Physics Problem Set 5 - due Mon. May 2 by 6pm (8954559)

Question 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1. Question Details OSColPhys1 11.P.003.WA. [2707306]

An accomplished silversmith needs an extremely thin sheet of silver. If he starts with a 3.30-kg sheet of silver, and pounds it to a thickness of 5.00×10^{-7} m (a small fraction of the thickness of a sheet of paper), determine the area of the sheet he has formed. Use 10.1×10^{3} kg/m^3 as the density of silver.

653 m^2

Supporting Materials

Physical Constants

2. Question Details OSColPhys1 11.P.001.Tutorial.WA. [2707402]

It is known that a cubical object made of cast aluminum 0.238 m on a side contains a hollow cavity also in the shape of a cube but of unknown dimensions. If the mass of the object is 34.8 kg, determine the length of each side of the interior cubical cavity. The density of aluminum is 2.70×10^{3} kg/m^3.

0.084 m

Supporting Materials

Physical Constants

3. Question Details OSColPhys1 11.P.041.WA. [2707334]

You can chew through very tough objects with your incisors because they exert a large force on the small area of a pointed tooth. What pressure in Pa can you create by exerting a force of 390 N with your tooth on an area of 1.23 mm^2?

3.17e+08 Pa

Supporting Materials

Physical Constants

4. Question Details OSColPhys1 11.P.008.WA. [2707298]

A 4.5-kg, three legged stool supports a 68-kg person. If each leg of the stool has a cross-sectional diameter of 1.4 cm and the weight of the person is evenly distributed, determine the pressure exerted on the floor by each leg.

1.54e+06 Pa

Supporting Materials

Physical Constants

5. Question Details OSColPhys1 11.P.009.WA. [2707288]

Determine the actual pressure inside an inflated football if it has a gauge pressure of 8.9 lb/in^2.

23.6 lb/in^2

Supporting Materials

Physical Constants

6. Question Details OSColPhys1 11.P.010.WA. [2707261]

You inflate the tires of your car to a gauge pressure of 42.0 lb/in^2. If your car has a mass of 1725 kg and is supported equally by its four tires, determine the following.

(a) Contact area between each tire and the road

0.0146 m^2

(b) Will the contact area increase, decrease, or stay the same when the gauge pressure is decreased?

- increase
- decrease
- stay the same

(c) Gauge pressure required to give each tire a contact area of 114 cm^2

53.8 lb/in^2

Supporting Materials

Physical Constants

7. Question Details OSColPhys1 11.P.042.WA. [2707337]

One way to force air into an unconscious person's lungs is to squeeze on a balloon appropriately connected to the subject. What force must you exert on the balloon with your hands to create a gauge pressure of 4.20 cm water, assuming you squeeze on an effective area of 48.0 cm^2?

1.98 N

Supporting Materials

Physical Constants

8. Question Details OSColPhys1 11.P.044.WA. [2707443]

Suppose a 2.20 N force can rupture an eardrum having an area of 1.29 cm^2.

(a) Calculate the maximum tolerable gauge pressure inside the eardrum (in the middle ear) in N/m^2. (Pressures in the middle ear may rise when an infection causes a fluid buildup. Use 13.6 × 10^3 kg/m^3 as the density of mercury.)

17100 N/m^2

Convert this value to mm Hg.

128 mm Hg

(b) At what depth in fresh water would this person's eardrum rupture, assuming the gauge pressure in the middle ear is zero?

1.74 m

Supporting Materials

Physical Constants

9. Question Details OSColPhys1 11.P.012.WA. [2707352]

The pressure at the bottom of a cylindrical container with a cross-sectional area of 45.0 cm^2 and holding a fluid of density 740 kg/m^3 is 115 kPa.

(a) Determine the depth of the fluid.

1.89 m

(b) Determine the pressure at the bottom of the container if an additional 1.40 × 10^{-3} m^3 of this fluid is added to the container. (Give your answer to at least 3 significant figures.)

