

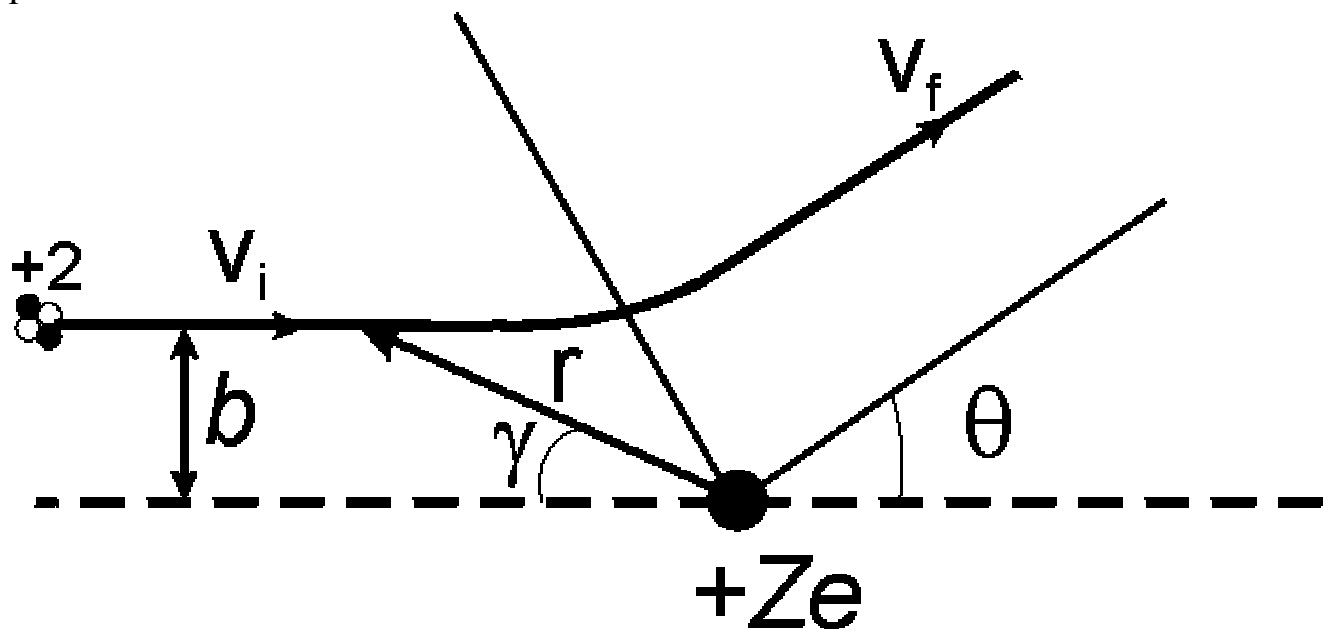
Rutherford's Formula Revisited

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Rutherford's formula was derived wrongly in most of the recent texts. Many texts start the derivation of Rutherford's formula from consideration of conservation of angular momentum but most of these derivations are wrong. An example will be given below:

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As the particle moves in a central field, angular momentum is conserved.

$$mr^2 \frac{d\gamma}{dt} = mv_0 b$$

This equation is wrong because from conservation of angular momentum, the velocity has to be perpendicular to the radius so that it is not affected by a central field. Looking at the diagram, actually V_i is perpendicular to b but $d\gamma/dt$ is the velocity of the particle. As you can see, the path of the particle is not a circle but a hyperbola, so there is no way the velocity, $d\gamma/dt$ can be perpendicular to r . So the above consideration of conservation of angular momentum is wrong!

A correct derivation of Rutherford's formula was given by Rutherford himself and can be found at <http://www.math.ubc.ca/~cass/rutherford/rutherford673.html>