Answer on Question #46294

Select the correct option from the following:

electric field is a scalar quantity
electromotive force is a vector quantity
electric current is a scalar quantity
electric potential is a vector quantity

Solution.

Correct option is “electric current is a scalar quantity”.
An electric current is the flow of electric charge across a surface per second: $I = \frac{q}{t}$, where
q – an electric charge is a scalar quantity;
t – a time is scalar quantity;
Then electric current I is the scalar quantity (when scalar quantity divides by scalar quantity, we have scalar quantity).

Other options are incorrect, because:

An electric field is a vector quantity. The field vector at a point is defined as the force vector per unit charge: $\vec{E} = \frac{\vec{F}}{q}$, where
$\vec{F}$ – a force is vector quantity;
q – an electric charge is a scalar quantity;
Then electric field $\vec{E}$ is the vector quantity (when vector quantity divides by scalar quantity, we have vector quantity).

An electromotive force is a scalar quantity. An electromotive force can be defined around a closed loop as the electromagnetic work that would be transferred to a unit of charge if it travels once around that loop: $\mathcal{E} = \frac{W}{q}$, where
W – an electromagnetic work is a scalar quantity;
q – an electric charge is a scalar quantity;
Then electromotive force $\mathcal{E}$ is the scalar quantity (when scalar quantity divides by scalar quantity, we have scalar quantity).

An electric potential is a scalar quantity. An electric potential at a point of space is the amount of electric potential energy that a unitary point charge would have when located at that point: $V = \frac{P}{q}$, where
P – an electric potential energy is a scalar quantity;
q – an electric charge is a scalar quantity;

Then electric potential V is the scalar quantity (when scalar quantity divides by scalar quantity, we have scalar quantity).

Answer: Correct option is: electric current is a scalar quantity.