University of Jordan
Faculty of Engineering & Technology
Chemical Engineering Department

الجامعـة الاردنية
كلية الهندسة و التكنولوجيا
قسم الهندسـة الكيميائية

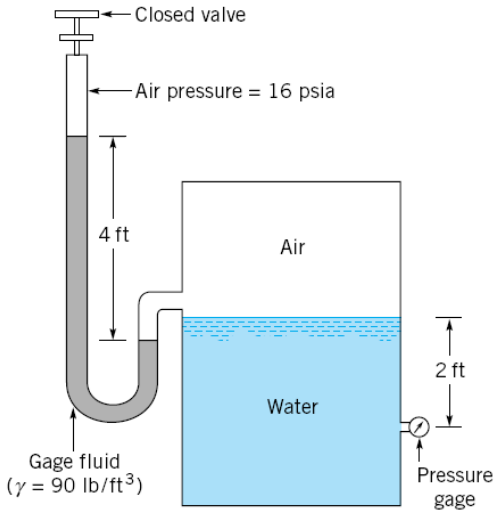
Fluid Mechanics **Second semester 2014/2015**

Suggested problems on topic II:

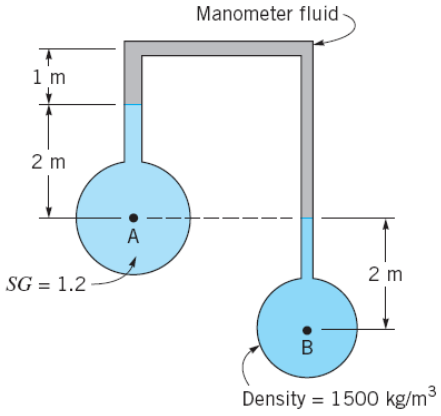
Problem 1. Develop an expression for the pressure variation in a liquid in which the specific weight increases with depth, h, as $\gamma = Kh + \gamma_0$ where K is a constant and γ_0 is the specific weight at the free surface.

Problem 2. Blood pressure is usually given as a ratio of the maximum pressure (systolic pressure) to the minimum pressure (diastolic pressure). Such pressures are commonly measured with a mercury manometer. A typical value for this ratio for a human would be 120/80 where the pressures are in mm Hg. **(a)** what would these pressures be in Pascal? **(b)** If your car tire was inflated to 120 mm Hg, would it be sufficient for normal driving?

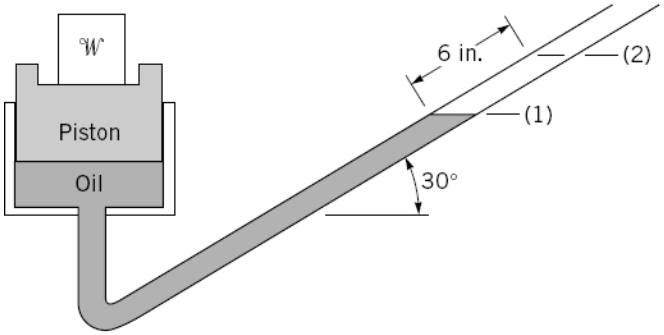
Problem 3. A U-tube manometer is connected to a closed tank containing air and water as shown in the figure below. At the closed end of the manometer the air pressure is 16 psia. Determine the reading on the pressure gage for a differential reading of 4 ft on the manometer. Express your answer in psig. Assume standard atmospheric pressure and neglect the weight of the air columns in the manometer.



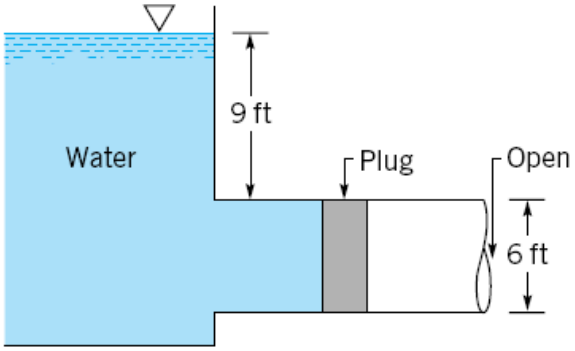
Problem 4. For the stationary fluid shown in figure below, the pressure at point B is 20 kPa greater than at point A. Determine the specific weight of the manometer fluid.



