

## Phys.12-Q3W5-Electric forces and fields-H.W

### Multiple Choice

Identify the choice that best completes the statement or answers the question.

Choose the best answer from the options that follow each question.

- \_\_\_\_\_ 1. Two point charges, initially 2 cm apart, are moved to a distance of 10 cm apart. By what factor does the resulting electric force between them change?
- $\frac{1}{5}$
  - 5
  - $\frac{1}{25}$
  - 25
- \_\_\_\_\_ 2. Two point charges, initially 1 cm apart, are moved to a distance of 3 cm apart. By what factor do the resulting electric and gravitational forces between them change?
- 9
  - 3
  - $\frac{1}{3}$
  - $\frac{1}{9}$
- \_\_\_\_\_ 3. Which statement is the most correct regarding electric insulators?
- Electric charges move freely in electric insulators.
  - Charges within electric insulators do not readily move.
  - Electric insulators have high tensile strength.
  - Electric insulators are good heat conductors.
- \_\_\_\_\_ 4. If a positively charged glass rod is used to charge a metal bar by induction, the charge on the bar
- must be positive.
  - will be greater in magnitude than the charge on the glass rod.
  - will be equal in magnitude to the charge on the glass rod.
  - must be negative.
- \_\_\_\_\_ 5. If an irregularly shaped conductor is in electrostatic equilibrium, charge accumulates
- evenly throughout the conductor.
  - where the radius of curvature is largest.
  - where the radius of curvature is smallest.
  - in flat places.
- \_\_\_\_\_ 6. Which is the most correct statement regarding the drawing of electric field lines?
- Electric field lines always form closed loops.
  - Electric field lines never cross each other.
  - Electric field lines always connect from one charge to another.
  - Electric field lines can start on a charge of either polarity.
- \_\_\_\_\_ 7. Two point charges, initially 1 cm apart, are moved to a distance of 3 cm apart. By what factor do the resulting electric and gravitational forces between them change?
- |                  |                  |
|------------------|------------------|
| a. 3             | c. $\frac{1}{9}$ |
| b. $\frac{1}{3}$ | d. 9             |

- \_\_\_ 8. If an irregularly shaped conductor is in electrostatic equilibrium, charge accumulates
- in flat places.
  - where the radius of curvature is largest.
  - evenly throughout the conductor.
  - where the radius of curvature is smallest.
- \_\_\_ 9. A surface charge can be produced on insulators by
- contact.
  - grounding.
  - polarization.
  - induction.
- \_\_\_ 10. An attracting force occurs between two charged objects when the charges are of
- equal magnitude.
  - unlike signs.
  - like signs.
  - unequal magnitude.
- \_\_\_ 11. The electric field just outside a charged conductor in electrostatic equilibrium is
- perpendicular to the conductor's surface.
  - zero.
  - the same as it is in the center of the conductor.
  - at its minimum level.
- \_\_\_ 12. Electric field strength depends on
- charge and distance.
  - elementary charge and radius.
  - charge and mass.
  - Coulomb constant and mass.
- \_\_\_ 13. Which of the following is *not* true for both gravitational and electric forces?
- Forces are either attractive or repulsive.
  - Potential energy is a function of distance of separation.
  - The inverse square distance law applies.
  - Forces are proportional to physical properties.
- \_\_\_ 14. For a conductor that is in electrostatic equilibrium, any excess charge
- resides entirely on the conductor's conductor.
  - resides entirely on the conductor's interior.
  - resides entirely on the conductor's outer surface.
  - flows to the ground.
- \_\_\_ 15. A repelling force occurs between two charged objects when the charges are of
- equal magnitude.
  - like signs.
  - unequal magnitude.
  - unlike signs.
- \_\_\_ 16. When a glass rod is rubbed with silk and becomes positively charged,
- unequal magnitude.
  - like signs.
  - equal magnitude.
  - unlike signs.

