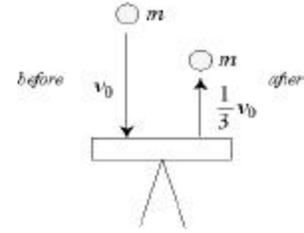
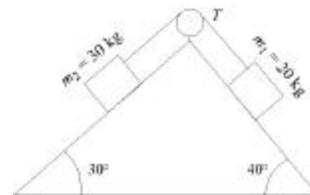


4. A ball of mass m strikes a scale with a speed v_0 . It rebounds at the speed of $\frac{1}{3}v_0$. What is the impact force on the ball? Assume the contact time is t .



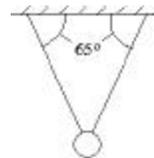
- (1) $\frac{4}{3} \frac{mv_0}{t}$ (2) $\frac{mv_0}{t}$ (3) $\frac{2}{3} \frac{mv_0}{t}$ (4) $v_0 t$ (5) 0
5. How many grams of hot steam at 130°C are needed to heat 1000 g of water at 50°C to 90°C ? ($C_{\text{water}} = 1 \text{ cal/g/}^\circ\text{C}$, $C_{\text{steam}} = 0.46 \text{ cal/g/}^\circ\text{C}$)
- (1) 71.1 (2) 36.2 (3) 326.3 (4) 0.5 (5) 13.8
6. The temperature of the sun's surface is 5500 K . How much heat does it radiate in a day assuming the sun is a blackbody (in J)? ($R_{\text{sun}} = 7 \times 10^8 \text{ m}$)
- (1) $2.8 \times 10^{31} \text{ J}$ (2) 3.6×10^{20} (3) 560.2 (4) 4.3×10^{50} (5) 3.9×10^6
7. A 0.5 kg mass vibrates with amplitude 5 cm at the end of a spring whose spring constant is 25 N/m . Find the speed of the mass when its displacement is 4 cm (in m/s).
- (1) 0.21 (2) 1.4 (3) 366 (4) 2.1 (5) 3.6
8. A 50 cm length of straight pipe is attached to a car's muffler. This tail pipe acts as a tube open on one end but closed on the other. Assume the speed of sound is 360 m/s in the pipe. Find the frequency of its first overtone (Hz) (hint: the second lowest frequency).
- (1) 540 (2) 300 (3) 4060 (4) 15 (5) 70
9. Which of the following statements is incorrect?
- (1) The fundamental frequency of a string or pipe depends on external force.
 - (2) Waves can pass through each other when they meet.
 - (3) The higher the frequency, the shorter the period.
 - (4) The speed of a wave is given by a product of the frequency and wavelength.
 - (5) A pipe with one end open has a lower fundamental frequency than a closed pipe of the same length.

10. Assume zero friction. What is the acceleration of the system? (m/s^2)



- (1) 0.42 to the left (2) 0.33 to the right (3) 0 static (4) 3.2 to the left (5) 1.6 to the right

18. Find the tension in each cord shown if the object weighs 50 N.



- (1) 27.6 N (2) 55.1 N (3) 13.7 N (4) 22.5 N (5) 45.4 N

19. A certain mass undergoes simple harmonic motion at the end of a spring. The period of the motion is 2.10 s. The mass oscillates back and forth through a total distance of 20 cm. Find the maximum speed of the mass.

- (1) 0.3 m/s (2) 20 m/s (3) 2.1 m/s (4) 0.03 m/s (5) 70 m/s

20. A heavy weight hangs at the end of a 140-m cable. A worker at the top of the cable notices that when he strikes the top of the cable sideways, the pulse hits the weight after a time of 4.0 s. With about what frequency must he vibrate the top end if the rope is to resonate in its fundamental?

- (1) 0.125 Hz (2) 17.5 Hz (3) 4.4 Hz (4) 557 Hz (5) 2.0 Hz