (4) b
- (5) b
- (6) a
- (7) b
- (8) c
- (9) c
- (10) a
- (11) c
- (12) a
- (13) c
- (14) d
- (15) b