Suggested problems
Chapter 14
The quiz questions will be same or very similar to the following text-book problems.
Refer to the course website for the latest version of this document.
You are encouraged to seek the help of your instructor during his office hours.

5. An office window has dimensions 3.4 m by 2.1 m. As a result of the passage of a storm, the outside air pressure drops to 0.96 atm, but inside the pressure is held at 1.0 atm. What net force pushes out on the window?

Answer: \(2.9 \times 10^4 \text{N}\)

10. The plastic tube in Fig. 14-30 has a cross-sectional area of 5.00 cm\(^2\). The tube is filled with water until the short arm (of length \(d = 0.800\) m) is full. Then the short arm is sealed and more water is gradually poured into the long arm. If the seal will pop off when the force on it exceeds 9.80 N, what total height of water in the long arm will put the seal on the verge of popping?

Answer: 2.8 m

20. The L-shaped tank shown in Fig. 14-33 is filled with water and is open at the top. If \(d = 5.0\) m, what is the force due to the water (a) on face A and (b) on face B?

Answer: (a) \(5.0 \times 10^6\) N (b) \(5.6 \times 10^6\) N

29. In Fig. 14-37, a spring of spring constant \(3.00 \times 10^4\) \(\text{N/m}\) is between a rigid beam and the output piston of a hydraulic lever. An empty container with negligible mass sits on the input piston. The input piston has area \(A_i\), and the output piston has area \(18.0A_i\). Initially the spring is at its rest length. How many kilograms of sand must be (slowly) poured into the container to compress the spring by 5.00 cm?

Answer: 8.5 kg

36. In Fig. 14-39a, a rectangular block is gradually pushed facedown into a liquid. The block has height \(d\); on the bottom and top the face area is \(A = 5.67\) \(\text{cm}^2\). Figure 14-39b gives the apparent weight \(W_{\text{app}}\) of the block as a function of the depth \(h\) of its lower face. The scale on the vertical axis is set by \(W_s = 0.20\) N. What is the density of the liquid?

Answer: 1.8g/cm\(^3\)
37. A hollow spherical iron shell floats almost completely submerged in water. The outer diameter is 60.0 cm, and the density of iron is $7.87 \text{ g/cm}^3$. Find the inner diameter.  

Answer: 57.3 cm

54. The water flowing through a 1.9 cm (inside diameter) pipe flows out through three 1.3 cm pipes. (a) If the flow rates in the three smaller pipes are 26, 19, and 11 L/min, what is the flow rate in the 1.9 cm pipe? (b) What is the ratio of the speed in the 1.9 cm pipe to that in the pipe carrying 26 L/min?  

Answer: (a) 56 L/min (b) 1.0

59. Water is moving with a speed of 5.0 m/s through a pipe with a cross-sectional area of 4.0 cm$^2$. The water gradually descends 10 m as the pipe cross-sectional area increases to 8.0 cm$^2$. (a) What is the speed at the lower level? (b) If the pressure at the upper level is $1.5 \times 10^5 \text{ Pa}$, what is the pressure at the lower level?  

Answer: (a) 2.5 m/s (b) $2.6 \times 10^5 \text{ Pa}$

71. Figure 14-54 shows a stream of water flowing through a hole at depth $h = 10 \text{ cm}$ in a tank holding water to height $H = 40 \text{ cm}$. (a) At what distance $x$ does the stream strike the floor? (b) At what depth should a second hole be made to give the same value of $x$? (c) At what depth should a hole be made to maximize $x$?  

Answer: (a) 35 cm (b) 30 cm (c) 20 cm