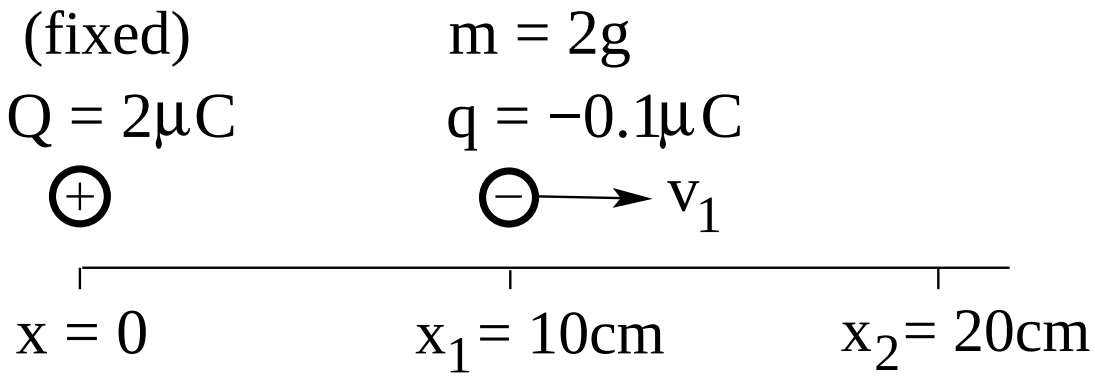
Electric Potential and Potential Energy: Application (1)

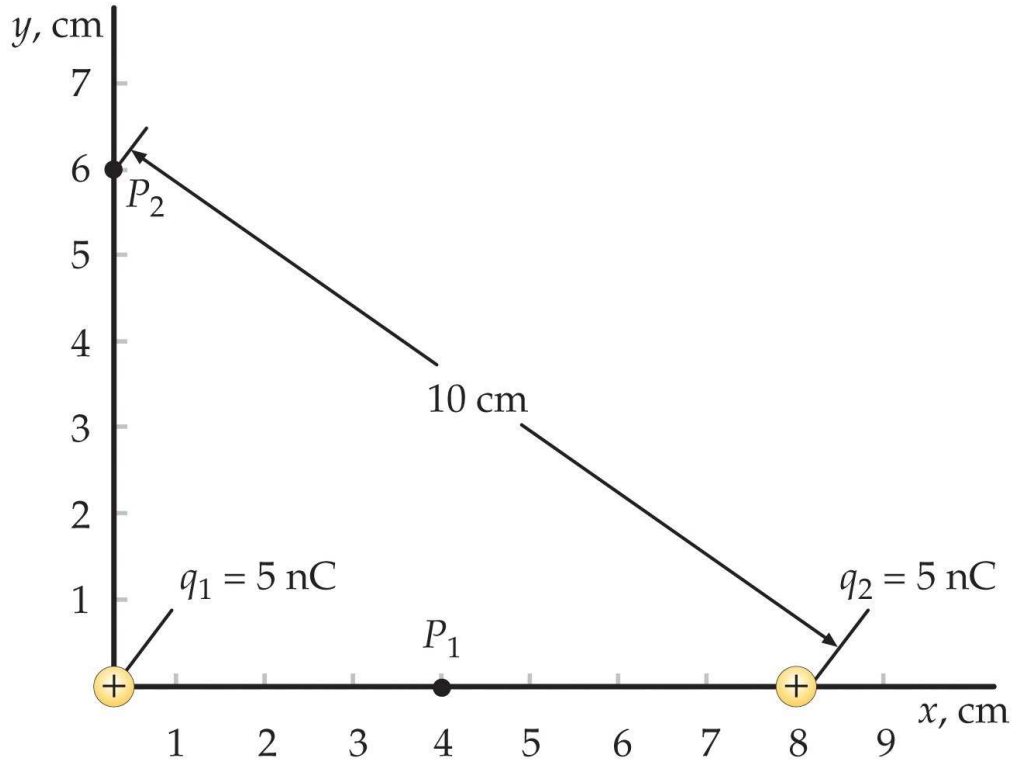
Consider a point charge $Q = 2\mu$C fixed at position $x = 0$. A particle with mass $m = 2$g and charge $q = -0.1\mu C$ is launched at position $x_1 = 10$cm with velocity $v_1 = 12$m/s.



- Find the velocity v_2 of the particle when it is at position $x_2 = 20$cm.

