

On-level Physics

Electrostatics

This unit will allow each student to:

- gain a better understanding of interactions of charged particles and electric fields
- continue making proper scientific measurements and calculations
- define and properly use all vocabulary
- properly apply all terms and concepts in describing/explaining real world examples
- continue making and interpreting scientific graphs
- teach someone else the concepts discussed
- practice proper laboratory safety

This will be accomplished by each student that is able to:

recognize and relate SI and USCS units of charge, electrical potential energy, electric potential (voltage)

recognize charge, electrical potential energy, electric potential (voltage) by the units only

- describe the effects of static electricity on matter
- describe charging by friction, conduction, and induction/charge polarization
- use an electroscope to detect the presence of charge; explain how the electroscope detects charge
- explain the process of grounding
- describe the two main purposes of a lightning rod (primary) preventing lightning and (secondary) redirecting lightning
- apply the principle of conservation of charge to an object being charged
- state Coulomb's law
- compare and contrast gravitational forces to electrical forces
- describe the behavior of electrons in conductors v. insulators
- describe and sketch electric fields surrounding single charged particles as well as multiple charged particles
- explain why the interior of a conducting sphere has zero electric field
- describe how a charged particle can possess electrical potential energy
- explain the relationship between electrical potential energy, charge, and electric potential
- describe the purpose and operation of a capacitor
- use a Van de Graaff generator to demonstrate the effects of an electric field
- perform calculations using proper problem solving techniques to determine:
 - electrical force
 - electric potential (aka: voltage)

Textbook Reference – Physics: Principles and Problems

Chapter 20: Static Electricity and Chapter 21: Electric Fields

Key Terms – *write the definitions of the boldface terms on your own paper, definitions are available at theteterszone.net*

charge, electrical force, electrically polarized, electrostatics, grounding, conduction, conductor, electric field, electroscope, induction, insulator, static electricity, Coulomb's law, capacitor, electric potential, electrical potential energy, voltage

Daily Grade: Daily questions/homework/review sheet

Electrostatics and electric fields review Answer on a separate sheet of paper due prior to the 20Q on Day 5

- A. In terms of attraction and repulsion, how do negative particles affect negative particles? How do negatives affect positives?
- B. What happens to electrons in any charging process? What happens to protons in the same processes?
- C. How many electrons are required to produce a charge of -1 C ?
- D. Describe charging by friction...use a familiar object.
- E. Describe charging by simple contact...use a familiar object.
- F. Describe charging by induction...use a familiar object.
- G. What occurs when an object is grounded?
- H. What are two purposes of a lightning rod? Which is primary?
- I. How does an electrically polarized object differ from an electrically charged object?
- J. Rub an inflated balloon against your hair and place it against a door. What does the balloon do? Explain how it does this.
- K. How does the magnitude of electrical force between a pair of charged objects change when the objects are moved twice as far apart? Three times as far apart?
- L. If you do 457 joules of work to push 3.2 coulombs of charge against an electric field, what will be its potential difference with respect to its starting position?
- M. What is the voltage of a 0.0001 C charge that has an electric potential energy of 0.5 J ?
- N. Why is it safe to be in a car when it is struck by lightning? No, it's not "grounding".
- O. Describe how an electrically charged particle would gain electrical potential energy.