## DRILL

## **CHAPTER 11 PRACTICE QUESTIONS**

- **Directions:** Complete the following problems as specified by each question, and then check your work using the solutions that follow. For extended, step-by-step solutions, access your Student Tools online.
- 1. Imagine balancing a charge, *q*, of mass *m*, 1 cm over a charge *Q* such that the repulsive electric force between the two supported *q* in the air. What would *Q* have to be if  $q = 6 \ \mu$ C and  $m = 1 \times 10^{-10} \ kg$ ?
- 2. A charge 4  $\mu$ C is fixed at the origin of a coordinate system. In this coordinate system, a -5  $\mu$ C charge moves from  $\vec{r_1} = (2 \text{ m})\hat{r} - (3 \text{ m})\hat{f}$  to  $\vec{r_2} = (3.6 \text{ m})\hat{f}$ . What is the work done by the electric force as this charge undergoes this displacement? Does the charge gain or lose kinetic energy?
- **3.** A charge *q* produces a measurable electric field that you can measure. If you measure the electric field to be 1 kN/C at a distance of 10 cm from the charge, what is *q*?
- 4. A neutral compound is produced by a positive charge q and a negative charge -q separated by a distance d. What is the electric field directly between these two charges?

- Separated by 5 cm, a 1 C charge and a -2 C charge both lie on the *x*-axis. Find a point on the *x*-axis where the electric field is zero. Note: Do not choose the trivial answers, x = ± infinity.
- **6.** Imagine a charge *q* inside a hemisphere, at the center of the bottom's surface, as shown in the following figure.



What is the electric flux through the bottom of the hemisphere?

 A capacitor has a charge Q in a vacuum. If a dielectric of constant κ were inserted in between the plates, what would the change in stored energy be?

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8. The following figure shows equipotential lines for a particular scenario. What is the electric field in this scenario? Represent the electric field as a vector.



**9.** A potential difference is building between a low-lying cloud and the ground. If a lightning bolt carries 5 C of charge at an energy of 300 million joules, what was the maximum potential difference supported by the air before dielectric breakdown occurred?