24. (a) We note that the cross section area of the beam is $\pi d^2/4$, where d is the diameter of the spot ($d = 2.00\lambda$). The beam intensity is

$$I = \frac{P}{\pi d^2/4} = \frac{5.00\times10^{-3}\text{ W}}{\pi\left[(2.00)(633\times10^{-9}\text{ m})\right]^2/4} = 3.97\times10^9\text{ W/m}^2.$$

(b) The radiation pressure is

$$p_r = \frac{I}{c} = \frac{3.97\times10^9\text{ W/m}^2}{2.998\times10^8\text{ m/s}} = 13.2\text{ Pa}.$$

(c) In computing the corresponding force, we can use the power and intensity to eliminate the area (mentioned in part (a)). We obtain

$$F_r = \left(\frac{\pi d^2}{4}\right)p_r = \left(\frac{P}{I}\right)p_r = \frac{(5.00\times10^{-3}\text{ W})(13.2\text{ Pa})}{3.97\times10^9\text{ W/m}^2} = 1.67\times10^{-11}\text{ N}.$$

(d) The acceleration of the sphere is

$$a = \frac{F_r}{m} = \frac{F_r}{\rho(\pi d^3/6)} = \frac{6(1.67\times10^{-11}\text{ N})}{\pi(5.00\times10^3\text{ kg/m}^3)[(2.00)(633\times10^{-9}\text{ m})]^3}$$
$$= 3.14\times10^3\text{ m/s}^2.$$