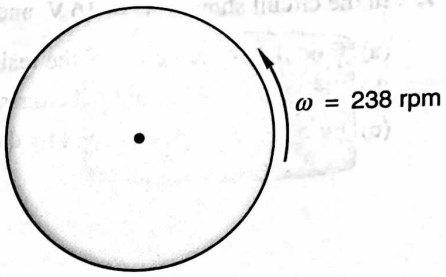
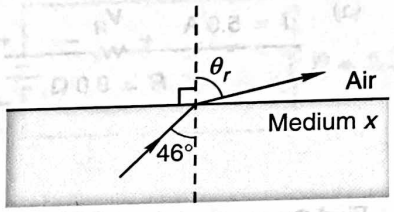
1. A disk is rotating at a constant angular speed of 238 revolutions per minute. A point on the rim of the disk has a linear speed of 25 meters per second.

(a) Find the angular speed of the disk in radians per second.

(b) What is the diameter of the disk?



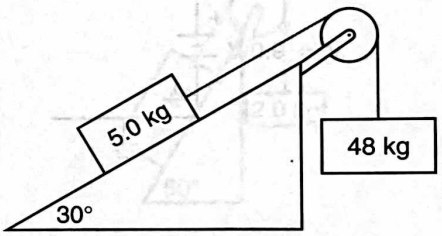
2. The speed of blue light in medium x is $0.75c$. The index of refraction for air is approximately 1.0. A ray of blue light enters air from medium x at an angle of incidence of 46°. What is the angle of refraction θ_r?



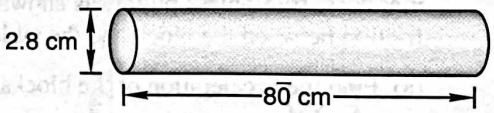
3. A 5.0-kg block rests on a frictionless plane that is inclined 30° to the horizontal. This block is connected to a 48-kg block by a rope of negligible mass that passes over a massless, frictionless pulley, as shown.

(a) Find the acceleration of the blocks.

(b) Find the tension in the rope.



4. A solid tungsten rod at 20°C has the dimensions shown in the diagram. The resistivity of tungsten at 20°C is 5.6×10^{-8} Ω·m. Find the resistance between the two ends.



5. A man who is 0.364 kilometer away from a cliff strikes a spike with a sledge hammer. The wavelength of the sound wave produced by the strike is 0.250 meter. Assume the speed of sound on this day is 335 meters per second.

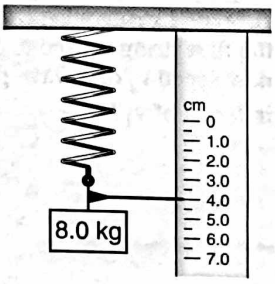
(a) How long does it take for the sound to travel to the cliff and reflect back to produce an echo?

(b) What is the frequency of the sound wave produced by the strike?

6. An 8.0-kg block stretches a spring 4.0 centimeters, as shown.

(a) What is the spring constant in newtons per meter?

(b) How much work is done in stretching the spring?

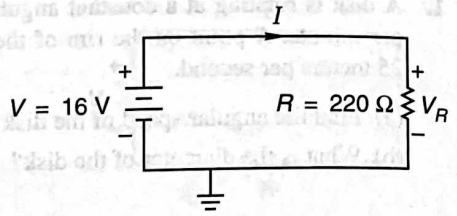


7. In the circuit shown, $V = 16\ \text{V}$ and $R = 220\ \Omega$.

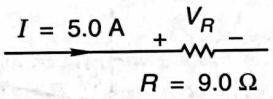
(a) Find the current through the resistor.

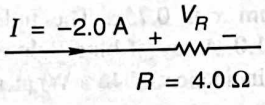
(b) Find the power used by the resistor.

(c) Find the energy consumed by the resistor in 4.5 minutes.

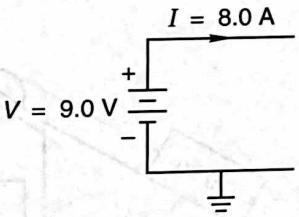


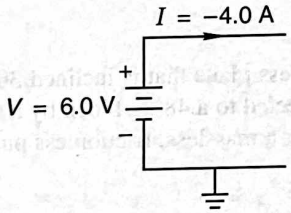
8. Find the voltage V_R across the following resistors:

(a) 

(b) 

Find the power output of the voltage sources:

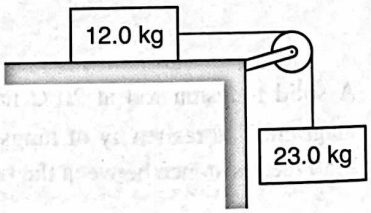
(c) 

(d) 

9. A 12.0-kg block rests on a level tabletop. This block is connected to a 23.0-kg block by a rope of negligible mass that passes over a massless, frictionless pulley, as shown. The coefficient of kinetic friction between the block and the tabletop is 0.240.

(a) Find the acceleration of the blocks.

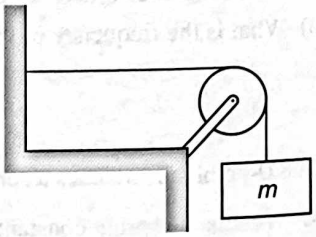
(b) Find the tension in the rope.



10. A wall is connected to a mass of m kilograms by a string that passes over a massless, frictionless pulley, as shown. The string has a uniform mass of M kilograms and a length of L meters. The speed of a wave pulse traveling along the string is v_1.

(a) By what factor should the mass m be increased in order for a wave pulse to have a speed of $6v_1$?

(b) A second string whose mass per unit length is 12 times that of the first string is used to replace the original string. What is the new speed v_2 of a wave pulse traveling along the second string in terms of v_1?



