Q- An electron in Chromium (Z=24) moves from the n=2 to the n=1 state without emitting a photon. Instead, the excess energy is transmitted to an outer electron (n=4 state), which is emitted. This is called an Auger Electron. Using ionization considerations, calculate the kinetic energy of the Auger electron.

The energy of an electron for a hydrogen like atom is given by Bohr's theory as

$$E_n = -\frac{m_e e^4 Z^2}{8 \in_0^2 h^2} \frac{1}{n}$$

Here n the quantum number corresponding to the state of the electron.

The release of energy by the electron from n = 2 to n = 1 state is given by the improvised Mosley law for chromium (Z = 24) as

$$\Delta E = \frac{m_e e^4}{8 \in_0^2 h^2} \left( \frac{1}{1^2} - \frac{1}{2^2} \right) (Z-1)^2 = 13.6 * 0.75 * 23^2 = 5395.8 \, \text{eV}$$

Energy of the electron in n = 4 state is given by

$$E_4 = -\frac{m_e e^4}{8 \in_0^2 h^2} (Z-1)^2 = -\frac{13.6}{16} * 23^2 = -449.65 . eV$$

Hence the energy remain with the Auger electron as kinetic energy will be

5395.8 - 449.65 = 4946.15 eV = 7.924*$10^{-16}$ J

(the energies are in good agreement with the actual energies as in the table http://www4.nau.edu/microanalysis/Microprobe/Xray-MoseleysLaw.html)