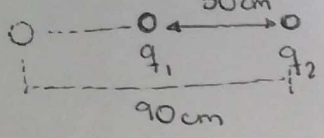
EYHOIT – Taller 2

① F, las cargas positivas experimentan fuerzas en la misma dirección que $\vec{E}$, de mayor a menor potencial. 10%

② $\Delta V = -\int \vec{E}\cdot d\vec{s} = -\frac{Cx^2}{2} = -0.5Cx^2$ → Opción (d) 10%

①



$q_1: 30\mu C$ $q_2: -50\mu C$ $E_o = E_f$

$m_1: 0.04kg$

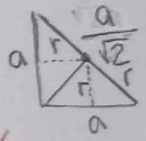
$V_1 = ?$

$$\frac{Kq_1q_2}{r_o} = \frac{Kq_1q_2}{r_f} + \frac{1}{2}m_1V_1^2$$ 7%

$$V_1 = \sqrt{\frac{2Kq_1q_2}{m}\left(\frac{1}{r_o}-\frac{1}{r_f}\right)} = \sqrt{\frac{(2)(9\times10^9)(30\mu)(50\mu)}{0.04}\left(\frac{1}{0.5}-\frac{1}{0.9}\right)}$$ → $V_1 = 24.5\ m/s$ 8%

②

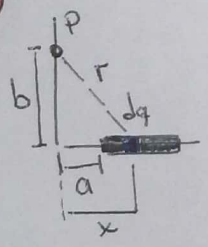
ⓐ $U = K\left[\frac{2q^2}{a}+\frac{q^2}{\sqrt{2}a}+\frac{2q^2}{a}\right] = (9\times10^9)\left[\frac{4(8\mu)^2}{0.1}+\frac{(8\mu)^2}{\sqrt{2}(0.1)}\right]$ → $U = 27.1\ J$ 5% 5%



ⓑ $V = \frac{kq}{r}+\frac{k(2q)}{r}+\frac{kq}{r} = \frac{4kq}{r} = \frac{4(9\times10^9)(8\mu)}{0.1/\sqrt{2}}$ → $V = 4073\ kV$ 5% 5%

ⓒ $W = \Delta U = q\Delta V = (1.5\times10^{-9})(4073\times10^3)$ → $W_{ext} = 6.1\ mJ$ 5%

③

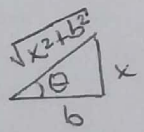


$$V = K\int\frac{dq}{r} = K\int_a^{a+L}\frac{\lambda dx}{\sqrt{x^2+b^2}} = K\lambda\int\frac{b\sec^2\theta\,d\theta}{b\sec\theta} = K\lambda\int\sec\theta\,d\theta$$ 10%

$$V = K\lambda\ln|\sec\theta+\tan\theta| = K\lambda\ln\left|\frac{\sqrt{x^2+b^2}}{b}+\frac{x}{b}\right|_{0.05}^{0.85}$$ 10%

$$V = (9\times10^9)(5\mu)\left[\ln\left|\frac{\sqrt{0.85^2+0.1^2}+0.85}{0.1}\right|-\ln\left|\frac{\sqrt{0.05^2+0.1^2}+0.05}{0.1}\right|\right]$$

$V = 45000\,[2.84-0.48]$



$x = b\tan\theta$

$dx = b\sec^2\theta\,d\theta$

$\sqrt{x^2+b^2} = b\sec\theta$

$V = 1062\ kV$ 5%

④ $V = 2xy + 3xz^2 - 8yz^3$ $\quad P(1, 4, -4)$

$E_x = -\frac{\partial V}{\partial x} = -(2y + 3z^2) = -(2(4) + 3(-4)^2) = -56$ 3%

$E_y = -\frac{\partial V}{\partial y} = -(2x - 8z^3) = -(2(1) + 8(-4)^3) = -514$ 3%

$E_z = -\frac{\partial V}{\partial z} = -(6xz - 24yz^2) = -(6(1)(-4) - 24(4)(-4)^2) = +1560$ 3%

$\vec{E} = -56\hat{i} - 514\hat{j} + 1560\hat{k}$ 3%

$|\vec{E}| = 1643.4 \, V/m$ 3%