

Answer on Question #61333-Physics-Electromagnetism

16 Which of the following correctly gives the electric field at the center of a uniformly charged semicircular arc of radius a and charge per unit length, λ ?

a) $\lambda 2\pi\epsilon_0 a$

b) $2\lambda\pi\epsilon_0 a$

c) $\lambda\pi\epsilon_0 a^2$

d) $\lambda\pi\epsilon_0 a$

Answer

The electric field at the center of a uniformly charged semicircular arc of radius is given by equation:

$$E = \frac{\lambda}{2\pi\epsilon_0 a}$$

15) A uniform electric field of $E = 200 \frac{N}{C}$ is in the x-direction. A point charge of $q = 3 \mu C$ is released from rest at the origin. What is the kinetic energy of the charge when it is at $x = 4$ m?

a) $2.4 \times 10^{-3} J$

b) $1.6 \times 10^{-3} J$

c) $3.6 \times 10^{-3} J$

d) $4.8 \times 10^{-3} J$

Solution

The kinetic energy of the charge is equal to the work done by uniform electric field on a point charge:

$$K = W.$$

The work done by uniform electric field on a point charge is

$$W = qEd.$$

Thus

$$K = qEd = 3 \cdot 10^{-6} C \cdot 200 \frac{N}{C} (4m - 0m) = 2.4 \cdot 10^{-3} J.$$