Module 6: Electric Fields

This section provides knowledge and understanding of Coulomb's law, uniform electric: fields, electric potential and energy.

| Specification reference | Checklist questions |
| --- | --- |
| 6.2.1 a | Can you explain electric fields being due to charges? |  |
| 6.2.1 b | Can you understand a uniformly charged sphere modelled as a point charge at its centre? |  |
| 6.2.1 c | Can you describe using electric field lines to map electric fields? |  |
| 6.2.1 d | Can you demonstrate that electric field strength is E = ? |  |
| 6.2.2 a | Can you demonstrate Coulomb’s law, *F* = , for the force between two point charges? |  |
| 6.2.2 b | Can you calculate electric field strength, *E* = , for a point charge? |  |
| 6.2.2 c | Can you describe the similarities and differences between the gravitational field of a point mass and the electric field of a point charge? |  |
| 6.2.3 a | Can you calculate uniform electric field strength, *E* = ? |  |
| 6.2.3 b | Can you explain parallel-plate capacitor and permittivity: *C* = , *C* = , *ε* = ? |  |
| 6.2.3 c | Can you describe the motion of charged particles in a uniform electric field? |  |
| 6.2.4 a | Can you describe electric potential as the work done in bringing a unit charge from infinity to a point? |  |
| 6.2.4 b | Can you calculate electric potential, *V* = ? |  |
| 6.2.4 c | Can you calculate capacitance, *C* = 4πε0*R*, for an isolated sphere? |  |
| 6.2.4 d | Can you demonstrate force–distance graphs for point or spherical charges? |  |
| 6.2.4 e | Can you calculate electric potential energy, *E* = *Vq* = ? |  |

**Homework and Independent Study**

HW: Assessed past-paper questions. Kerboodle online task(s)

Revision: As part of Module 6.1 – 6.3 topic test (*Capacitors, Electric Fields and Electromagnetism*)

IS: Textbook summary questions on each sub-topic, to self-assess.

Zig-zag module 6 booklets for revision and IS. *Answers distributed at end of topic.*

Use of online resources including physicandmathstutor.com, Seneca Learning and Kerboodle textbook, Chapter 22. Practise past-paper questions at the end of topic (textbook pages 443-45).

**Key Terms**

**Coulomb’s Law:** The size of the force that acts between two point charges is proportional to the product of their charges and inversely proportional to the square of their separation. It is attractive for opposite charges and repulsive for like charges.

**Electric Field Strength:** The force per unit positive charge exerted on a charged object placed at that point in the field. This is a vector acting in the same direction as the force on a positive charge.

**Electric Field:** A region surrounding a charged object which causes a force to be exerted on any charged object placed within the field.

**Electric Potential Energy:** The work done on a positive charge in bringing it from infinity to that point in the field. It is proportional to the product of the two charges and inversely proportional to their separation.

**Electric Potential:** The work done per unit charge on a positive test charge in bringing it from infinity to that point in the field.

**Field Lines:** Lines that demonstrate the direction in which a positive charge would feel if placed at that point in the field.

**Parallel Plate Capacitor:** A capacitor made up of two parallel conducting plates with an insulator between them (dielectric).

**Permittivity:** A property of an electric field. It relates electric flux density and the electric field strength.