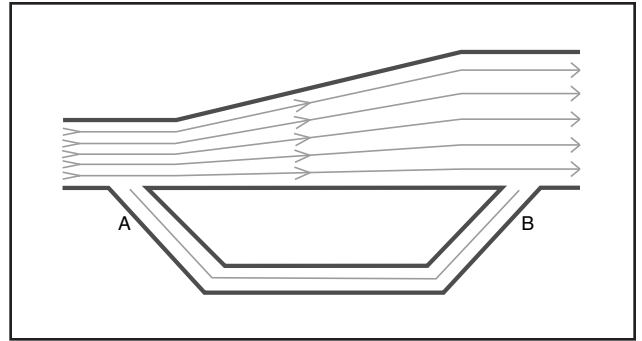


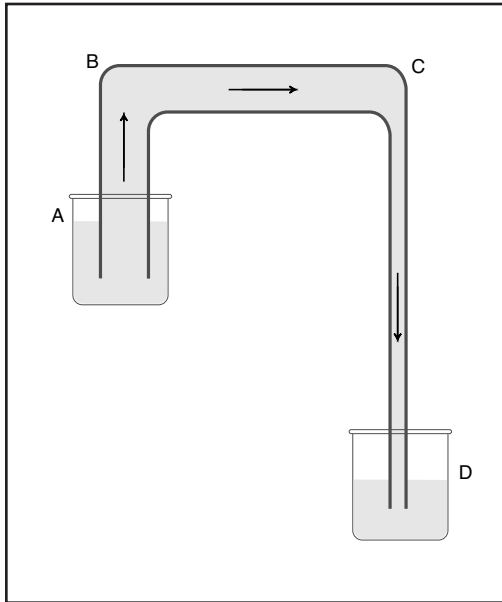
Fluid Mechanics Problem Set

- A bar of lead has the dimensions $2 \times 3 \times 5 \text{ cm}^3$ and mass 330 gm. What is the specific gravity of lead?
 - 1
 - 10
 - 11
 - cannot be determined from given information
- If the bar of lead in problem #1 were submerged in water, what would be the apparent loss of weight on the bar?
 - 300 N
 - 1 N
 - .3 N
 - $1/11 \text{ N}$
- A barge 20 m long and 5 m wide sinks 2 m deeper when loaded with coal than when empty. What is the weight of the coal?
 - $2 \times 10^5 \text{ N}$
 - $5 \times 10^5 \text{ N}$
 - $2 \times 10^6 \text{ N}$
 - $1 \times 10^5 \text{ N}$
- As a helium weather balloon rises through the atmosphere, it expands as it enters the less dense air of the upper atmosphere. Disregarding the change in temperature and any change in the resistance of the fabric to stretching, what happens to the buoyant force on the balloon?
 - decreases
 - remains the same
 - increases
 - not enough information to determine
- What is the net force acting on the circular, level bottom of an open-topped water tower having a base 20 m in diameter containing water to a depth of 10 m?
 - $3.1 \times 10^7 \text{ N}$
 - $1.0 \times 10^5 \text{ N}$
 - $6.2 \times 10^7 \text{ N}$
 - $1.2 \times 10^8 \text{ N}$
- In laminar flow
 - momentum is rapidly interchanged within the fluid
 - the Reynolds number is greater than 3000
 - eddy currents exist
 - none of the above

7. In the illustration at right, the flow through the large pipe moves left to right. The secondary flow in pipe AB
- moves left to right
 - moves right to left
 - does not move
 - moves left to right in streamline flow, but may move either way in turbulent flow



The following passage pertains to questions 8-12



In the construction of a siphon, a tube is filled with liquid and the end of one arm of the tube is immersed in the liquid to be moved. Flow will occur up one arm of the siphon and then down the other. It is necessary in constructing a siphon for the arm drawing off the liquid to be shorter than the arm into which the liquid will flow, and that the end of the short arm of the siphon be kept at a level higher than the end of the long arm.

The action of a siphon is explained by the following: Because the column of liquid CD exerts more pressure at D than the column of liquid AB exerts at A, the atmospheric pressure encounters less opposition in pushing the liquid up the short arm and into the long arm than in pushing the opposite direction.

8. If atmospheric pressure were to increase, the flow rate through the siphon above would
- decrease
 - remain the same
 - increase
 - impossible to determine
9. The diameter of tube segment AB is 3 cm. The diameter of tube segment CD is 1 cm. When the flow speed through AB is 2 cm/s, what will the flow speed be through CD?
- 6 cm/s
 - 18 cm/s
 - 9 cm/s
 - 15 cm/s
10. What is the approximate maximum height of segment AB in a functioning siphon in which the liquid is water?
- 1 meter
 - 10 meters
 - 30 meters
 - there is no maximum

11. As the length of segment CD is increased:

- a. flow rate through the siphon will decrease
- b. pressure in AB will increase
- c. flow rate through the siphon will increase
- d. more than one of the above is correct

12. If instead of ordinary water, we were siphoning deuterium oxide (heavy water) which of the following differences would we observe in our system?

- I. For a siphon of given dimensions, flow rate would decrease.
- II. For a siphon of given dimensions, flow rate would increase.
- III. The maximum height of segment AB would be less.

- a. I only
- b. II only
- c. III only
- d. both I and III