## EX 3.50

P = 100 watt
Light beam


$m = 2e\text{-}3\,kg$

$\Delta t = 10^4\,sec$ } time of illumination

a) How much energy & momentum are absorbed by the blackbody?

$E = P\,\Delta t = (100W)(10^4 sec) = \boxed{1e6\ Joules}$

$\Delta p$ of blackbody = total momentum lost by light

each photon has momentum $p = \frac{E_1}{c}$

so all the photons have momentum $P = \frac{E}{c}$

$\Delta p_{blackbody} = \frac{1e6}{3e8} = \boxed{\frac{1}{3}e\text{-}2} = 0.33e\text{-}2$

b) the velocity of the blackbody is

$\Delta v = \frac{\Delta p}{m} = \frac{\frac{1}{3}e\text{-}2}{2e\text{-}3} = \frac{1}{6}e1$

$\Delta v = \boxed{1.67\ m/s}$

c) the final KE is $\frac{1}{2}mv^2 = \frac{1}{2}(2e\text{-}3)(1.67)^2$

$KE = \boxed{2.79\ mJ}$

Much of the light energy has gone into heating the blackbody, since the collision were inelastic.