In the system shown in Figure P5.33, a horizontal force $\vec{F}_x$ acts on an object of mass $m_2 = 8.00$ kg. The horizontal surface is frictionless. Consider the acceleration of the sliding object as a function of F_x. (a) For what values of F_x does the object of mass $m_1 = 2.00$ kg accelerate upward? (b) For what values of F_x is the tension in the cord zero?

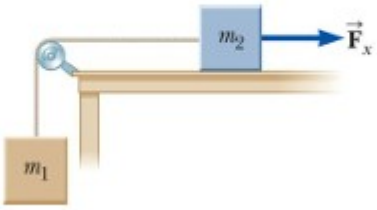


Figure P5.33

A meteoroid (a chunk of rock) is initially at rest in interplanetary space at a large distance from the Sun. Under the influence of gravity, the meteoroid begins to fall toward the Sun along a straight radial line. With what speed does it strike the Sun? (A) 88 km/s (B) 320 km/s (C) 483 km/s (D) 618 km/s (E) 721 km/s.

When a certain light source illuminates a metal surface, electrons are emitted from the metal with kinetic energies up to the value K. The light source is replaced with one that has the same wavelength but less intensity. With this new light source, does the upper limit of the electron kinetic energies increase, decrease, or remain the same? EXPLAIN YOUR ANSWER.

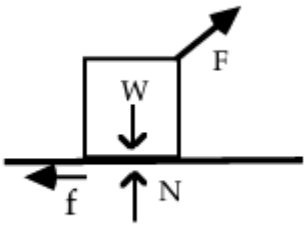
13. Electrons (mass m, charge $-e$) are accelerated from rest through a potential difference V and are then deflected by a perpendicular magnetic field B. The radius of the resulting electron trajectory is:

(a) $\sqrt{2eV/m}/B$ (b) $B\sqrt{2meV}$ (c) $B\sqrt{2mV/e}$ (d) $\sqrt{2mV/e}/B$

(e) $\sqrt{2meV}/B$

Problem 6

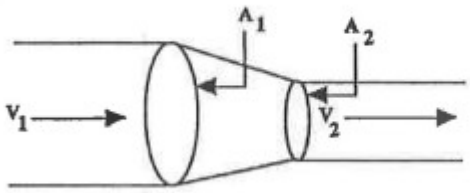
A person pulls on a block by applying a force F and the block remains at rest. The arrows in the diagram correctly show the directions, but not necessarily the magnitudes, of the various forces on the block. Which of the following relations among the force magnitudes F, W, N, f must be true? f is friction and W is the weight (the force of gravity).



- ❑ F = f and N = W
- ❑ F = f and N > W
- ❑ F > f and N < W
- ❑ F > f and N = W
- ❑ None of the above choices is correct.

Which one of the following statements is true if the intensity of a light beam is increased while its frequency is kept the same? (A) The photon gains higher speeds. (B) The energy of photons is increased. (C) The number of photons per unit time in increased. (D) The wavelength of the light is increased.

Incompressible liquid flows along the pipe as shown in the following. The ratio of the speeds v_2/v_1 is: (A)



A_1/A_2 (B) A_2/A_1 (C) $(A_1/A_2)^{1/2}$ (D) $(A_2/A_1)^{1/2}$ (E) $(A_2/A_1)^2$

A 6.0 kg block initially at rest is pulled to the right along a frictionless, horizontal surface by a constant horizontal force of 9N. Find the block's speed after it has moved 3.0m. (10%)

A particle moving along the x-axis has a position function given by $x(t) = (4.00\ \text{m/s}^3)\ t^3 - (5.00\ \text{m/s})\ t +$ (6.00 m). What is the average acceleration of the particle between $t = 1.00$ s and $t = 2.00$ s. (A) 24 m/s^2 (B)12 m/s^2 (C) 36 m/s^2 (D) 18 m/s^2 (E) 30 m/s^2.

The position of a particle is given by the following equations:

$$x = at + bt^3 \text{ where } a = 2.0\,{}^{m}/_{s} \text{ and } b = 0.5\,{}^{m}/_{s^3}$$

$$y = A\sin(Bt) \text{ where } A = 2.0m \text{ and } B = \frac{\pi}{2}\,{}^{rad}/_{s}$$

a) Write equations for the components of the velocity, v_x and v_y, as functions of time.
b) Write equations for the components of the acceleration, a_x and a_y, as functions of time.
c) Make an XY plot showing (as dots numbered 0 and 1) the position of the particle at t=0 and 1 seconds. On this same plot, draw two arrows at each dot showing the approximate direction of the velocity and acceleration at that time. If either velocity or acceleration has zero magnitude, indicate that clearly. Label your two arrows so we know which is which. Don't worry about the length of these arrows, just their approximate directions

(16%) In the isothermal expansion of an idea gas, what is the work done on the gas if the volume expands from V_i to V_f at constant temperature T. (PV=nRT=constant).

A satellite is in circular orbit at an altitude of 1500 km above the surface of a non-rotating planet with an orbital speed of 9.2 km/s. The minimum speed needed to escape from the surface of the planet is 14.9 km/s. The orbital period of the satellite is closest to

(a) 72 min. (b) 65 min. (c) 58 min. (d) 51 min. (e) 44 min.