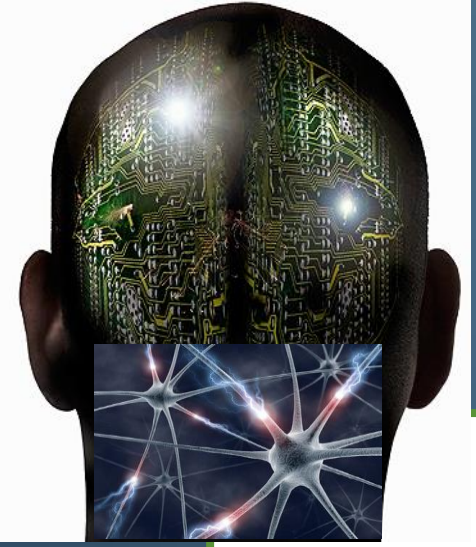
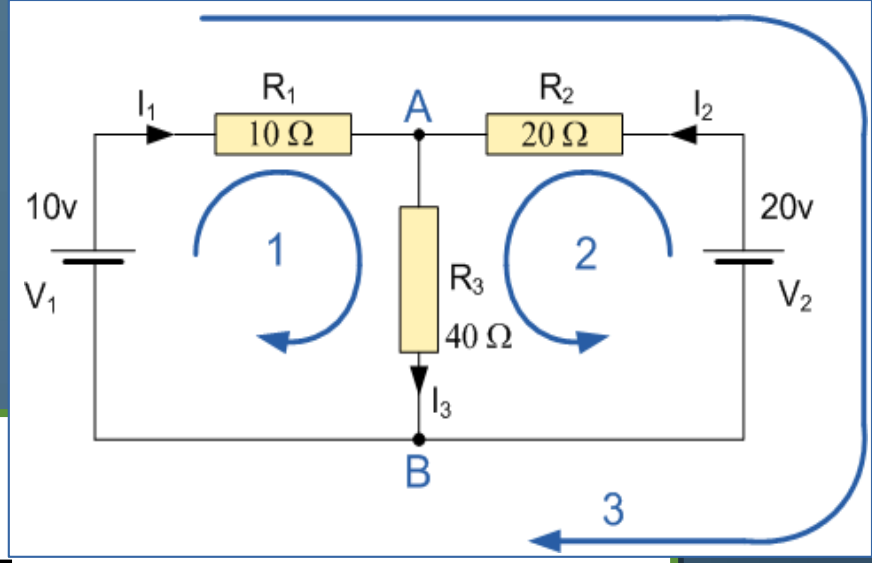
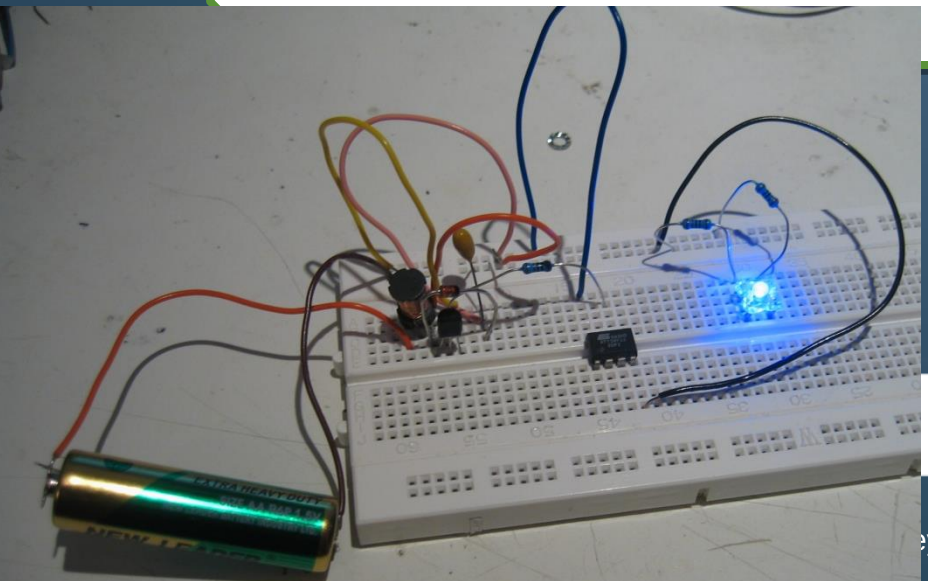
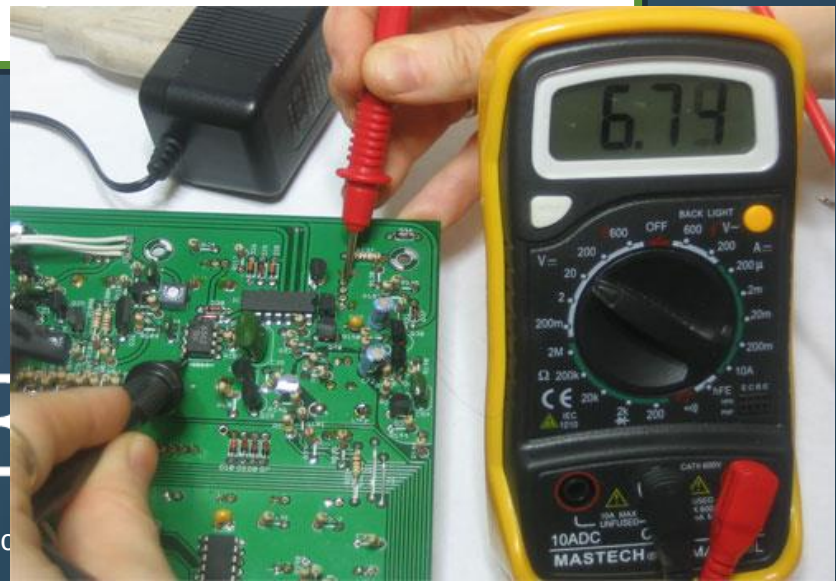




