

Q- In moving from point A to point B, an alpha particle lost 9.8×10^{-17} J of electric potential energy and gains an equal amount of kinetic energy. What is the potential difference between A and B?

The electric potential at a point in an electric field is the electrostatic potential energy stored per unit (test) charge at that point.

If a charge q posses electrostatic potential energy U at a point then potential at that point is given by

$$V = U/q$$

Potential difference between two points in an electric field gives the electrostatic potential energy difference per unit test charge. The energy of positive charge is more at the point of high potential and less at the point of low potential.

If the potential difference between two points A and B is V_{AB} then the difference of energy of q charge at the two points will be $q \cdot V_{AB}$.

Now the charge on the α particle is $q = + 2e = + 2 \cdot 1.6 \cdot 10^{-19} = 3.2 \cdot 10^{-19}$ C.

The energy difference between points A and B is $U = 9.8 \cdot 10^{-17}$ J

Hence the potential difference between the two points is given by

$$V_{AB} = U/q = 9.8 \cdot 10^{-17} \text{ J} / 3.2 \cdot 10^{-19} \text{ C} = 306.25 \text{ V}$$