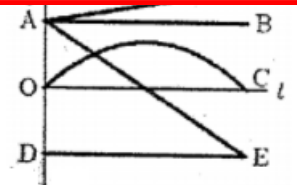


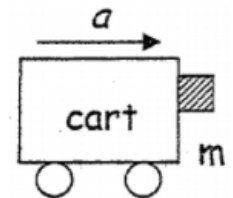


1. A force acting on an object moving along the x axis is given by $F_x = (14x - 3.0x^2)N$, where x is in m. How much work is done by this force as the object moves from $x = -1$ m to $x = +2$ m?
 (A) +12J (B) +28J (C) +40J
 (D) +42J (E) -28J.

2. Which of the curves in the right graph best represents the vertical component v_y of the velocity versus the time t for a projectile fired at an angle of 45° above the horizontal?
 (A) OC (B) AE (C) AB
 (D) DE (E) AF.

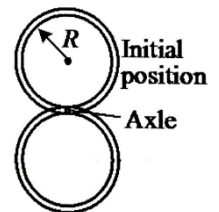


3. The coefficient of static friction between the block and the cart is 0.5. If the mass of the block is m, what is the minimal acceleration of the cart to prevent the block from falling?
 (A) g (B) 0.6g (C) 0.3g
 (D) 0.5g (E) 2g.



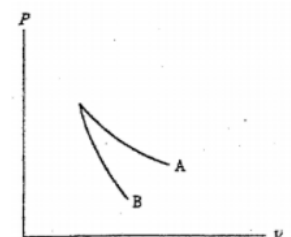
4. A rotating wheel requires 3.00s to rotate through 37.0 revolutions. Its angular speed at the end of the 3.00-s interval is 98.0 rad/s. What is the constant angular acceleration of the wheel?
 (A) 13.7 rad/s² (B) 12.7 rad/s² (C) 11.7 rad/s²
 (D) 10.7 rad/s² (E) 9.7 rad/s².

5. A thin ring of mass M and radius R rotates about an axis through its edge. The ring starts at its highest point and is given a very small push to start its rotation. Its angular position velocity at the lowest point is
 (A) $\sqrt{2g/R}$ (B) $\sqrt{3g/R}$ (C) $\sqrt{4g/R}$ (D) $\sqrt{5g/R}$
 (E) $\sqrt{6g/R}$. (The parallel-axis theorem $I = I_{cm} + Mh^2$)



6. A speedboat moving at 20.6 m/s sounds a signal on its horn, producing a tone of 320 Hz. There is no wind, and the speed of sound in air is 329 m/s. The apparent frequency of the sound heard by an observer in another boat moving in the opposite direction and approaching the first at a speed of 15.4 m/s is
 (A) 282 Hz (B) 287 Hz (C) 316 Hz (D) 357 Hz (E) 369 Hz.

7. The relation $PV = nRT$ holds for all ideal gases. The additional relation PV^γ holds for an adiabatic process. The figure below shows two curves: one is an adiabat and one is an isotherm. Each starts at the same pressure and volume. Which statement is correct? (Note: “ \propto ” means “is proportional to”.)



- (A) Isotherm: $P \propto \frac{1}{V}$; Adiat: $P \propto \frac{1}{V}$: A is both an isotherm and adiat.
 (B) Isotherm: $P \propto \frac{1}{V^\gamma}$; Adiat: $P \propto \frac{1}{V}$: B is an isotherm, A is an adiat.
 (C) Isotherm: $P \propto \frac{1}{V}$; Adiat: $P \propto \frac{1}{V^\gamma}$: A is an isotherm, B is an adiat.
 (D) Isotherm: $P \propto \frac{1}{V^\gamma}$; Adiat: $P \propto \frac{1}{V}$: B is both an isotherm and an adiat.
 (E) I cannot answer this without additional information about the starting temperature.