Review

ANSWERS

1. The positive charge moves in the direction of the electric field. As the field does work on the charge, it converts the electrical potential energy associated with the charge to kinetic energy.
2. b
3. Electric potential is the electrical potential energy associated with a charge divided by the magnitude of the charge. Thus, electric potential is a characteristic of a point in space and is independent of the charge at that point.
4. Potential difference is the change in electric potential between two points in space.
5. at infinity
6. no; The point of zero electric potential can be chosen to be anywhere.
7. decrease; decrease
8. 2.6×10^4 V
9. -4.2×10^5 V
10. The charge on each plate doubles.
11. Use a dielectric between the capacitor plates.
12. The Earth is large enough that it can accept or supply an unlimited number of charges without its electric potential changing significantly; Any object with this ability can act as a ground.
13. $PE_{electric}$ is 4 times as great.
14. yes; The plates' capacitance depends on the area of the plates and the distance between them.

ELECTRICAL POTENTIAL ENERGY AND POTENTIAL DIFFERENCE

Review Questions

1. Describe the motion and explain the energy conversions that are involved when a positive charge is placed in a uniform electric field. Be sure your discussion includes the following terms: *electrical potential energy, work,* and *kinetic energy.*
2. If a point charge is displaced perpendicular to a uniform electric field, which of the following expressions is likely to be equal to the change in electrical potential energy?
   a. $-qEd$
   b. 0
   c. $-k_c\left(\frac{q^2}{r^2}\right)$
3. Differentiate between electrical potential energy and electric potential.
4. Differentiate between electric potential and potential difference.
5. At what location in relationship to a point charge is the electric potential considered by convention to be zero?

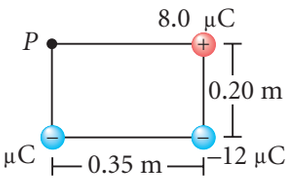
Conceptual Questions

6. If the electric field in some region is zero, must the electric potential in that same region also be zero? Explain your answer.
7. If a proton is released from rest in a uniform electric field, does the corresponding electric potential at the proton's changing locations increase or decrease? What about the electrical potential energy?

Practice Problems

For problems 8–9, see Sample Problem A.

8. The magnitude of a uniform electric field between two plates is about 1.7×10^6 N/C. If the distance between these plates is 1.5 cm, find the potential difference between the plates.
9. In the figure below, find the electric potential at point *P* due to the grouping of charges at the other corners of the rectangle.



CAPACITANCE

Review Questions

10. What happens to the charge on a parallel-plate capacitor if the potential difference doubles?
11. You want to increase the maximum potential difference of a parallel-plate capacitor. Describe how you can do this for a fixed plate separation.
12. Why is the Earth considered a "ground" in electric terms? Can any other object act as a ground?

Conceptual Questions

13. If the potential difference across a capacitor is doubled, by what factor is the electrical potential energy stored in the capacitor multiplied?
14. Two parallel plates are uncharged. Does the set of plates have a capacitance? Explain.
15. If you were asked to design a small capacitor with high capacitance, what factors would be important in your design?
16. A parallel-plate capacitor is charged and then disconnected from a battery. How much does the stored energy change when the plate separation is doubled?