Answer on Question #41318, Physics, Mechanics

In which one of the following cases will the liquid flow in a pipe be most streamlined?

(1) Liquid of high viscosity and high density flowing through a pipe of small radius

(2) Liquid of high viscosity and low density flowing through a pipe of small radius

(3) Liquid of low viscosity and low density flowing through a pipe of large radius

(4) Liquid of low viscosity and high density flowing through a pipe of large radius

Solution

The liquid flow in a pipe is most streamlined if the Reynolds number would be lesser.

For flow in a pipe or tube, the Reynolds number is generally defined as:

$$Re = \frac{\rho v \cdot (2r)}{\mu},$$

where r is the radius of a pipe, v is the mean velocity of the fluid, ρ is the density of the fluid, μ is the dynamic viscosity of the fluid.

We can see from this formula that the Reynolds number would be lesser when liquid of high viscosity and low density flowing through a pipe of small radius.

Answer: (2) Liquid of high viscosity and low density flowing through a pipe of small radius.