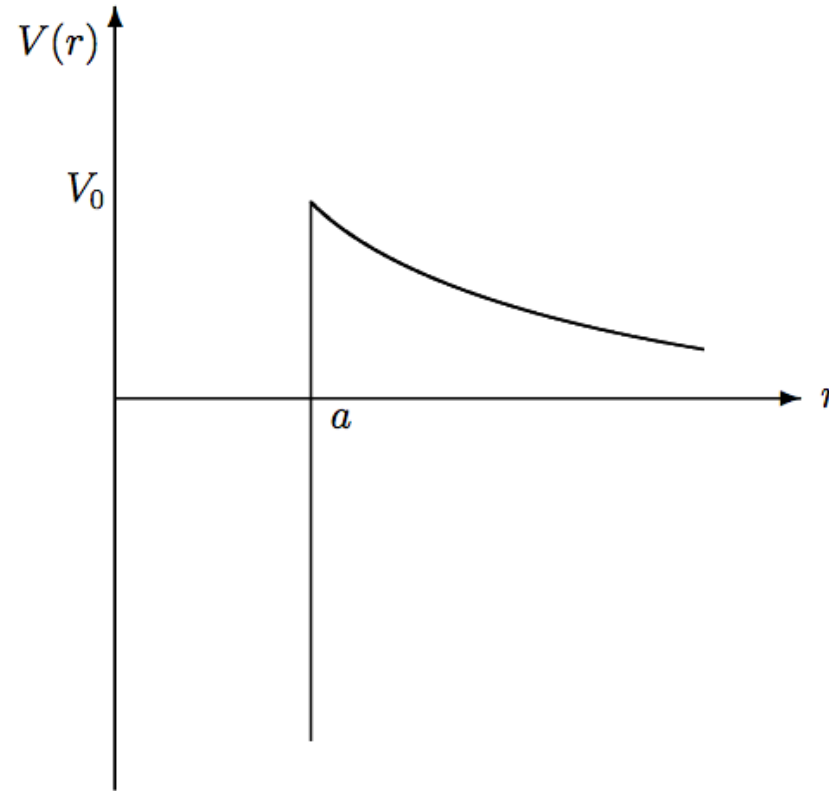An elementary representation of the potential energy of interaction between electrons and certain atoms is that of a rigid sphere plus a long–range repulsive potential energy:

Let a heavy atom of radius a be at rest at the origin and an electron with mass m and speed v be incident on the atom. Assume that an electron is captured (i.e. a negative ion is formed) if the electron approaches within a distance a of the origin (i.e. comes "inside" the atom). Calculate the cross-section $\sigma = \pi b^2$ and the maximum impact parameter $b(v)$ for ionization for two separate cases:

- $v < \sqrt{2V_0/m}$

- $v > \sqrt{2V_0/m}$