HW10 - due 6 pm Day 21 (Mon. Aug. 25) (6168125)

Question 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

1. Question Details OSColPhys1 12.P.005.WA. [2707398]

A standard after-surgery intravenous fluid has a density of 1105 kg/m^3. If during the first three hours after surgery a patient is to receive a volume of 1.05×10^{-3} m^3 of this fluid, determine the mass flow rate in kg/s.

0.000107 kg/s

Supporting Materials

Physical Constants

2. Question Details OSColPhys1 12.P.003.WA. [2707440]

(a) Blood with a density ρ = 1.00 g/cm^3 is flowing with a speed of 25 cm/s through an aorta with a cross-sectional area of 2.2 cm^2. Determine the mass flow rate (in g/s) of blood.

55 g/s

(b) If this aorta branches to a number of capillaries which have a combined cross-sectional area of 2.6×10^3 cm^2, determine the flow speed (in cm/s) of the blood in the capillaries.

0.0212 cm/s

Supporting Materials

Physical Constants

3. Question Details OSColPhys1 12.P.002.WA. [2707396]

(a) If it takes 2.15 min to fill a 23.0 L bucket with water flowing from a garden hose of diameter 2.50 cm, determine the speed at which water is traveling through the hose.

0.363 m/s

(b) If a nozzle with a diameter four-fifths the diameter of the hose is attached to the hose, determine the speed of the water leaving the nozzle.

0.568 m/s

Supporting Materials

Physical Constants

4. Question Details OSColPhys1 12.P.006.WA. [2707276]

For modeling and calculation purposes, architects treat air as an incompressible fluid. As an architect's intern, you are doing the specs on a dorm air conditioning system that is designed to replace the air in each room every twenty-one minutes. If the rooms each have a volume of 130 m^3 and they are supplied by ducts with a square cross section, determine the following.

(a) the length of each side of a duct if the air speed in the duct is to be 2.6 m/s

0.199 m

(b) the length of each side of a duct if the air speed at the duct is to be a value twice this speed.

0.141 m

Supporting Materials

Physical Constants

5. Question Details OSColPhys1 12.P.007.WA. [2707416]

(a) Determine the speed at which blood is flowing through an artery with a radius of 5.40×10^{-3} m, if the artery is supplying blood to the brain at a volume flow rate of 4.30×10^{-6} m^3/s.

0.0469 m/s

(b) If the flow rate is to remain the same through a constriction that reduces the radius of the artery by a factor of 5, determine the speed at which blood must flow through the constricted region.

1.17 m/s

Supporting Materials

Physical Constants

6. Question Details OSColPhys1 12.P.008.WA. [2707373]

The aorta carries blood away from the heart and eventually branches into a large number of capillaries that distribute the blood to various body organs. If for an average person, the aorta has a radius of 1.2 cm and blood travels through it at a speed of 43 cm/s and the capillaries have an average radius of 5.0×10^{-4} cm and blood travels through them at a speed of 0.004 cm/s, determine the approximate number of capillaries in the human body.

6.19e+10 capillaries

Supporting Materials

Physical Constants

7. Question Details OSColPhys1 12.P.010.WA. [2707391]

You wish to fill a child's inflatable wading pool by using a garden hose. The hose you are using has an inside diameter of 3.0 cm and water travels though it at a speed of 1.5 m/s. If the pool is circular with an inside diameter of 2.5 m and you wish to fill it to a depth of 49 cm, determine the time (in minutes) required to fill the pool to this depth.

[ ] 37.8 min

Supporting Materials

Physical Constants

8. Question Details OSColPhys1 12.P.012.Tutorial.WA. [2707284]

Water is flowing into a factory in a horizontal pipe with a radius of 0.0173 m at ground level. This pipe is then connected to another horizontal pipe with a radius of 0.0360 m on a floor of the factory that is 12.6 m higher. The connection is made with a vertical section of pipe and an expansion joint. Determine the volume flow rate that will keep the pressure in the two horizontal pipes the same.

[ ] 0.0152 m^3/s

Supporting Materials

Physical Constants

9. Question Details OSColPhys1 12.P.013.WA. [2707290]

At a soft drink bottling plant, a horizontal section of pipe carrying citric acid in liquid form goes from a cross-sectional area of 8.00 cm^2, fluid flow speed of 270 cm/s, and pressure of 1.40×10^5 Pa to a section of pipe with a cross-sectional area of 3.80 cm^2. The density of the citric acid is 1660 kg/m^3. For the section of smaller pipe, determine the liquid flow speed and the liquid pressure.

(a) the liquid flow speed

[ ] 5.68 m/s

(b) the liquid pressure

[ ] 1.19e+05 Pa

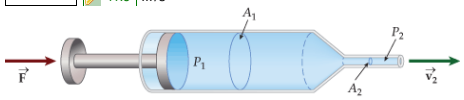
Supporting Materials

Physical Constants

10. Question Details OSColPhys1 12.P.014.WA. [2707370]

A veterinarian uses a hypodermic syringe like the one shown in the figure to inject a horse with a medical solution with a density that is the same as water. The barrel of the syringe has a cross-sectional area of 2.23×10^{-5} m^2 and before she exerts any force on the plunger, the pressure everywhere in the syringe is 1.00 atm. When she exerts a force with a magnitude of 1.55 N on the plunger, the medical solution squirts horizontally from the needle. Determine the speed of the solution as it leaves the needle.

