MisConceptual Questions

1. A $+0.2\,\mu C$ charge is in an electric field. What happens if that charge is replaced by a $+0.4\,\mu C$ charge?

(*a*) The electric potential doubles, but the electric potential energy stays the same.

(*b*) The electric potential stays the same, but the electric potential energy doubles.

(*c*) Both the electric potential and electric potential energy double.

(*d*) Both the electric potential and electric potential energy stay the same.

2. Two identical positive charges are placed near each other. At the point halfway between the two charges,

(*a*) the electric field is zero and the potential is positive.

(*b*) the electric field is zero and the potential is zero.

(*c*) the electric field is not zero and the potential is positive.

(*d*) the electric field is not zero and the potential is zero.

(*e*) None of these statements is true.

3. Four identical point charges are arranged at the corners of a square [*Hint*: Draw a figure]. The electric field E and potential V at the center of the square are

(*a*) $E = 0,\ V = 0.$

(*b*) $E = 0,\ V \neq 0.$

(*c*) $E \neq 0,\ V \neq 0.$

(*d*) $E \neq 0,\ V = 0.$

(*e*) $E = V$ regardless of the value.

4. Which of the following statements is valid?

(*a*) If the potential at a particular point is zero, the field at that point must be zero.

(*b*) If the field at a particular point is zero, the potential at that point must be zero.

(*c*) If the field throughout a particular region is constant, the potential throughout that region must be zero.

(*d*) If the potential throughout a particular region is constant, the field throughout that region must be zero.

5. If it takes an amount of work W to move two $+q$ point charges from infinity to a distance d apart from each other, then how much work should it take to move three $+q$ point charges from infinity to a distance d apart from each other?

(*a*) $2W$.

(*b*) $3W$.

(*c*) $4W$.

(*d*) $6W$.

6. A proton ($Q = +e$) and an electron ($Q = -e$) are in a constant electric field created by oppositely charged plates. You release the proton from near the positive plate and the electron from near the negative plate. Which feels the larger electric force?

(*a*) The proton.

(*b*) The electron.

(*c*) Neither—there is no force.

(*d*) The magnitude of the force is the same for both and in the same direction.

(*e*) The magnitude of the force is the same for both but in opposite directions.

7. When the proton and electron in MisConceptual Question 6 strike the opposite plate, which one has more kinetic energy?
(*a*) The proton.
(*b*) The electron.
(*c*) Both acquire the same kinetic energy.
(*d*) Neither—there is no change in kinetic energy.
(*e*) They both acquire the same kinetic energy but with opposite signs.

8. Which of the following do not affect capacitance?
(*a*) Area of the plates.
(*b*) Separation of the plates.
(*c*) Material between the plates.
(*d*) Charge on the plates.
(*e*) Energy stored in the capacitor.

9. A battery establishes a voltage V on a parallel-plate capacitor. After the battery is disconnected, the distance between the plates is doubled without loss of charge. Accordingly, the capacitance _____ and the voltage between the plates _____.
(*a*) increases; decreases.
(*b*) decreases; increases.
(*c*) increases; increases.
(*d*) decreases; decreases.
(*e*) stays the same; stays the same.

10. Which of the following is a vector?
(*a*) Electric potential.
(*b*) Electric potential energy.
(*c*) Electric field.
(*d*) Equipotential lines.
(*e*) Capacitance.

11. A $+0.2\,\mu C$ charge is in an electric field. What happens if that charge is replaced by a $-0.2\,\mu C$ charge?

(*a*) The electric potential changes sign, but the electric potential energy stays the same.

(*b*) The electric potential stays the same, but the electric potential energy changes sign.

(*c*) Both the electric potential and electric potential energy change sign.

(*d*) Both the electric potential and electric potential energy stay the same.

1. B
2. A
3. B
4. D
5. B
6. E
7. C
8. D, E
9. B
10. C
11. B