Chapter 27

Circuits





27-4 Single-Loop Circuits

Learning Objectives

27.01 Identify the action of an *emf* source in terms of the work it does.

27.02 For an ideal battery, apply the relationship between the *emf*, the current, and the power (rate of energy transfer).

27.03 Draw a schematic diagram for a single-loop circuit containing a battery and three resistors.

27.04 Apply the loop rule to write a loop equation that relates the potential differences of the circuit elements around a (complete) loop.

27.05 Apply the resistance rule in crossing through a resistor.

27.06 Apply the emf rule in crossing through an emf.

27.07 Identify that resistors in series have the same current, which is the same value that their equivalent resistor has.

27.08 Calculate the equivalent of series resistors.

27.09 Identify that a potential applied to resistors wired in series is equal to the sum of the potentials across the individual resistors.

27-4 Single-Loop Circuits

Learning Objectives (Cont'd.)

27.10 Calculate the potential difference between any two points in a circuit.

27.11 Distinguish a real battery from an ideal battery and, in a circuit diagram, replace a real battery with an ideal battery and an explicitly shown resistance.

27.12 With a real battery in a circuit, calculate the potential difference between its terminals for current in the direction of the *emf* and in the opposite direction.

27.13 Identify what is meant by grounding a circuit, and draw a schematic diagram for such a connection.

27.14 Identify that grounding a circuit does not affect the current in a circuit.

27.15 Calculate the dissipation rate of energy in a real battery.

27.16 Calculate the net rate of energy transfer in a real battery for current in the direction of the *emf* and in the opposite direction.

27-7 Multiloop Circuits

Learning Objectives

27.17 Apply the junction rule.

27.18 Draw a schematic diagram for a battery and three parallel resistors and distinguish it from a diagram with a battery and three series resistors.

27.19 Identify that resistors in parallel have the same potential difference across each, which is the same value as that of their equivalent resistor.

27.20 Calculate the resistance of the equivalent resistor of several resistors in parallel.

27.21 Identify that the total current through parallel resistors is the sum of the currents through the individual resistors.

27.22 For a circuit with a battery and some resistors in parallel and some in series, simplify the circuit in steps by finding equivalent resistors, until the current through the battery can be determined, and then reverse the steps to find the currents and potential differences of the individual resistors.

27-7 Multiloop Circuits

Learning Objectives (Continued)

27.23 If a circuit cannot be simplified by using equivalent resistors, identify the several loops in the circuit, choose names and directions for the currents in the branches, set up loop equations for the various loops, and solve these simultaneous equations for the unknown currents.

27.24 In a circuit with identical real batteries in series, replace them with a single ideal battery and a single resistor.

27.25 In a circuit with identical real batteries in parallel, replace them with a single ideal battery and a single resistor.

27-8 The Ammeter and The Voltmeter

Learning Objectives

27.26 Explain the use of an ammeter and a voltmeter, including the resistance required of each in order not to affect the measured quantities.

27-9 *RC* Circuits

Learning Objectives

27.27 Draw schematic diagrams of charging and discharging *RC* circuits.

27.28 Write the loop equation (a differential equation) for a charging RC circuit.

27.29 Write the loop equation (a differential equation) for a discharging *RC* circuit.

27.30 For a capacitor in a charging or discharging *RC* circuit, apply the relationship giving the charge as a function of time.

27.31 From the function giving the charge as a function of time in a charging or discharging *RC* circuit, find the capacitor's potential difference as a function of time.

27.32 In a charging or discharging *RC* circuit, find the current through and potential difference across the resistor as functions of time.

27.33 Calculate the capacitive time constant τ.

27-9 *RC* Circuits

Learning Objectives (continued)

27.34 For a charging *RC* circuit and a discharging *RC* circuit, determine the capacitor's charge and potential difference at the start of the process and then a long time later.