CHEM 105 Quiz 3

Name Key

$E_{photon} = h\nu = \frac{hc}{\lambda}$ $h = 6.626\ x\ 10^{-34}\ Js$ $c = 2.998\ x\ 10^{8}\ ms^{-1}$

$E_K = ½\ mv^2$ $m_{electron} = 9.109\ x\ 10^{-31} kg$ $c = \lambda\nu$

1. What is the frequency of a photon E = 5 x 10^{-17} J?

$E = h\nu$

$\nu = \frac{E}{h} = \frac{5 \times 10^{-17}\ J}{6.626 \times 10^{-34}\ Js} = 7.55 \times 10^{16}\ s^{-1}$

2. Determine the kinetic energy of an electron that is ejected from a Uranium surface when 145 nm light is directed at that surface. The threshold energy of Uranium is 3.6 eV (note that 1 eV = 1.602 x 10^{-19} J).

$3.6\ eV \left| \frac{1.602 \times 10^{-19}\ J}{1\ eV} \right. = 5.767 \times 10^{-19}\ J$

$\lambda = 145\ nm \left| \frac{10^{-9}\ m}{1\ nm} \right. = 1.45 \times 10^{-7}\ m$

$E_{photon} = \frac{(6.626 \times 10^{-34}\ Js)(2.998 \times 10^{8}\ m/s)}{1.45 \times 10^{-7}\ m} = 1.37 \times 10^{-18}\ J$

$E_K = E_{photon} - \phi = 1.37 \times 10^{-18}\ J - 5.76 \times 10^{-19}\ J$

$E_K = 7.94 \times 10^{-19}\ J$