



17. Two particles of equal mass  $m_0$ , moving with equal speeds  $v_0$  along paths inclined at  $60^\circ$  to the  $x$ -axis as shown above, collide and stick together. Their velocity after the collision has magnitude

(A)  $\frac{v_0}{4}$  (B)  $\frac{v_0}{2}$  (C)  $\frac{\sqrt{2}v_0}{2}$   
 (D)  $\frac{\sqrt{3}v_0}{2}$  (E)  $v_0$

18. Which of the following is true for a system consisting of a mass oscillating on the end of an ideal spring?

- (A) The kinetic and potential energies are equal at all times.  
 (B) The kinetic and potential energies are both constant.  
 (C) The maximum potential energy is achieved when the mass passes through its equilibrium position.  
 (D) The maximum kinetic energy and maximum potential energy are equal, but occur at different times.  
 (E) The maximum kinetic energy occurs at maximum displacement of the mass from its equilibrium position.

19. A particle is moving in a circle of radius 2 meters according to the relation  $\theta = 3t^2 + 2t$ , where  $\theta$  is measured in radians and  $t$  in seconds. The speed of the particle at  $t = 4$  seconds is

(A) 13 m/s (B) 16 m/s (C) 26 m/s  
 (D) 52 m/s (E) 338 m/s

20. The mass of Planet  $X$  is one-tenth that of the Earth, and its diameter is one-half that of the Earth. The acceleration due to gravity at the surface of Planet  $X$  is most nearly

(A)  $2 \text{ m/s}^2$  (B)  $4 \text{ m/s}^2$  (C)  $5 \text{ m/s}^2$   
 (D)  $7 \text{ m/s}^2$  (E)  $10 \text{ m/s}^2$

21. A person pushes a box across a horizontal surface at a constant speed of 0.5 meter per second. The box has a mass of 40 kilograms, and the coefficient of sliding friction is 0.25. The power supplied to the box by the person is

(A) 0.2 W  
 (B) 5 W  
 (C) 50 W  
 (D) 100 W  
 (E) 200 W