Answer on Question #55931-Physics-Classical Mechanics

A pump is used to pump a liquid of density D continuously through a pipe of cross section area A. If liquid is flowing with speed v, then power of pump is

(a) (DAv^2)/3

(b) (DAv^2)/2

(c) 2DAv^2

(d) (DAv^3)/2

Solution

The mass of liquid is

$$m = D \cdot V = DAvt.$$

The kinetic energy is

$$K = \frac{1}{2}mv^2 = \frac{1}{2}DAvtv^2 = \frac{1}{2}DAtv^3.$$

The power of pump is

$$P = \frac{K}{t} = \frac{1}{2}DAv^3$$

Answer: (d) (DAv^3)/2.