Answer on Question#37464, Physics, Other

Question:

Blood flows through a section of a horizontal artery that is partially blocked by a deposit along the artery wall. As a hemoglobin molecule moves from the narrow region into the wider region, its speed changes from v2 = 0.800 m/s to v1 = 0.411 m/s. What is the change in pressure, P1 - P2, that it experiences? The density of blood is 1060 kg/m3.

Answer:

Bernoulli's principle can be expressed as a mathematical equation:

$$\frac{v^2}{2} + gh + \frac{p}{\rho} = const$$

where v is the blood streams speed, g is the acceleration due to gravity,

h is the height, p is the pressure, and ρ is the density of the blood.

In our case:

$$\frac{v_1^2}{2} + \frac{p_1}{\rho} = \frac{v_2^2}{2} + \frac{p_2}{\rho}$$

$$p_1 - p_2 = \frac{\rho}{2}(v_2^2 - v_1^2) = \frac{1060\,\frac{kg}{m^3}}{2}\,(0.8^2 - 0.411^2)\,\frac{m^2}{s^2} = 250\ Pa$$

Answer: $250\ Pa$