Objectives Electrostatics

Topic	Objectives
Electric charges (18.1, 18.2, Basic Phenomena)	Know examples of positive and negative charge Know different methods how to detect charges Describe how magnitude and sign of a charge can be measured (electroscope, neon bulb) Know the magnitude of the elementary charge Explain what a charge carrier is Explain the "creation" of charges using the concept of charge separation and conservation (e.g. Van-de-Graaff generator)
Conductors and Insulators (18.3, 18.8)	Describe charge distribution in conductors and insulators Explain what a Faraday cage is (electric shielding) Know typical examples of conductors and insulators
Induction (18.4)	Explain the term "electric induction" Explain induction with permanent or spontaneous dipoles
Coulomb's Law (18.5)	Calculate forces between point charges (magnitude and direction) Realise analogies with gravitational force
Electric field (18.6, 18.7)	Explain term "electric field" Distinguish charges producing a field and test charges in a field Sketch field lines for a given arrangement of charges Explain what a homogeneous field is and how it can be realised Basic calculations with electric field Describe a method to determine the elementary charge Calculations with homogeneous field or field of point charges Determine superposition of electric fields (graphically and/or algebraically)
Potential and potential difference (19.1, 19.2, 19.3, 19.4)	Calculate work in a homogeneous field Explain the terms "electric potential energy", "electric potential", "potential difference" and "voltage" Calculate potential difference between two points in a homogeneous electric field or in the field of point charges Describe the trajectory of a charged particle in a homogeneous field Match deflection voltages and oscilloscope display Calculations with conservation of energy in an electric field Calculate velocity from acceleration voltage Use energy unit eV

Constant	Value
Elementary charge	$e = 1.6 \cdot 10^{-19}$ C
Electron mass	$m_e = 9.1 \cdot 10^{-31}$ kg = 511 keV/c²
Nucleon mass	$m_p \cong m_n = 1.67 \cdot 10^{-27}$ kg = 939 MeV/c²
Coulomb's constant	$k = 9 \cdot 10^9$ N·m²/C²

Property	Table
Properties of electrons and nucleons	FoTa T 165
Dielectric constant	FoTa T 177