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.

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?

Fig. 14-30 Problems 10 and 81.

Answer: 2.80 m

28. A piston of cross-sectional area a is used in a hydraulic press to exert a small force of magnitude f on the enclosed liquid. A connecting pipe leads to a larger piston of cross-sectional area A (Fig. 14-36). (a) What force magnitude F will the larger piston sustain without moving? (b) If the piston diameters are 3.80 cm and 53.0 cm, what force magnitude on the small piston will balance a 20.0 kN force on the large piston?

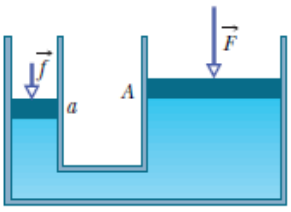

Fig. 14-36 Problem 28.

Answer: (a) 5.0×10^6 N (b) 5.6×10^6 N

32. In Fig. 14-38, a cube of edge length L = 0.600 m and mass 450 kg is suspended by a rope in an open tank of liquid of density 1030 kg/m^3. Find (a) the magnitude of the total downward force on the top of the cube from the liquid and the atmosphere, assuming atmospheric pressure is 1.00 atm, (b) the magnitude of the total upward force on the bottom of the cube, and (c) the tension in the rope. (d) Calculate the magnitude of the buoyant force on the cube using Archimedes' principle.What relation exists among all these quantities?

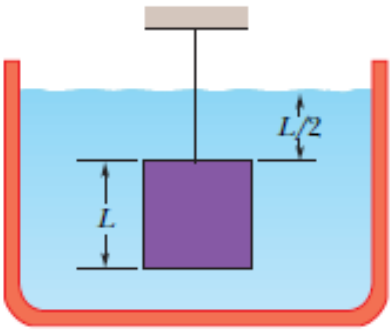

Fig. 14-38 Problem 32.

Answer: (a) 3.75×10^4 N (b)3.96×10^4 N (*c*)2.23×10^3 N (d) 2.18×10^3 N

51. A garden hose with an internal diameter of 1.9 cm is connected to a (stationary) lawn sprinkler that consists merely of a container with 24 holes, each 0.13 cm in diameter. If the water in the hose has a speed of 0.91 m/s, at what speed does it leave the sprinkler holes?

Answer: 8.1 m/s

71. Figure 14-54 shows a stream of water flowing through a hole at depth h = 10 cm in a tank holding water to height H= 40 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?

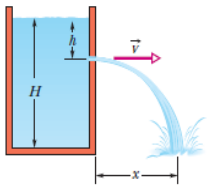

Fig. 14-54 Problem 71.

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