**Electrostatics, Conductors and Capacitors (9%) of AP Physics B Exam**

**Charge and Coulomb’s Law**

**Students should understand the concept of electric charge, so they can:**

**(1)**  **Describe the types of charge and the attraction and repulsion of charges.**

**(2)**  **Describe polarization and induced charges.**

**Students should understand Coulomb’s Law and the principle of superposition, so they can:**

**(1)**  **Calculate the magnitude and direction of the force on a positive or negative charge due to other specified point charges.**

**(2)**  **Analyze the motion of a particle of specified charge and mass under the influence of an electrostatic force.**

**Electric field and electric potential (including point charges)**

**Students should understand the concept of electric field, so they can:**

**(1)**  **Define it in terms of the force on a test charge.**

**(2)**  **Describe and calculate the electric field of a single point charge.**

**(3)**  **Calculate the magnitude and direction of the electric field produced by two or more point charges.**

**(4)**  **Calculate the magnitude and direction of the force on a positive or negative charge placed in a specified field.**

**(5)**  **Interpret an electric field diagram.**

**(6)**  **Analyze the motion of a particle of specified charge and mass in a uniform electric field.**

**Students should understand the concept of electric potential, so they can:**

**(1)**  **Determine the electric potential in the vicinity of one or more point charges.**

**(2)**  **Calculate the electrical work done on a charge or use conservation of energy to determine the speed of a charge that moves through a specified potential difference.**

**(3)**  **Determine the direction and approximate magnitude of the electric field at various positions given a sketch of equipotentials.**

**(4)**  **Calculate the potential difference between two points in a uniform electric field, and state which point is at the higher potential.**

**(5)**  **Calculate how much work is required to move a test charge from one location to another in the field of fixed point charges.**

**(6)**  **Calculate the electrostatic potential energy of a system of two or more point charges, and calculate how much work is required to establish the charge system.**

**Conductors & Capacitors**

**Students should understand the nature of electric fields in and around conductors, so they can:**

**(1)**  **Explain the mechanics responsible for the absence of electric field inside a conductor, and know that all excess charge must reside on the surface of the conductor.**

**(2)**  **Explain why a conductor must be an equipotential, and apply this principle in analyzing what happens when conductors are connected by wires.**

**Students should be able to describe and sketch a graph of the electric field and potential inside and outside a charged conducting sphere.**

**Students should understand induced charge and electrostatic shielding, so they can:**

**(1)**  **Describe the process of charging by induction.**

**(2)**  **Explain why a neutral conductor is attracted to a charged object.**

**Capacitors**

**Students should understand the definition and function of capacitance, so they can:**

**(1)**  **Relate stored charge and voltage for a capacitor.**

**(2)**  **Relate voltage, charge, and stored energy for a capacitor.**

**(3)**  **Recognize situations in which energy stored in a capacitor is converted to other forms.**

**Students should understand the physics of the parallel-plate capacitor, so they can:**

**(1)**  **Describe the electric field inside the capacitor, and relate the strength of this field to the potential difference between the plates and the plate separation.**

**(2)**  **Determine how changes in dimension will affect the value of the capacitance.**