Answer on Question#64220 – Physics – Electromagnetism

A small particle has charge $-5\mu C$ and mass $2 \cdot 10^{-4} kg$. It moves from point A, where the electric potential is $V_a = +200V$, at point B is $V_b = +800V$. The electric force is the only electric force acting on the particle. The particle has speed $5\frac{m}{s}$ at point A. What is the speed at point B?

Solution. The work of the electric field to move a charge equal to $W = q(V_a - V_b)$, where $q = -5 \cdot 10^{-6} C$ – charge of the particle, potential is $V_a = +200V$, at point B is $V_b = +800V$. Because only electric force acting on the particle the law of conservation of energy. Therefore, the work of electric power is consumed for the change in the kinetic energy of the particle.

$$W = E_f - E_i$$

E_f – final kinetic energy, E_i – initial kinetic energy. Hence

$$q(V_a - V_b) = \frac{mv_f^2}{2} - \frac{mv_i^2}{2} \rightarrow v_f = \sqrt{\frac{2q(V_a - V_b)}{m} + v_i^2} = 7.4\frac{m}{s}$$

Answer. $v_f = 7.4\frac{m}{s}$