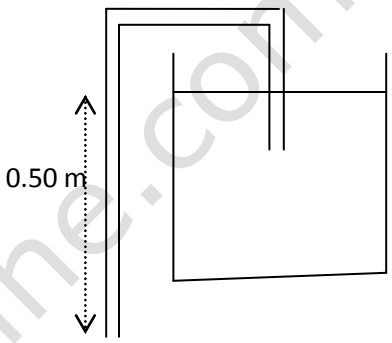
Q- A siphon tube is filled with gasoline and closed at each end. One end is inserted into a gasoline tank 0.20 m below the surface of the gasoline. The outlet is placed outside the tank at a distance 0.50 m below the surface of the gasoline. The tube has an inner cross-sectional area of $4.2*10^{-4}$ m^2. The density of gasoline is 680 kg/m^3. Ignoring viscous effects, what is the velocity of the gasoline in the tube shortly after the tube is opened? What is the corresponding rate of flow of the gasoline?

As the surface of water in the tank and the open end of the tube both are open to the atmosphere we can directly use Torricelli's equation to find the flow velocity as



$$v = \sqrt{2gh}$$

Or $$v = \sqrt{2 * 9.8 * 0.50} = 3.13\ m/s$$

The volume flow rate of gasoline is given by

$$\frac{dQ}{dT} = Av$$

Or $$\frac{\mathrm{dQ}}{\mathrm{dT}} = 4.2 * 10^{-4} * 3.13 = 1.31 * 10^{-3}\mathrm{m}^3/\mathrm{s}$$

And the mass flow rate will be

$$\frac{\mathrm{dm}}{\mathrm{dt}} = \rho\ \frac{\mathrm{dQ}}{\mathrm{dT}} = 680 * 1.31 * 10^{-3} = 0.894\ \mathrm{kg/s}$$