

NCERT/CBSE PHYSICS CLASS 11 textbook

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Answers to NCERT/CBSE PHYSICS Class 10(Class XI)textbook Exercise and Additional exercise

CHAPTER NINE

MECHANICAL PROPERTIES OF FLUIDS

EXERCISES

(For simplicity in numerical calculations, take $g = 10 \text{ m s}^{-2}$)

10.25 In deriving Bernoulli's equation, we equated the work done on the fluid in the tube to its change in the potential and kinetic energy. (a) What is the largest average velocity of blood flow in an artery of diameter $2 \times 10^{-3} \text{ m}$ if the flow must remain laminar? (b) Do the dissipative forces become more important as the fluid velocity increases? Discuss qualitatively.

10.25. solution

(a)

While deriving Bernoulli's equation, we say that

Decrease in pressure energy per second = increase in K.E./sec + increase in P.E./sec

assume that viscous forces are absent. thus as the fluid flow from lower to upper edge there is a fall of potential energy due to fall of pressure. if dissipative forces are present then part of potential energy will be used in overcoming those forces during the flow of fluid. So there shall be greater drop of pressure as fluid moves along the tube.

(b) Yes the dissipative forces become more important as the velocity increases. According to Newton's law of viscous drag we know that

$$F = -\eta A \frac{dv}{dx}$$

clearly as v increases, velocity gradient increases and hence, velocity drag i.e. dissipative forces also increases.

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