[ ] 11.8 m/s



Supporting Materials

Physical Constants

11. Question Details OSColPhys1 12.P.015.WA. [2707364]

As a person breathes, during the inhale part of the cycle air moves down the windpipe (bronchus) and through a constriction where the air speed doubles. If the air is traveling 48 cm/s before the constriction and we treat air as an incompressible fluid, determine the pressure drop in the constriction. Use the density of air as 1.29 kg/m^3.

[ ] 0.446 Pa

Supporting Materials

Physical Constants

12. Question Details OSColPhys1 12.P.022.WA. [2707316]

Plaque builds up on the walls of an artery decreasing its diameter from 1.16 cm to 0.62 cm. If the flow speed is 11.5 cm/s before reaching the region of plaque buildup, determine the following.

(a) speed at which blood is traveling through the plaque-constricted region

[ ] 40.3 cm/s

(b) pressure change within the plaque-constricted region. (Assume the density of blood is 1050 kg/m^3. Be sure to include the appropriate sign with your answer.)

[ ] -78.1 Pa

Supporting Materials

Physical Constants

13. Question Details OSColPhys1 12.P.023.WA. [2707322]

Water is traveling through a horizontal pipe with a speed of 1.9 m/s and at a pressure of 140 kPa. This pipe is reduced to a new pipe which has a diameter half that of the first section of pipe. Determine the speed and pressure of the water in the new, reduced in size pipe.

(a) speed

[ ] 7.6 m/s

(b) pressure

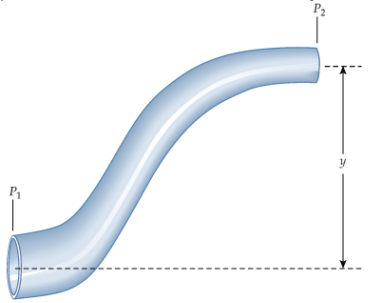
[ ] 113 kPa

Supporting Materials

Physical Constants

14. Question Details OSColPhys1 12.P.017.WA. [2901740]

Water flows through a pipe as shown in the figure. The pressure at points 1 and 2 respectively is 1.90×10^5 Pa and 1.15×10^5 Pa. The radius of the pipe at points 1 and 2 respectively is 4.00 cm and 1.40 cm. If the vertical distance between points 1 and 2 is 2.75 m, determine the following.



(a) speed of flow at point 1

[ ] 1.21 m/s

(b) speed of flow at point 2

[ ] 9.88 m/s

(c) volume flow rate of the fluid through the pipe

[ ] 0.00608 m^3/s

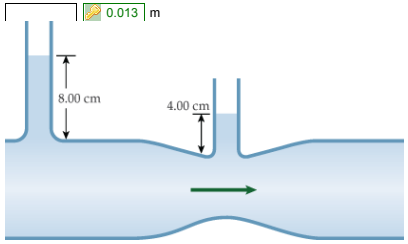
Supporting Materials

Physical Constants

15. Question Details OSColPhys1 12.P.020.WA. [2707332]

A horizontal water pipe goes from a large diameter to a small diameter and then back to the first diameter as shown in the figure below. The level of water in the small vertical tubes provides us with information about the water pressure in the two different sizes of pipe. The inside diameter of the larger pipe is 2.30 cm and water travels through both sizes of pipe with a volume flow rate of 1.25×10^{-4} m^3/s. Determine the inside diameter of the smaller pipe.

[ ] 0.013 m



Supporting Materials

Physical Constants

16. Question Details OSColPhys1 12.P.028.Tutorial.WA. [2707243]

Fluid originally flows through a tube at a rate of 175 cm^3/s. To illustrate the sensitivity of flow rate to various factors, calculate the new flow rate for the following changes with all other factors remaining the same as in the original conditions.

(a) The pressure difference increases by a factor of 1.43.

[ ] 250 cm^3/s

(b) A new fluid with 3.30 times greater viscosity is substituted.

[ ] 53 cm^3/s

(c) The tube is replaced by one having 4.00 times the length.

[ ] 43.8 cm^3/s

(d) Another tube is used with a radius 0.100 times the original.

[ ] 0.0175 cm^3/s

(e) Yet another tube is substituted with a radius 0.100 times the original and half the length, and the pressure difference is increased by a factor of 1.26.

[ ] 0.0441 cm^3/s

Supporting Materials

Physical Constants

17. Question Details OSColPhys1 12.P.031.WA. [2707400]

Angioplasty is a technique in which arteries partially blocked with plaque are dilated to increase blood flow. By what factor must the radius of an artery be increased in order to increase blood flow by a factor of 5, assuming no change in pressure difference?

$\frac{r_f}{r_i}$ = [ ] 1.5

Supporting Materials

Physical Constants

18. Question Details OSColPhys1 12.P.032.WA. [2707426]

When physicians diagnose arterial blockages, they quote the reduction in flow rate. If the flow rate in an artery has been reduced to 18.3% of its normal value by a blood clot and the average pressure difference has increased by 28.0%, by what factor has the clot reduced the radius, r_o, of the artery?

r = [ ] 0.615 r_o

Supporting Materials

Physical Constants

Assignment Details

Name (AID): **HW10 - due 6 pm Day 21 (Mon. Aug. 25) (6168125)**
Submissions Allowed: **5**
Category: **Homework**
Code:
Locked: **No**
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