

Chapters 32 & 33: Electrostatics

Text:Chapter 32

Think and Explain: 1-6, 8

Think and Solve:

Chapter 33

Think and Explain: 1, 4, 5, 8, 10

Think and Solve: 1-2

Vocabulary:

electric forces, charge, ion, conservation of charge, Coulomb's law, coulomb, conductors, insulators, semiconductors, superconductors, charging by friction, charging by contact, charging by induction, grounding, charge polarization

Equations:

$$Q = ne \quad F_e = \frac{kq_1q_2}{d^2} \quad E = \frac{F}{q} \quad E = \frac{kQ}{d^2} \quad V = \frac{PE_e}{q}$$

Constants: $k = 9 \times 10^9 \text{ Nm}^2/\text{C}^2$ $e = \pm 1.6 \times 10^{-19} \text{ C}$ $1 \mu\text{C} = 1 \times 10^{-6} \text{ C}$

Key Objectives:*Concepts*

- Charged objects have gained or lost electrons.
- Distinguish between charging by friction, charging by contact, and charging by induction.
- Electric charge is conserved.
- Like charges repel and unlike charges attract.
- Electric forces exist between charged objects and that force can be calculated using Coulomb's law.
- Compare and contrast electrostatic forces and gravitational forces.
- Understand how charge polarization allows for a charged object to be attracted to a neutral object.
- Be able to state the units of charge, electric force.
- Understand the concept of electric field as the space around every electric charge.
- State the direction of the e-field
- Sketch e-field diagrams for a single charge, a pair of charges, and between two oppositely charged parallel plates.
- State the direction of force on a proton and on an electron placed in the field.
- How would you move a charge (positive or negative) in an e-field in order to increase electric potential energy.
- Distinguish between electric potential energy and electric potential.
- Distribution of charge on a conductor
- Strength of the e-field inside of a conductor

Problem Solving:

- Convert between μC and C
- Convert between total charge and number of electrons.
- Use Coulomb's law to calculate the force between two charged objects.
- Use Coulomb's law to find the unknown value when all other values are given.
- Calculate the strength and direction of the electric field given the a force on a test charge and the charge
- Calculate the strength and direction of an electric field some distance away from the charge.
- Convert between electric potential, potential energy and charge.