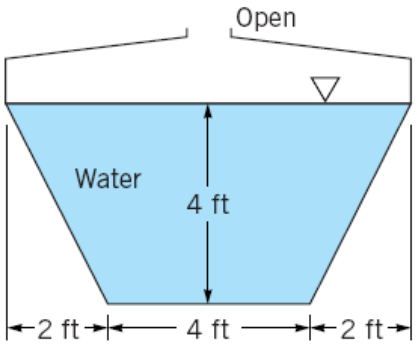
Problem 5. A 6-in.-diameter piston is located within a cylinder which is connected to 0.5 in-diameter inclined-tube manometer as shown in figure below. The fluid in the cylinder and the manometer is oil(density=59 lb/ft^3). When a weight (W) is placed on the top of the cylinder, the fluid level in the manometer tube rises from point (1) to (2). How heavy is the weight? Assume that the change in position of the piston is negligible.



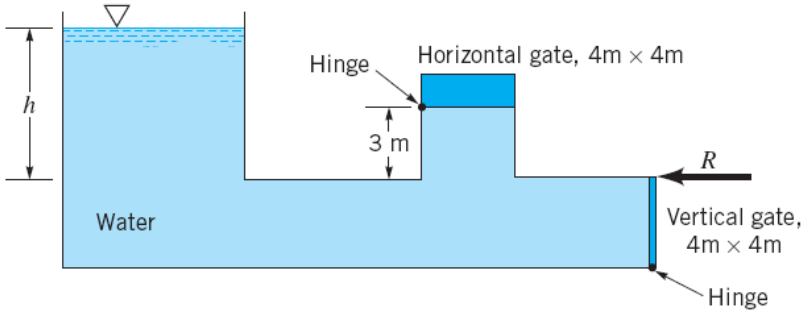
Problem 6. A large, open tank contains water and is connected to a 6-ft-diameter conduit as shown in the figure below. A circular plug is used to seal the conduit. Determine the magnitude, direction, and location of the force of the water on the plug.



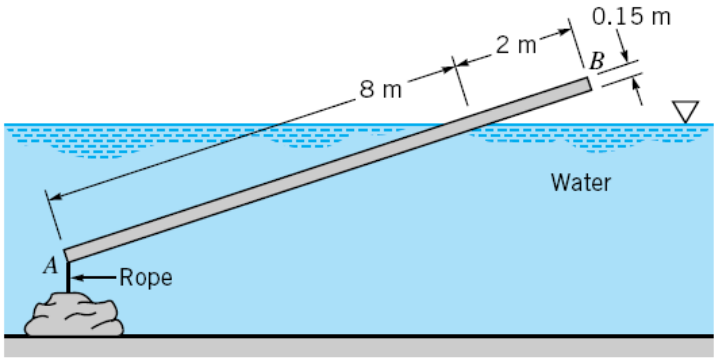
Problem 7. A tanker truck carries water, and the cross section of the truck's tank is shown in figure below. Determine the magnitude of the force of the water against the vertical front end of the tank.



Problem 8. Two square gates close two openings in a conduit connected to an open tank of water as shown in figure below. When the water depth, h, reaches 5 m it is desired that both gates open at the same time. Determine the weight of the homogeneous horizontal gate and the horizontal force, R, acting on the vertical gate that is required to keep the gates closed until this depth is reached. The weight of the vertical gate is negligible, and both gates are hinged at one end as shown. Friction in the hinges is negligible.



Problem 9. The homogeneous timber AB in the figure below is 0.15 m by 0.35 m in cross section. Determine the specific weight of the timber and the tension in the rope.



Problem 10. An L-shaped rigid gate is hinged at one end and is located between partitions in an open tank containing water as shown in the figure below. A block of concrete (density=150 lb/ft^3) is to be hung from the horizontal portion of the gate. Determine the required volume of the block so that the reaction of the gate on the partition at A is zero when the water depth is 2 ft above the hinge. The gate is 2 ft wide with a negligible weight, and the hinge is smooth.