Question

A cricket ball of mass 150 g is moving with velocity 12 m/s and is hit by a bat so that ball is turned back with 20 m/s. The force acts for 0.01 s. The average force exerted by the bat on the ball is

a) 400 N

b) 450 N

c) 485 N

d) 480 N

Solution

m = 150 g = 0.15 kg; $|v_i|$ = 12 m/s; $|v_f|$ = 20 m/s; Δt = 0.01 s.

The second Newton's Law:

$$\vec{F} = m\vec{a};$$

$$\vec{F} = m\frac{\overrightarrow{\Delta v}}{\Delta t} = m\frac{\overrightarrow{v_f} - \overrightarrow{v_i}}{\Delta t}; \; F = m\frac{|v_f| - (-|v_i|)}{\Delta t} = m\frac{|v_f| + |v_i|}{\Delta t} = \boldsymbol{480\ N}$$

Answer: d) F = 480 N.