

1. Calculate the speed that a gas-phase fluorine molecule, F_2 , would have if it had the same energy as an infrared photon ($\lambda = 1.00 \times 10^4$ nm), a visible photon ($\lambda = 500$ nm), and an X-ray photon ($\lambda = 100$ nm). ($h = 6.626 \times 10^{-34}$ J•s, $c = 3.00 \times 10^8$ m/s)

b) What temperature would the gas have if it had the same energy as the X-ray photon? Use the root mean square speed, $v_{rms} = \sqrt{3k_B T / m}$, for this calculation. ($k_B = 1.38 \times 10^{-23}$ J/K).

2. What is the maximum number of electrons that can be emitted if a potassium surface of work function 2.40 eV absorbs 5.00×10^{-3} J of radiation at a wavelength of 325 nm? ($1.00 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$)

b) What is the kinetic energy and velocity of the electrons emitted? ($m_e = 9.11 \times 10^{-31} \text{ kg}$)