

OBJECTIVES ELECTRIC CIRCUITS

TOPIC	OBJECTIVES
Circuit diagrams	Recognise and draw symbols for voltage supply, switch, light bulb, resistor and meters Draw schematic diagram including series and parallel wiring
Electromotive force and Current (20.1)	Know examples of electromotive forces Explain the difference between electromotive force and voltage Define electric current in words Units ampere and Ah
Power (20.4)	Calculate power dissipated in an electric circuit or in a single resistor Know examples for the effects of electric current (especially heat and light) and their inversion An electric load does not consume the current, but it transforms electric energy into another energy form!
Resistance (20.2)	Resistance of a general electric load is not constant Read values from a current vs. voltage characteristic
Resistance of wires (20.3)	Calculate the resistance of a wire from length, diameter and resistivity (FoTaBe 194) Calculate the temperature of a wire from its resistance and temperature coefficient (FoTaBe 194)
Resistor circuits	The resistance of a linear resistor is independent of the current (20.2) Describe two different types of resistors Calculations with Ohm's law (valid only for linear resistors) Calculate the equivalent resistance for a combination of resistors (series and parallel wiring) (20.6 – 20.8) Calculate partial voltages and partial currents in a circuit Describe how the range of a voltmeter or ammeter can be changed (20.11) Connect voltmeter and ammeter correctly to a circuit (20.11) Describe how a meter influences the current in a circuit and what the conditions for an ideal meter are Draw the equivalent circuit for a battery (20.9) Calculate the terminal voltage from the battery's emf, its internal resistance and the load resistance (20.9)
RC circuits (20.13)	Explain behaviour of voltage, current and power in an RC circuit during charging and discharging (diagrams) Calculate time constant and half life of the (dis-) charging process
Electrical conduction	Qualitatively explain Tolman-Stewart effect Calculate the drift speed in metals and know typical values know two examples of electric currents in non-metallic materials

Constant	Value
Household voltage (Europe/USA)	$V = 230\text{ V}/110\text{ V}, f = 50\text{ Hz}/60\text{ Hz}$
Resistance of a 100 m long copper wire with cross section 1 mm^2	$R = 1.7\ \Omega$
Typical drift speed in copper	$v = 5\text{ mm/s}$ (for an electric field of 1 V/m)

Property	Table
Properties of conductors (resistivity, temperature coefficient)	FoTaBe 194