

Question

1 2 3 4 5 6 7 8 9

1. Question Details

SerCP9 8.P.062. [1589051]

A student sits on a rotating stool holding two 4.0-kg objects. When his arms are extended horizontally, the objects are 1.0 m from the axis of rotation and he rotates with an angular speed of 0.75 rad/s. The moment of inertia of the student plus stool is $3.0 \text{ kg} \cdot \text{m}^2$ and is assumed to be constant. The student then pulls in the objects horizontally to 0.44 m from the rotation axis.

(a) Find the new angular speed of the student.

 rad/s

(b) Find the kinetic energy of the student before and after the objects are pulled in.

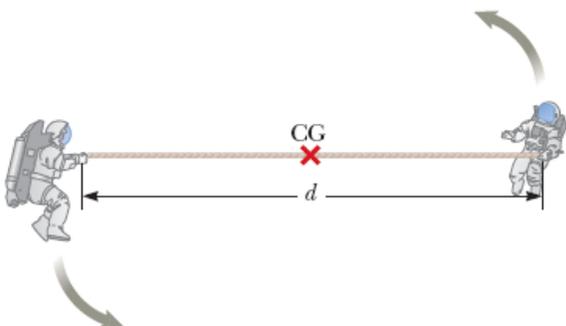
before J

after J

2. Question Details

SerCP9 8.P.072. [1594372]

Two astronauts, each having a mass of 84.0 kg, are connected by a 10.0-m rope of negligible mass. They are isolated in space, moving in circles around the point halfway between them at a speed of 5.30 m/s. Treating the astronauts as particles, calculate each of the following.



(a) the magnitude of the angular momentum of the system

 $\text{kg} \cdot \text{m}^2/\text{s}$

(b) the rotational energy of the system

 kJ

By pulling on the rope, the astronauts shorten the distance between them to 5.00 m.

(c) What is the new angular momentum of the system?

 $\text{kg} \cdot \text{m}^2/\text{s}$

(d) What are their new speeds?

 m/s

(e) What is the new rotational energy of the system?

 kJ

(f) How much work is done by the astronauts in shortening the rope?

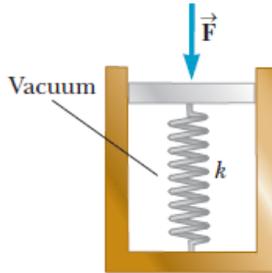
 kJ

The four tires of an automobile are inflated to a gauge pressure of 1.7×10^5 Pa. Each tire has an area of 0.023 m² in contact with the ground. Determine the weight of the automobile.

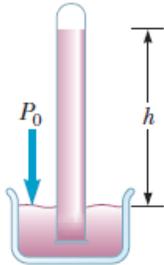
N

The spring of the pressure gauge shown in the figure below has a force constant of $1,200$ N/m, and the piston has a radius of 1.37 cm. As the gauge is lowered into water, what change in depth causes the piston to move in by 0.750 cm?

m



Blaise Pascal duplicated Torricelli's barometer using a red Bordeaux wine, of density 984 kg/m³, as the working liquid (figure below).



(a) What was the height h of the wine column for normal atmospheric pressure?

m

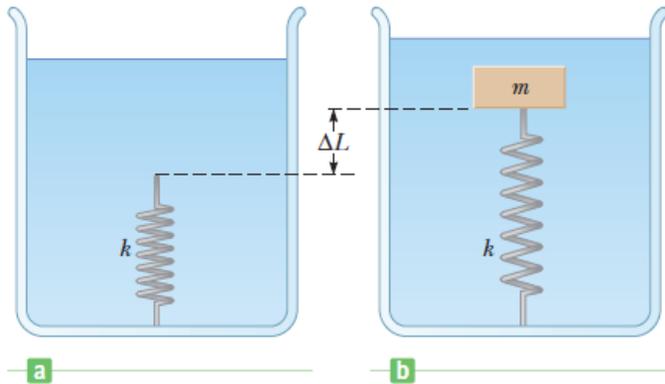
(b) Would you expect the vacuum above the column to be as good as for mercury?

Yes

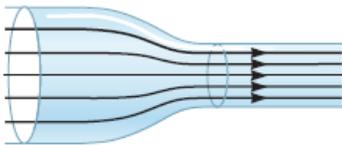
No

A light spring of force constant $k = 162 \text{ N/m}$ rests vertically on the bottom of a large beaker of water (Figure a). A 4.90-kg block of wood (density = 650 kg/m^3) is connected to the spring, and the block-spring system is allowed to come to static equilibrium (Figure b). What is the elongation ΔL of the spring?

cm



A liquid ($\rho = 1.65 \text{ g/cm}^3$) flows through a horizontal pipe of varying cross section as in the figure below. In the first section, the cross-sectional area is 10.0 cm^2 , the flow speed is 267 cm/s , and the pressure is $1.20 \times 10^5 \text{ Pa}$. In the second section, the cross-sectional area is 3.00 cm^2 .



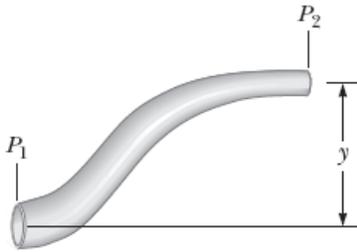
(a) Calculate the smaller section's flow speed.

m/s

(b) Calculate the smaller section's pressure.

Pa

Water moves through a constricted pipe in steady, ideal flow. At the lower point shown in the figure below, the pressure is 1.80×10^5 Pa and the pipe radius is 2.60 cm. At the higher point located at $y = 2.50$ m, the pressure is 1.27×10^5 Pa and the pipe radius is 1.60 cm.



(a) Find the speed of flow in the lower section.

 m/s

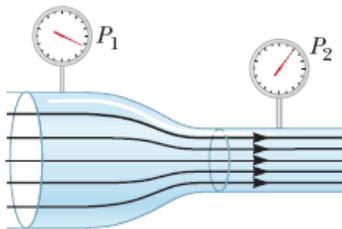
(b) Find the speed of flow in the upper section.

 m/s

(c) Find the volume flow rate through the pipe.

 m³/s

The Venturi tube shown in the figure below may be used as a fluid flowmeter. Suppose the device is used at a service station to measure the flow rate of gasoline ($\rho = 7.00 \times 10^2$ kg/m³) through a hose having an outlet radius of 1.53 cm. The difference in pressure is measured to be $P_1 - P_2 = 1.10$ kPa and the radius of the inlet tube to the meter is 3.06 cm.



(a) Find the speed of the gasoline as it leaves the hose.

 m/s

(b) Find the fluid flow rate in cubic meters per second.

 m³/s

Assignment Details

Name (AID): Homework #9 - Due Monday Nov. 17, 2014

Submissions Allowed: 5

Category: Homework

Code:

Locked: No

Author: Segre, Phil (psegre@physics.emory.edu)

Last Saved:

Permission: Protected

Randomization: Person

Which graded: Last

Feedback Settings

Before due date

Question Score

Assignment Score

Publish Essay Scores

Question Part Score

Mark

Add Practice Button

Help/Hints

Response

Save Work

After due date

Question Score

Assignment Score

[Publish Essay Scores](#)

[Key](#)

[Question Part Score](#)

[Solution](#)

[Mark](#)

[Add Practice Button](#)

[Help/Hints](#)

[Response](#)