Answer on Question #59026, Physics / Electromagnetism

Charges of +2 and −2C are situated at points P and Q respectively which are at a distance apart. A point X is mid-way between P and Q. Which of the following correctly describes the electric field and the electric potential at point X?

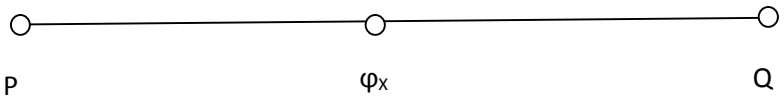
electric field is toward Q, electric potential is zero

electric field is toward Q, electric potential is negative

electric field is toward P, electric potential zero

electric field is toward P, electric potential is positive

Solution:



The electric potential at point X:

$\varphi_X = \varphi_{XP} + \varphi_{XQ}$ (1),

where φ_{XP} – electric potential at point X, which creates a charge at point P,

φ_{XQ} – electric potential at point X, which creates a charge at point Q,

Electric potential at point X, which creates a charge at point P:

$\varphi_{XP} = \frac{1}{4\pi\varepsilon_0} \times \frac{q_P}{\varepsilon r}$ (2),

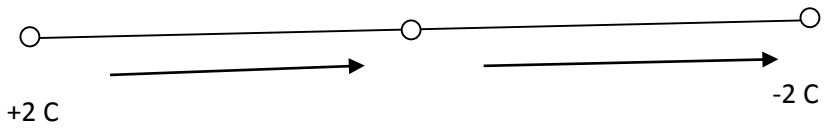
where q_P=+2 C

Electric potential at point X, which creates a charge at point Q:

$\varphi_{XQ} = \frac{1}{4\pi\varepsilon_0} \times \frac{q_Q}{\varepsilon r}$ (3),

where q_Q=-2 C

(2) and (3) in (1): $\varphi_X = 0$ V



The lines of the electric field

Answer:

electric field is toward Q, electric potential is zero