2. High-speed photography shows that the head of a 240-g golf club is traveling at 54.0 m/s just before striking a 50.0-g golf ball that was resting on a tee. The club and ball are in contact for 2.00 ms. After the collision, the club head travels (in the same direction) at 40.0 m/s. Find the speed of the golf ball just after impact. Calculate the average force exerted on the ball by the club. Was energy conserved during this collision? How do you know?

Momentum Before = Momentum After

$.240(54) + 0 = .240(40) + .05 V_{ball\ after}$

$12.96 = 9.6 + .05 V_{ball\ after}$

$3.36 = .05 V_{ball\ after}$

$V_{ball\ after} = 67.2 m/s$

$F = ma = m\frac{\Delta V}{\Delta t} = 0.05\frac{(67.2 - 0)}{(.002)} = 1680 N$

Energy before

$\frac{1}{2}(.240)(54)^2 + \frac{1}{2}(.05)(0)^2$

349.92

Energy after

$\frac{1}{2}(.240)(40)^2 + \frac{1}{2}(.05)(67.2)^2$

192 + 112.896

304.896

about 45 Joules lost

mechanical energy not conserved

↖ generated sound + heat