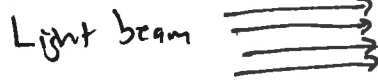


EX 3.50

$P = 100 \text{ watt}$



$m = 2 \times 10^{-3} \text{ kg}$

$\Delta t = 10^1 \text{ sec}$  } time of illumination

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

$E = P \Delta t = (100 \text{ W})(10^1 \text{ sec}) = \boxed{1 \times 10^6 \text{ Joules}}$

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

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

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

$\Delta p_{\text{blackbody}} = \frac{1 \times 10^6}{3 \times 10^8} = \boxed{\frac{1}{3} \times 10^{-2}} = 0.33 \times 10^{-2}$

b) the velocity of the blackbody is

$\Delta v = \frac{\Delta p}{m} = \frac{\frac{1}{3} \times 10^{-2}}{2 \times 10^{-3}} = \frac{1}{6} \times 10^1$

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

c) the final KE is  $\frac{1}{2} m v^2 = \frac{1}{2} (2 \times 10^{-3}) (1.67)^2$

$KE = \boxed{2.79 \text{ mJ}}$

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