Study Guide - <u>some</u> things you need to know about Electrostatics

Note that below, the bare facts are stated without proof. You may be asked to show proofs of some statements in exams. Proofs were discussed in lecture, either on the blackboard or in the transparencies. You can find proofs in the lecture notes and the textbook. <u>This list is not necessarily complete.</u>

Like charges repel. Unlike charges attract. Neutral and charged objects attract each other.

In a conductor, charges may move around freely; the charges may separate if an external electric field is applied. In an insulator, charges cannot move freely, they can just shift a bit, leading to polarization.

In electrostatics, the electric field inside a conductor is zero. In electrostatics, on the surface of a conductor, $\vec{E}$ is perpendicular to the surface. Excess charge on a conductor collects on the outside surface of the conductor.

By putting an object into a box made of conducting material, one can protect the object from electric fields (shielding).

In an insulator, $\vec{E}$ may have any value.

Electric field lines start at positive charges or infinity, and end at negative charges or infinity. Electric field lines cannot cross. The density of electric field lines is proportional the magnitude of the electric field. The direction of the electric field at a point is given by the tangent to the field line at that point.

Electric potential energy and electric potential are two different physical quantities.

Two points connected by a conducting material are on the same potential.

Positive charges move towards lower potential, negative charges move towards higher potential.

Both positive and negative charges move towards lower PE.

Each point on an equipotential surface (e.p.s.) is on the same potential. If a charge is moved from one point on an e.p.s. to another point on the same e.p.s., no net work is done.

Equipotential surfaces are always perpendicular to electric field lines.