Given that the work functions from Al, Cd, Co and Fe are 4.08, 4.07, 5.09 and 4.50 eV, respectively. Calculate:

A. The frequency of radiation required to eject an electron.

$E = h\nu$ in Joules → $\nu = E/h$ is E is in Joules

$E = CV$ = charge x voltage = $(1.62 \times 10^{-19}\ C)(5.0\ eV) = 8.1 \times 10^{-19}\ J$

$\nu = E/h = 8.1 \times 10^{-19}\ J / 6.26 \times 10^{-34}\ Js = 1.29 \times 10^{15}\ s^{-1}$

$\nu = C/h\ \Phi = 1.62 \times 10^{-19}\ C / 6.26 \times 10^{-34}\ Js\ \Phi$ in eV $= 2.59 \times 10^{14}\ Js\ \Phi$ in eV

B. The wavelength of radiation required to eject an electron.

$c = \lambda\nu$ → $\lambda = c/\nu = 2.99 \times 10^{8}\ m/s / 1.29 \times 10^{15}\ s^{-1} = 2.31 \times 10^{-7}\ m = 231\ nm$

C. The velocity of an electron ejected by a 6 eV photon.

The kinetic energy is $E - \Phi = 6.0\ eV - 5.0\ eV = 1.0\ eV$

The energy in Joules is $CV = (1.62 \times 10^{-19}\ C)(1.0\ eV) = 1.62 \times 10^{-19}\ J$

$1/2mv^2 = E - \Phi$

The velocity is $v = \text{sqrt}(2(E - \Phi)/m) = \text{sqrt}(1.62 \times 10^{-19}\ J / 2 / 9.1 \times 10^{-31}\ kg) = 5.96 \times 10^{5}\ m/s$