



Basic Electrical and DC Theory

Course Number: EE-02-301

PDH: 10

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After the course has been purchased, review the technical material and then complete the quiz at your convenience.

A Certificate of Completion is available once you pass the exam (70% or greater).

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TERMINAL OBJECTIVE

- 1.0 Given a simple electrical circuit, **APPLY** basic electrical theory fundamental principles to describe circuit operation.

LEARNING OBJECTIVES

- 1.1 **DESCRIBE** the following terms:
- a. Electrostatic force
 - b. Electrostatic field
 - c. Potential difference
 - d. Electromotive force (EMF)
 - e. Ion charge
- 1.2 **DEFINE** the following terms:
- a. Conductor
 - b. Insulator
 - c. Resistor
 - d. Electron current flow
 - e. Conventional current flow
 - f. Direct current (DC)
 - g. Alternating current (AC)
 - h. Ideal source
 - i. Real source
- 1.3 **DESCRIBE** the following electrical parameters, including the unit of measurement and the relationship to other parameters.
- a. Voltage
 - b. Current
 - c. Resistance
 - d. Conductance
 - e. Power
 - f. Inductance
 - g. Capacitance
- 1.4 Given any two of the three component values of Ohm's Law, **DETERMINE** the unknown component value.

ENABLING OBJECTIVES (Cont.)

- 1.5 **DESCRIBE** how the following methods produce a voltage:
- a. Electrochemistry
 - b. Static electricity
 - c. Magnetic Induction
 - d. Piezoelectric effect
 - e. Thermoelectricity
 - f. Photoelectric effect
 - g. Thermionic emission
- 1.6 **DEFINE** the following terms:
- a. Magnetic flux
 - b. Magnetic flux density
 - c. Weber
 - d. Permeability
 - e. Magnetomotive force (mmf)
 - f. Ampere turns
 - g. Field intensity
 - h. Reluctance
- 1.7 **DESCRIBE** the following materials as they relate to permeability, including an example and an approximate relative permeability.
- a. Ferromagnetic materials
 - b. Paramagnetic materials
 - c. Diamagnetic materials
- 1.8 **EXPLAIN** the physical qualities of a simple magnetic circuit, including relationships of qualities and units of measurements.
- 1.9 Given the physical qualities of a simple magnetic circuit, **CALCULATE** the unknown values.
- 1.10 **DESCRIBE** the shape and components of a BH magnetization curve.
- 1.11 **EXPLAIN** the cause of hysteresis losses.
- 1.12 Given Faraday's Law of induced voltage:
- a. **DESCRIBE** how varying parameters affect induced voltage.
 - b. **CALCULATE** voltage induced in a conductor moving through a magnetic field.
- 1.13 **STATE** Lenz's Law of induction.

ENABLING OBJECTIVES (Cont.)

1.14 Given a standard electrical symbol, **IDENTIFY** the component that the symbol represents.
The symbols will be for the following components:

- | | |
|-----------------------|----------------------------------|
| a. Resistor | m. Fuse |
| b. Capacitor | n. Junction |
| c. Inductor | o. AC voltage source |
| d. Relay | p. Voltmeter |
| e. Contacts | q. Ammeter |
| f. Breaker | r. Wattmeter |
| g. Switch | s. Relay operated contacts |
| h. Transistor | t. Potential transformer |
| i. Rheostat | u. Current transformer |
| j. Diode | v. Wye (Y) connection |
| k. Ground connections | w. Delta (Δ) connection |
| l. Vacuum tube | x. Light bulb |
| | y. Battery |

ATOM AND ITS FORCES

What is electricity? Electricity is defined as "the flow of electrons through simple materials and devices" or "that force which moves electrons." Scientists think electricity is produced by very tiny particles called electrons and protons. These particles are too small to be seen, but exist as subatomic particles in the atom. To understand how they exist, you must first understand the structure of the atom.

- EO 1.1 DESCRIBE the following terms:**
- a. Electrostatic force**
 - b. Electrostatic field**
 - c. Potential difference**
 - d. Electromotive force (EMF)**
 - e. Ion charge**
-

The Atom

Elements are the basic building blocks of all matter. The atom is the smallest particle to which an element can be reduced while still keeping the properties of that element. An atom consists of a positively charged nucleus surrounded by negatively charged electrons, so that the atom as a whole is electrically neutral. The nucleus is composed of two kinds of subatomic particles, protons and neutrons, as shown in Figure 1. The proton carries a single unit positive charge equal in magnitude to the electron charge. The neutron is slightly heavier than the proton and is electrically neutral, as the name implies. These two particles exist in various combinations, depending upon the element involved. The electron is the fundamental negative charge (-) of electricity and revolves around the nucleus, or center, of the atom in concentric orbits, or shells.

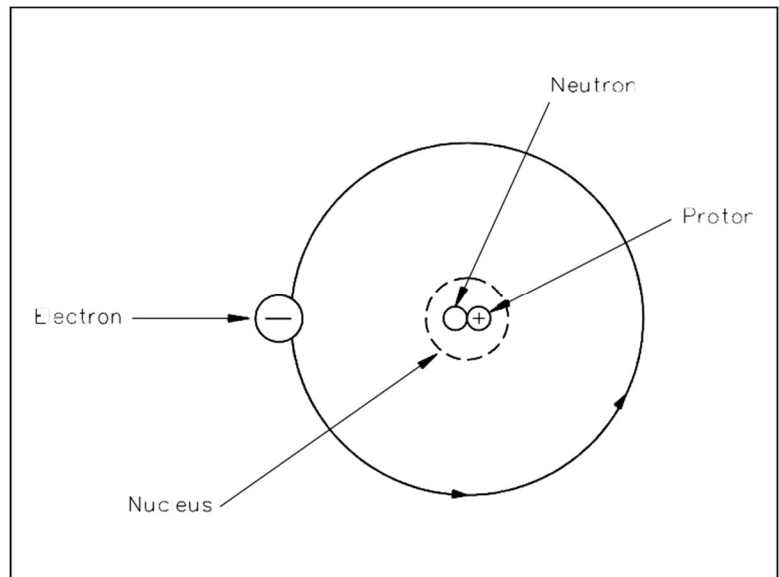


Figure 1 The Atom



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the technical materials.