Test 11 5/13/20

97 A+

1 $V = \omega r$

$\omega = 238 \frac{rev}{min}$

$V = 25 \frac{m}{s}$

$\frac{238 rev}{min} \times \frac{2\pi (rad)}{1 rev} \times \frac{min}{60 s} = \frac{24.92 (rad)}{s}$

$\omega = \frac{24.92 rad}{s}$

$r = \frac{V}{\omega}$

$r = \frac{25 \frac{m}{s}}{24.92 \frac{rad}{s}}$

$r = 1.003 m$

$d = 2.006 m$

2 $n = \frac{c}{v}$ $c = 3 \times 10^8$ $\frac{\sin\theta_1}{v_1} = \frac{\sin\theta_2}{v_2}$

$v_1 = .75c$ $n_2 = 1$

$\theta_1 = 46$ $n_1 = \frac{c}{.75c} = \frac{1}{.75} = 1.3$

$\frac{\sin 46}{.75c} = \frac{\sin\theta_r}{c}$

$\frac{\sin 46 c}{.75c} = \sin\theta_r$

$\frac{\sin 46}{.75} = \sin\theta_r$

$\theta_r = 73.56$

3 15 kg, 48 kg, 30

$T - f_x = m_1 a$

$m_1 g = 49.05$

$m_2 g = 472.32$

$f_x = m_1 g \sin 30 = 24.525$

$T - 24.525 = 5a$

$T = 5a + 24.525$

$m_2 g - T = m_2 a$

$472.32 - (5a + 24.525) = 48a$

$472.32 - 24.525 = 48a + 5a$

$447.795 = 53a$

$a = 8.45 \frac{m}{s^2}$

$T = 66.77 N$

4 $R = \rho \frac{L}{A}$

28 cm, 0.028 m

$28 cm = .28 m$ $r = .014 m$ $A = 6.16 \times 10^{-4} m^2$

$\rho = 5.6 \times 10^{-8} \Omega \cdot m$

$R = (5.6 \times 10^{-8}) \frac{.28 m}{6.16 \times 10^{-4} m^2} = .727 \times 10^{-4}$

$R = 7.27 \times 10^{-4} \Omega$ -1

5 $d = VT$ $\lambda = \frac{v}{f}$ $f = \frac{v}{\lambda}$

$d = .364 km = 364 m$ $V = 335 \frac{m}{s}$ $\lambda = .25 m$

$T = \frac{364 m}{335 \frac{m}{s}}$ $T = 1.087 s$ and reflect back read carefully -2

$f = \frac{335 \frac{m}{s}}{.25 m}$

$f = 1340 Hz$

6 $F = kx$ $W = \frac{1}{2} k x^2$

4 cm = .04 m

8 kg

$(8)(9.81) = (.04)k$

$\frac{78.48 N}{.04 m} = k$

$k = 1962 \frac{N}{m}$

$W = \frac{1}{2}(1962)(.04)^2$

$W = 1.5696 J$

7 → P

7 $V=IR$ $P=VI$ $W=Pt$

$V=16V$ $R=220\Omega$ $t=4.5min$ $t=270s$

$I=\frac{16V}{220\Omega}$

$I=.072A$

$P=(16V)(.072A)$

$P=1.152W$

$W=(1.152W)(270s)$

$W=311.04J$

8 $V=IR$

$I=5A$ $R=4\Omega$

$V=(5A)(4\Omega)$

$V=45V$

$I=-2A$ $R=4\Omega$

$V=(-2A)(4\Omega)$

$V=-8V$

$P=VI$

$V=9V$ $I=8A$

$P=(9V)(8A)$

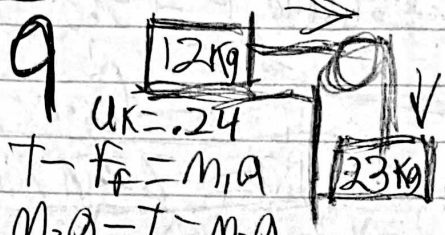
$P=72W$

$I=-4A$ $V=6V$

$P=(-4A)(6V)$

$P=-24W$

9



$\mu_K=.24$

$T-f_f=m_1a$

$m_2g-T=m_2a$

$m_1g=117.72N$

$m_2g=225.63N$

$f_f=(.24)(117.72)=28.25N$

$T-28.25N=12kg\,a$

$T=12a+28.25$

$225.63-(12a+28.25)=23a$

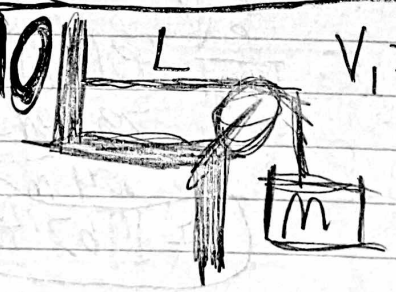
$225.63-12a-28.25=23a$

$197.38=35a$

$a=5.6\frac{m}{s^2}$

$T=95.92N$

10



$V_1=\sqrt{\frac{mg}{m_L}}$ $m_L=\frac{m}{L}$

$V_2=6V_1$

$V_2=6\sqrt{\frac{mg}{m_L}}$

$V_2=\sqrt{\frac{36mg}{mL}}$

$36M=6V_1$ A

12M

$V_2=\sqrt{\frac{mg}{\frac{12m}{L}}}$

$V_2=\sqrt{\frac{1}{12}\frac{mg}{\frac{m}{L}}}$

$V_2=\left(\sqrt{\frac{1}{12}}\right)\left(\sqrt{\frac{mg}{m_L}}\right)$

$V_2=\left(\sqrt{\frac{1}{12}}\right)(V_1)$ B

$V_2=.2887V_1$