# Chapter 03: dynamics of incompressible ideal fluids.

## *Exercises series Number: 01*

***Exercise 01:***

Water flows through a pipe of internal diameter **20cm** at the speed of **1m/s**. What should the diameter of the nozzle be if the water is to emerge at the speed of **4m/s**?

***Exercise 02:***

A garden hose has an unobstructed opening with a cross-sectional area of $\mathbf{2.85 \times 10^{-4}\ m^2}$, from which water fills a bucket in **30 sec**. The volume of the bucket is $\mathbf{8 \times 10^{-3}\ m^3}$. Find the speed of the water that leaves the hose through the unobstructed opening and through an obstructed opening with half as much area?

***Exercise 03:***

A patient who is recovering from surgery is being given fluid intravenously. The fluid has a density of $\mathbf{1030\ kg/m^3}$ and $\mathbf{9.5 \times 10^{-4} m^3}$ of it flows into the patient every six hours. Find the mass flow rate in kg/s?

***Exercise 05:***

A large tank open to the atmosphere is filled with water to a height of 5 m from the outlet tap (**Figure. (1)**). A tap near the bottom of the tank is now opened, and water flows out from the smooth and rounded outlet. Determine the water velocity at the outlet.

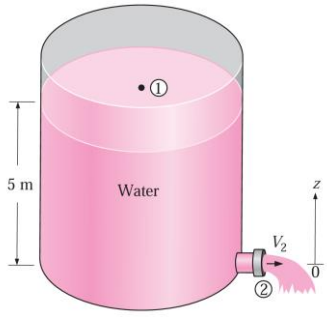


**Figure 1**

***Exercise 06:***

During a trip to the beach ($\boldsymbol{P_{atm} = 1\ atm = 101.3\ kPa}$), a car runs out of gasoline, and it becomes necessary to siphon gas out of the car of a Good Samaritan (**Figure. (2)**). The siphon is a small-diameter hose, and to start the siphon it is necessary to insert one siphon end in the full gas tank, fill the hose with gasoline via suction, and then place the other end in a gas can below the level of the gas tank. The difference in pressure between **point 1** (at the free surface of the gasoline in the tank) and **point 2** (at the outlet of the tube) causes the liquid to flow from the higher to the lower elevation. **Point 2** is located **0.75 m** below **point 1** in this case, and **point 3** is located **2 m** above **point 1**. The siphon **diameter is 4 mm**, and frictional losses in the siphon are to be disregarded. Determine **(a)** the minimum time to withdraw **4 L** of gasoline from the tank to the can and **(b)** the pressure at **point 3**. The density of gasoline is **750 kg/m3**.

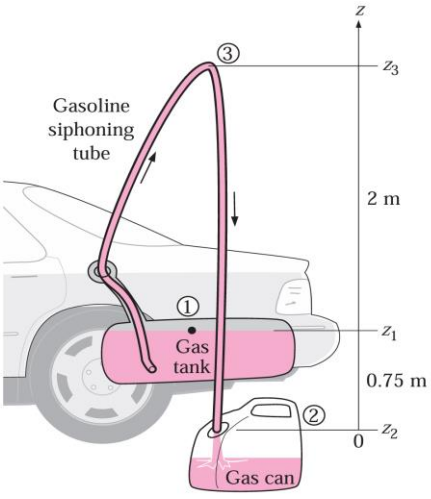


**Figure 2**