117 kPa

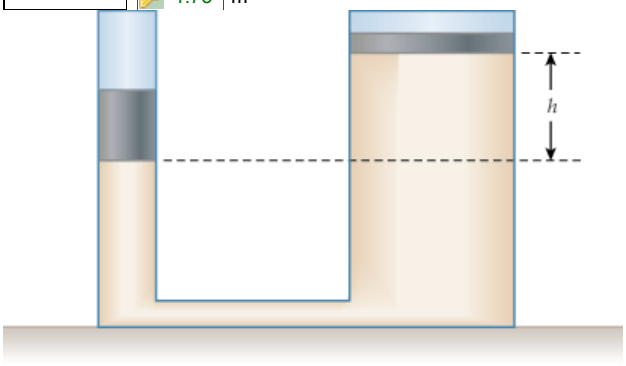
Supporting Materials

Physical Constants

10. Question Details OSColPhys1 11.P.011.WA. [2707326]

As shown in the figure below, a hydraulic system has two pistons of different diameter and uses a liquid of density ρ = 850 kg/m^3. The smaller piston has a diameter of 3.5 cm and a mass of 1.6 kg and the larger piston a diameter of 14 cm and a mass of 3.0 kg. Determine h, the height difference between the two pistons.

1.73 m



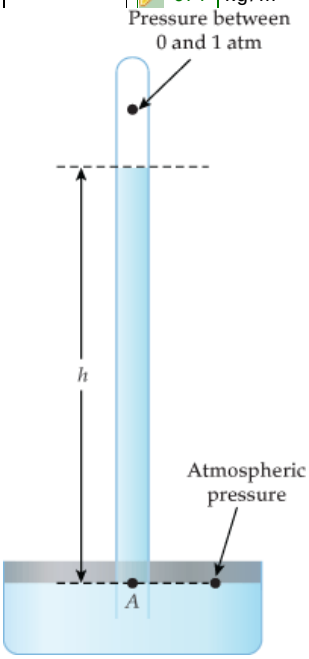
Supporting Materials

Physical Constants

11. Question Details OSColPhys1 11.P.014.WA. [2707293]

We have two barometers, like the one shown in the figure. One uses mercury and the other uses an unknown liquid. The pressure above the liquid for each barometer is the same and is between zero and atmospheric pressure. If the height of the unknown liquid is fourteen times greater than the height of the mercury, determine the density of the unknown fluid. (Assume ρ = 13.6 × 10^3 kg/m^3 for mercury.)

971 kg/m^3



Supporting Materials

Physical Constants

12. Question Details OSColPhys1 11.P.036.WA. [2707315]

(a) If the gauge pressure inside a 14.1 cm radius rubber balloon is equal to pressure experienced at a depth of 16.5 cm in water, what is the effective surface tension of the balloon?

57 N/m

(b) What will the gauge pressure inside the balloon be when its radius is 7.20 cm, assuming the rubber acts like a liquid surface?

3170 N/m^2

Supporting Materials

Physical Constants

13. Question Details OSColPhys1 11.P.038.WA. [2707260]

You are studying capillary action and you notice that a fluid with a density of 1325 kg/m^3 rises to a height of 2.7 cm in a 1.0 mm-diameter tube. You also note that the contact angle between the wall and the fluid is zero. Determine the surface tension of the fluid.

0.0876 N/m

Supporting Materials

Physical Constants

14. Question Details OSColPhys1 11.P.039.WA. [2707350]

You are doing an experiment to determine how far whole blood can rise in a capillary tube. If whole blood has a density of 1.05×10^3 kg/m^3, a surface tension of 5.80×10^{-2} N/m, and the contact angle with the wall of the tube is zero, determine the height to which it will rise in a capillary tube with a radius of 1.80×10^{-6} m.

6.26 m

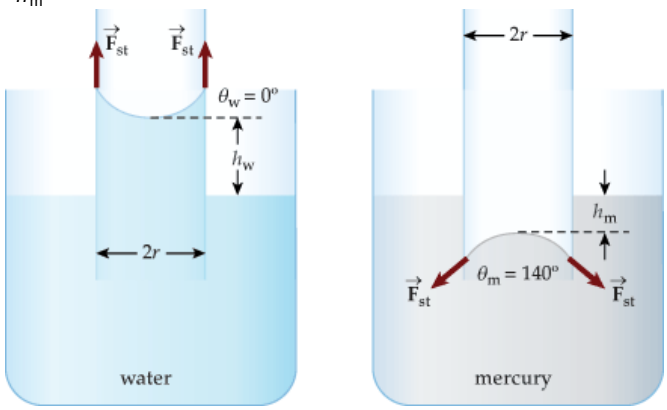
Supporting Materials

Physical Constants

15. Question Details OSColPhys1 11.P.035.Tutorial.WA. [2734830]

Using data from the diagram below, calculate the ratio of the height to which water at 100°C and mercury are raised or suppressed by capillary action in the same glass tube. (Use density and surface tension values of water that are accurate to at least 3 significant figures for your calculation. Include the appropriate sign with your answer.)

$\frac{h_w}{h_m}$ = [ ] -2.35



Supporting Materials

Physical Constants