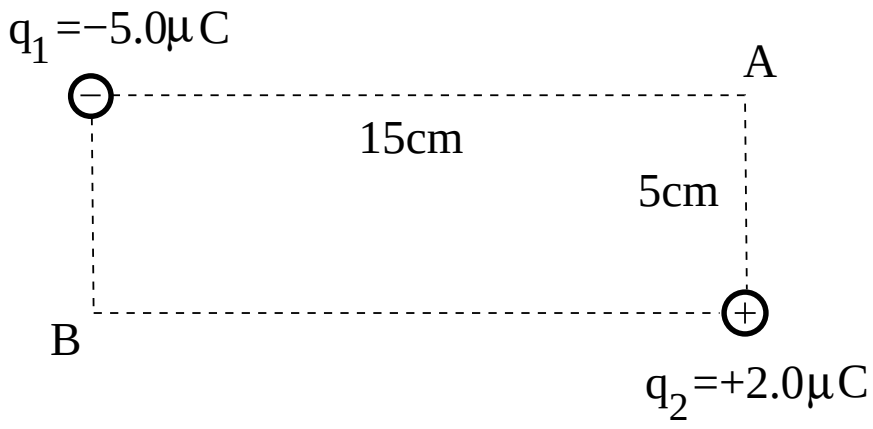
Electric Potential and Potential Energy: Application (2)

- Electric potential at point P_1: $V = \dfrac{kq_1}{0.04\text{m}} + \dfrac{kq_2}{0.04\text{m}} = 1125\text{V} + 1125\text{V} = 2250\text{V}.$
- Electric potential at point P_2: $V = \dfrac{kq_1}{0.06\text{m}} + \dfrac{kq_2}{0.10\text{m}} = 750\text{V} + 450\text{V} = 1200\text{V}.$



Electric Potential and Potential Energy: Application (3)

Point charges $q_1 = -5.0\mu$C and $q_2 = +2.0\mu$C are positioned at two corners of a rectangle as shown.



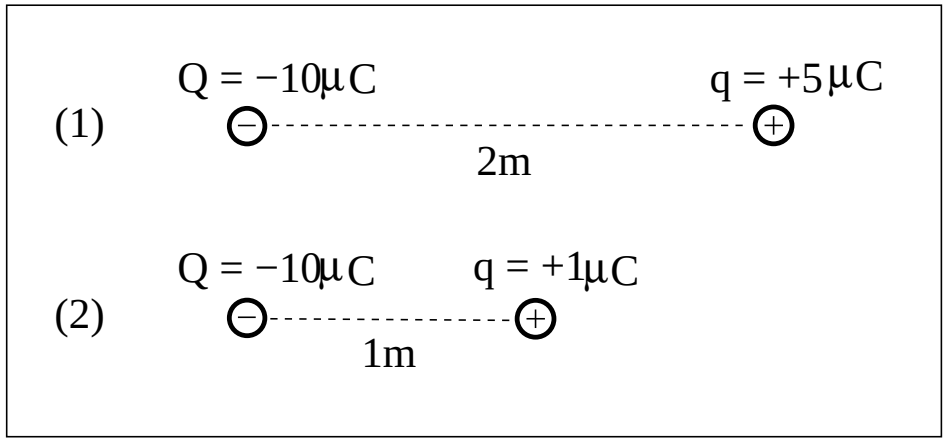
(a) Find the electric potential at the corners A and B.

(b) Find the electric field at point B.

(c) How much work is required to move a point charge $q_3 = +3\mu$C from B to A?

Electric Potential and Potential Energy: Application (4)

A positive point charge q is positioned in the electric field of a negative point charge Q.



(a) In which configuration is the charge q positioned in the stronger electric field?

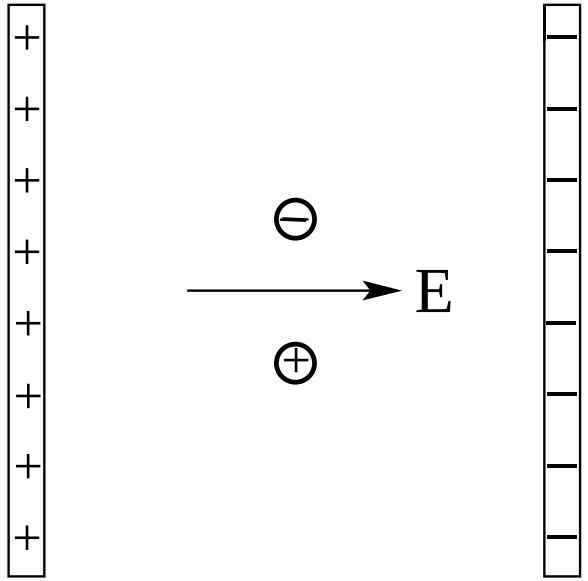
(b) In which configuration does the charge q experience the stronger force?

