Roadmap Solution

Friday, May 12, 2023 11:54 AM

Physics 203

Quizbit | Electric Potential

Part A: Work individually to produce a handwritten solution to **Part A (question 1)** of this Quizbit. Submit an image of your solution to Canvas. The quality of your solution and communication is far more important than the final answer!

1) Point P is some distance from a **10 kg** sphere of unknown charge. The electric potential at point P is **-4.5 V**. The sphere and point P are very far from anything else (ignore gravity/friction/drag).

Hints:

$W_{ext} = \Delta E_{sys}$

$U^E = qV$

$KE = \frac{1}{2}mv^2$

$V_{pc} = k\,\frac{q}{|\Delta\vec{r}|}$

$k = 8.99\ \times 10^9\ N\frac{m^2}{C^2}$

(a) What is the sign of the charge on the 10 kg sphere? Explain.

$V_{p.c.} = K\frac{q}{|\Delta\vec{r}|}$

A **5 kg** sphere with a charge of **-3 C** is now placed at rest at point P.

(b) What is the initial potential energy of the two charge system?

$U^E = qV$

(c) The 10 kg sphere is fixed in place and the 5 kg sphere is allowed to move. After a long time has passed, what is the speed of the 5 kg sphere?

$\Delta V \longrightarrow \Delta U^E \longrightarrow \Delta KE \longrightarrow \Delta|\vec{v}|$

Part B: As a group, assign roles to each member. One person should be the writer, one should be the recorder in charge of submitting the group solution to Gradescope (or Canvas), and if you have a third member, they should be the advice giver. Write each group member's name on the solution! Make sure to rotate roles so that each person has a chance to be the writer. **Work together to produce a written solution to Part A, then additionally answer Part B (questions 2 and 3)**. Submit an image of your work to Gradescope or Canvas.

2) Point S is halfway between the 10 kg sphere and point P. Before the 5 kg sphere has been added to the system, what is the electric potential at point S?

3) When you add the 5 kg sphere to the system (before either sphere is allowed to move), do you expect the electric potential at point S to increase, decrease, or stay the same? Explain.