

The current I in a conductor as a function of time t is given as $I(t)=5t^2-3t+10$ where current is in amperes (A) and t is in seconds (s). What quantity of charge moves across a section through the conductor during the interval $t=2s$ to $t=5s$?

- a. 154.4C
- b. 193.5C
- c. 225.5C
- d. 300.0C

Electric current is defined as the rate at which charge flows through a surface (the cross section of a wire, for example), the definition of electric current:

$$I(t) = \frac{dq}{dt}$$

In our case: $I(t) = 5t^2 - 3t + 10$.

Therefore, quantity of charge moving during the interval $t=2s$ to $t=5s$ equals:

$$q = \int_2^5 (5t^2 - 3t + 10) dt = \left(\frac{5t^3}{3} - \frac{3t^2}{2} + 10t + C \right) \Big|_2^5 = 193.5 \text{ C}$$

Answer: b. 193.5 C