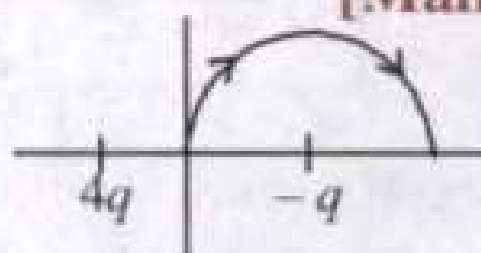


A two point charges $4q$ and $-q$ are fixed on the x -axis at $x = -\frac{d}{2}$ and $x = \frac{d}{2}$, respectively. If a third point charge ' q ' is taken from the origin to $x = d$ along the semicircle as shown in the figure, the energy of the charge will :

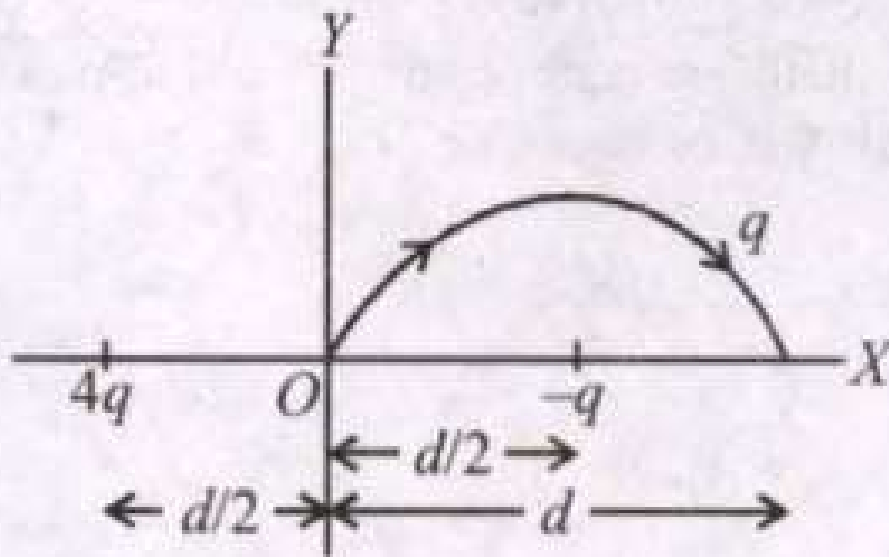
[Main Sep. 04, 2020 (I)]



- (a) increase by $\frac{3q^2}{4\pi\epsilon_0 d}$ (b) increase by $\frac{2q^2}{3\pi\epsilon_0 d}$
- (c) decrease by $\frac{q^2}{4\pi\epsilon_0 d}$ (d) decrease by $\frac{4q^2}{3\pi\epsilon_0 d}$

(d) Change in potential energy, $\Delta u = q(V_f - V_i)$

Potential of $-q$ is same as initial and final point of the path.



$$\Delta u = q \left(\frac{k4q}{3d/2} - \frac{k4q}{d/2} \right) = -\frac{4q^2}{3\pi\epsilon_0 d}$$

-ve sign shows the energy of the charge is decreasing.