Name: _____ Class: _____ Date: _____ ID: A

PHYS132-QUIZ2

Multiple Choice
Identify the choice that best completes the statement or answers the question.

___ 1. Charge Q is distributed uniformly along a semicircle of radius a. Which formula below gives the correct magnitude of the electric field at the center of the circle?

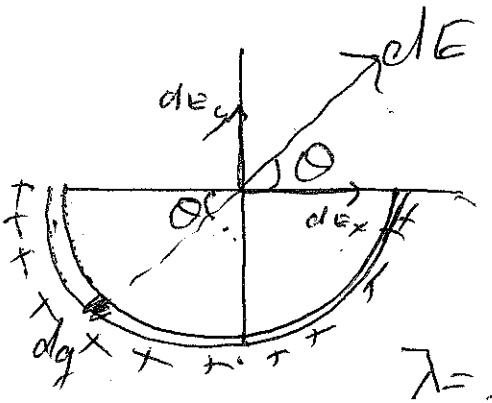
a. $E = \frac{1}{4\pi\varepsilon_0}\frac{Q}{\pi a}$.

b. $E = \frac{1}{4\pi\varepsilon_0}\frac{Q}{\pi a^2}$.

c. $E = \frac{1}{4\pi\varepsilon_0}\frac{2Q}{\pi a}$.

d. $E = \frac{1}{4\pi\varepsilon_0}\frac{2Q}{\pi a^2}$.

e. $E = \frac{1}{4\pi\varepsilon_0}\frac{2Q}{a^2}$.



$\lambda = \frac{Q}{\pi a}$

$dE = \frac{k\,dq}{a^2}$

$dE_x = dE\cos\theta$

$dE_y = dE\sin\theta$

$E_x = 0$ from symmetry

$dE_y = \frac{k\,dq}{a^2}\sin\theta$, $dq = \lambda(a\,d\theta)$

$dq = \lambda\,dl$

$= \lambda(a\,d\theta)$

$E_y = \int dE_y = \int \frac{k\lambda a\,d\theta}{a^2}\sin\theta$

$E_y = \frac{k\lambda}{a}\int_0^{180} \sin\theta\,d\theta = \frac{k\lambda}{a}\left[-\cos\theta\right]_0^{180}$

$E_y = \frac{2k\lambda}{a} = \frac{1}{4\pi\varepsilon_0}\cdot\frac{2Q}{\pi a^2}$