

Short Answers. Multiple choice: Mark your scantron with a #2 pencil. Nota means none of the above.

1. The coulomb, which is the unit of charge, is also the charge of one electron. True or False. (a) True (b) False
2. An electrically neutral atom does not have a net charge. True or False. (a) True (b) False
3. An electric dipole does not have a net charge. True or False. (a) True (b) False
4. The Coulomb force between two charges can be attractive or repulsive. True or False. (a) True (b) False
5. The gravitational force between two masses can be attractive or repulsive. True or False. (a) True (b) False
6. A positive charge placed in an electric field experiences a force in the same direction as the field. True or False. (a) True (b) False
7. A negative charge placed in an electric field experiences a force in the same direction as the field. True or False. (a) True (b) False
8. The main difference between conductors and insulators is in terms of (a) protons (b) neutrons (c) outer valence or conduction electrons (d) atoms
9. When the distance between two point charges is doubled, the magnitude of the electric force between them is (a) doubled (b) quadrupled (c) reduced by a factor of 3 (d) reduced by a factor of  $\sqrt{2}$  (e) reduced by a factor of 4 (f) (nota)
10. When the distance between two point charges is reduced by a factor of 2, the magnitude of the force between them is (a) doubled (b) quadrupled (c) reduced by a factor of 3 (d) reduced by a factor of  $\sqrt{2}$  (e) reduced by a factor of 4 (f) (nota)
11. When the magnitude of each of two interacting point charges is increased by a factor of 2, the magnitude of the force between them is (a) doubled (b) quadrupled (c) reduced by a factor of 3 (d) reduced by a factor of  $\sqrt{2}$  (e) reduced by a factor of 4 (f) (nota)
12. Electric *potential* is a vector quantity. True or False. (a) True (b) False
13. The direction of an electric field *vector* is from lower to higher potential. True or False. (a) True (b) False

14. When a proton moves in the direction of the electric field, the proton's potential *energy* decreases. True or False. (a) True (b) False
15. When an electron moves in a direction opposite to the electric field, the electron's potential *energy* decreases. True or False. (a) True (b) False
16. The capacitance of a parallel plate capacitor is *inversely* proportional to its plate separation  $d$ . True or False. (a) True (b) False
17. For a given voltage difference between the plates, the electric field magnitude between the plates of a parallel plate capacitor is *inversely* proportional to the plate separation  $d$ . (a) True (b) False
18. **EXTRA CREDIT.** Which expression represents the potential *energy* of a capacitor with voltage difference  $V$  and charge  $Q$  on the positively charged conductor?
- (a)  $\frac{1}{2} CV^2$  (b)  $\frac{Q^2}{2C}$  (c) all of the above (d) none of the above