- \_\_\_ 17. Both insulators and conductors can be charged by
- grounding.
  - induction.
  - contact.
  - polarization.
- \_\_\_ 18. Which of the following is *not* true for both gravitational and electric forces?
- The inverse square distance law applies.
  - Potential energy is a function of distance of separation.
  - Forces are proportional to physical properties.
  - Forces are either attractive or repulsive.
- \_\_\_ 19. When a glass rod is rubbed with silk and becomes positively charged,
- protons are added to the silk.
  - electrons are removed from the rod.
  - protons are removed from the silk.
  - the silk remains neutral.
- \_\_\_ 20. If the charge is tripled for two identical charges maintained at a constant separation, the electric force between them will be changed by what factor?
- 9
  - $\frac{1}{9}$
  - 18
  - $\frac{2}{3}$
- \_\_\_ 21. Both insulators and conductors can be charged by
- contact.
  - polarization.
  - grounding.
  - induction.
- \_\_\_ 22. Which is the *most* correct statement regarding the drawing of electric field lines?
- Electric field lines always form closed loops.
  - Electric field lines never cross each other.
  - Electric field lines can start on a charge of either polarity.
  - Electric field lines always connect from one charge to another.
- \_\_\_ 23. Electric charge is
- found only in insulators.
  - conserved.
  - found only in a conductor.
  - not conserved.
- \_\_\_ 24. A surface charge can be produced on insulators by
- contact.
  - polarization.
  - induction.
  - grounding.
- \_\_\_ 25. For a conductor that is in electrostatic equilibrium, any excess charge
- resides entirely on the conductor's outer surface.
  - resides entirely on the conductor's interior.
  - flows to the ground.
  - resides entirely in the center of the conductor.
- \_\_\_ 26. Which sentence best describes electrical conductors?
- Electrical conductors are poor heat conductors.
  - Electrical conductors have electric charges that move freely.
  - Electrical conductors have low mass density.
  - Electrical conductors have high tensile strength.
- \_\_\_ 27. When a charged body is brought close to an uncharged body without touching it, a(n) \_\_\_ charge may result on the uncharged body. When a charged body is brought into contact with an uncharged body and then is removed, a(n) \_\_\_ charge may result on the uncharged body.
- residual; induced
  - positive; negative
  - negative; positive
  - induced; residual

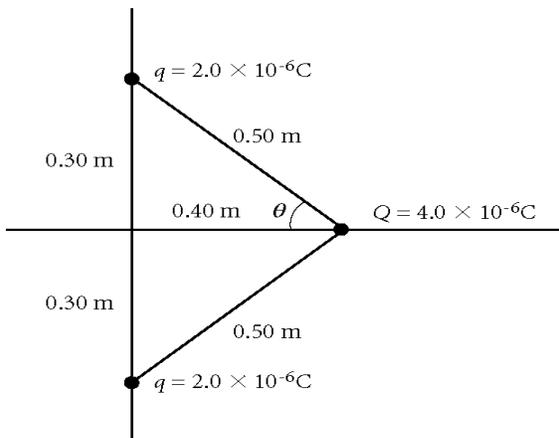


- \_\_\_\_\_ 33. If an irregularly shaped conductor is in electrostatic equilibrium, charge accumulates
- where the radius of curvature is largest.
  - where the radius of curvature is smallest.
  - evenly throughout the conductor.
  - in flat places.
- \_\_\_\_\_ 34. A conductor that is in electrostatic equilibrium has an electric field inside the conductor that
- is parallel to the surface of the conductor.
  - depends on the radius of the conductor.
  - is zero.
  - is greatest near the conductor's surface.
- \_\_\_\_\_ 35. What happens when a rubber rod is rubbed with a piece of fur, giving it a negative charge?
- |                                    |                                      |
|------------------------------------|--------------------------------------|
| a. The fur is left neutral.        | c. Electrons are added to the rod.   |
| b. Electrons are added to the fur. | d. Protons are removed from the rod. |

**Problems**

- A.  $1.76 \times 10^9 \text{ N/C}$
- B.  $2.3 \times 10^{-8} \text{ N}$ ; attractive
- C.  $2.3 \times 10^{-17} \text{ N}$
- D.  $1.6 \times 10^{-8} \text{ N}$
- E.  $-0.35 \text{ C}$

36. Two point charges are 4.8 cm apart and have values of  $56.5 \mu\text{C}$  and  $-56.5 \mu\text{C}$ , respectively. What is the electric field at the midpoint between the two charges? ( $k_C = 8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$ )
37. What is the electric force between a proton and an alpha particle (charge  $2e$ ) that are separated by a distance of  $4.5 \times 10^{-10} \text{ m}$ ? ( $e = 1.60 \times 10^{-19} \text{ C}$ ,  $k_C = 8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$ )



38. The diagram above shows four charges—A, B, C, and D—at the corners of a square. Charges A and D, on opposite corners, have equal charge, whereas both B and C have a charge of  $1.0 \text{ C}$ . If the force on B is zero, what is the charge on A?
39. An electron is separated from a potassium nucleus (charge  $19e$ ) by a distance of  $5.2 \times 10^{-10} \text{ m}$ . What is the electric force between these particles? ( $e = 1.60 \times 10^{-19} \text{ C}$ ,  $k_C = 8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$ )
40. What is the electric force between an electron and a proton that are separated by a distance of  $1.0 \times 10^{-10} \text{ m}$ ? Is the force attractive or repulsive? ( $e = 1.60 \times 10^{-19} \text{ C}$ ,  $k_C = 8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$ )

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