(c) In which configuration is the charge q positioned at the higher electric potential?

(d) In which configuration does the charge q have the higher potential energy?

Electric Potential and Potential Energy: Application (5)

An electron and a proton are released from rest midway between oppositely charged plates.



(a) Name the particle(s) which move(s) from high to low electric potential.

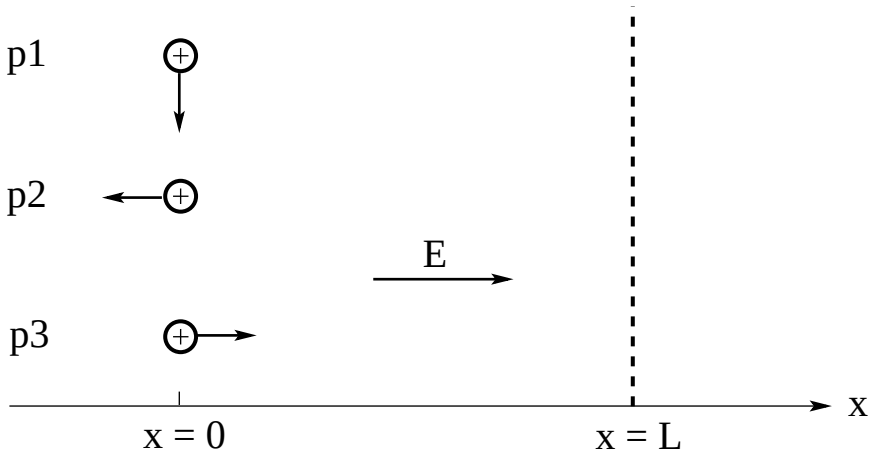
(b) Name the particle(s) whose electric potential energy decrease(s).

(c) Name the particle(s) which hit(s) the plate in the shortest time.

(d) Name the particle(s) which reach(es) the highest kinetic energy before impact.

Electric Potential and Potential Energy: Application (6)

Three protons are projected from $x = 0$ with equal initial speed v_0 in different directions. They all experience the force of a uniform horizontal electric field $\vec{E}$. Ultimately, they all hit the vertical screen at $x = L$.



(a) Which proton travels the longest time?

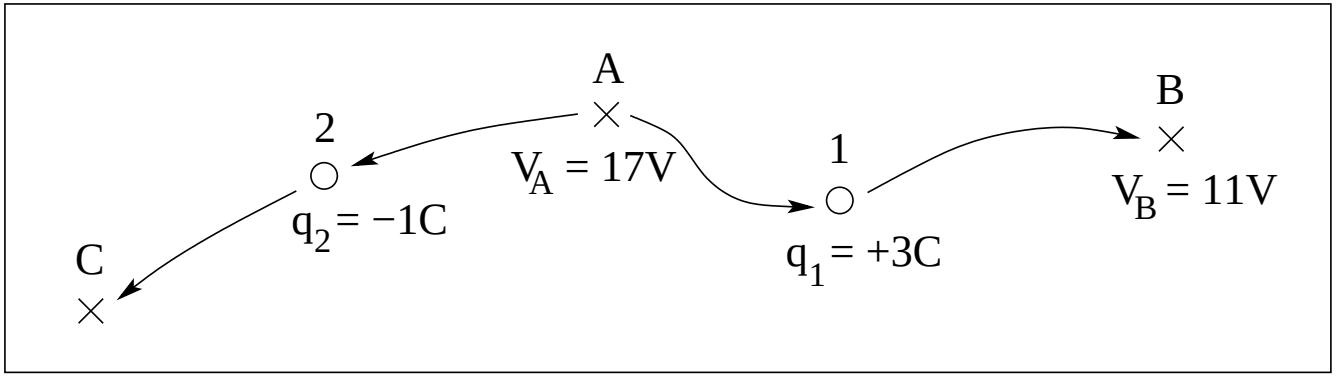
(b) Which proton travels the longest path?

(c) Which particle has the highest speed when it hits the screen?

Two of the questions are easy, one is hard.

Electric Potential and Potential Energy: Application (7)

Consider a region of nonuniform electric field. Charged particles 1 and 2 start moving from rest at point A in opposite directions along the paths shown.



From the information given in the figure...

(a) find the kinetic energy K_1 of particle 1 when it arrives at point B,

(b) find the electric potential V_C at point C if we know that particle 2 arrives there with kinetic energy $K_2 = 8J$.