No. 1

If air friction is neglected, a 1 kg projectile has an escape speed of about 11 km/s at the surface of the Earth. If the mass of the projectile is doubled, the escape speed is

(A) 22 km/s

(B) $11\sqrt{2}$ km/s

(C) 11 km/s

(D) $\frac{11}{\sqrt{2}}$ km/s

(E) 5.5 km/s

No. 2

An unstable nucleus has mass M and is initially at rest. It ejects a particle of mass m with speed v_o. The remaining nucleus recoils in the opposite direction with a speed

(A) v_o (B) $\frac{mv_o}{M}$ (C) $\frac{mv_o}{M+m}$

(D) $\frac{(M+m)v_o}{m}$ (E) $\frac{mv_o}{M-m}$

No. 3

As a drag car moves from rest at time t = 0, its velocity varies as the square of the elapsed time according to the equation $v = bt^2$, where b is a constant. The expression for the distance traveled by the car from its position at t = 0 is

(A) bt^3 (B) $\frac{bt^3}{3}$ (C) $4bt^2$

(D) $3bt^2$ (E) $\frac{bt^2}{3}$

No. 4

For a block of mass m to slide without friction up a rise of height h. the minimum initial speed of the block must be

(A) $\frac{\sqrt{gh}}{2}$ (B) $\sqrt{\frac{gh}{2}}$ (C) $\sqrt{2gh}$

(D) $2\sqrt{gh}$ (E) $2\sqrt{2gh}$

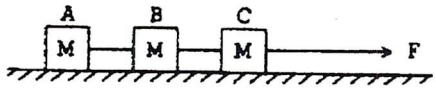
No. 5

An ice skater starts a spin with kinetic energy $\frac{1}{2}I_o\omega_o^2$. As she pulls her arms in, her moment of inertia decreases to $\frac{1}{3}I_o$. Her angular speed then becomes

(A) $\frac{\omega_o}{3}$ (B) $\frac{\omega_o}{\sqrt{3}}$ (C) ω_o

(D) $\sqrt{3}\omega_o$ (E) $3\omega_o$

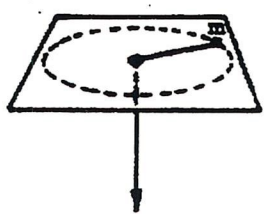
No. 6



Three blocks, A, B. and C. each have mass M and are connected by massless strings as shown above. Block C is pulled to the right by a force F causing the entire three-block system to accelerate. Assuming frictionless contact between the blocks and the level table beneath them. What is the net force experienced by block B ?

(A) 0 (B) $\frac{F}{3}$ (C) $\frac{F}{2}$ (D) $\frac{2F}{3}$ (E) F

No. 7



A mass m on the end of a string moves in a circle on a horizontal frictionless table as shown above. If the string is pulled through a hole in the table, the

(A) angular momentum of m remains constant

(B) angular momentum of m increases

(C) angular momentum of m decreases

(D) kinetic energy of m remains constant

(E) kinetic energy of m decreases