Answer on Question #51832, Physics, Mechanics | Kinematics | Dynamics

Question:

1)A force of 6.0N is used to accelerate a mass of 1.0 kg from rest for a distance of 12m.The force is applied along the direction of travel.The coefficient of kinetic friction is 0.30.What is the

a)work done by the applied force?

b)work done by friction?

2)A ball having a mass of 150g strikes a wall a speed of 5.0m/s and rebounds with only 50% of its initial kinetic energy

a)What is the speed of the ball immediately after rebounding?

b)If the ball is in contact with the wall for 7ms.What is the magnitude of the average force on the ball from the wall during this time interval

Answer:

1)

a) work done by the applied force equals:

$$A = Fd = 6N \cdot 12m = 72\,J$$

b) work done by friction equals:

$$A_{fr} = F_{fr} d \cos 180 = -\mu mgd = -0.3 \cdot 1kg \cdot 9.8\frac{m}{s^2}\ 12m = 35.3$$

2)

a) Final kinetic energy equals:

$$T_f = \frac{T_i}{2} = \frac{\frac{mv_i^2}{2}}{2} = \frac{mv_f^2}{2}$$

Therefore:

$$v_f^2 = \frac{v_i^2}{2}$$

the speed of the ball immediately after rebounding equals:

$$v_f = \frac{v_i}{\sqrt{2}} = 3.5\frac{m}{s}$$

b) Change of momentum equals:

$$\Delta p = m(v_i + v_f) = F\Delta t$$

average force on the ball equals:

$$F = \frac{mv_i\left(1 + \frac{1}{\sqrt{2}}\right)}{\Delta t} = 183\ N$$