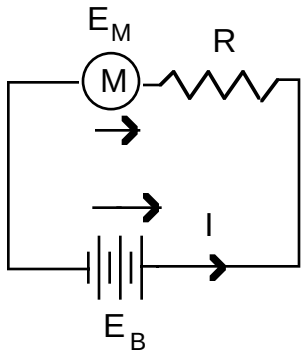
Counter EMF in the Electric Motor : Notes/W.S.-40

When the rotor of an electric motor moves in a magnetic field, a "back emf", or "counter emf", is induced in the coil because of Lenz's law. This emf opposes the emf of the battery.



$$E_B = E_M + I \cdot R$$

The battery emf, E_B, equals the back emf of the motor, E_M, plus the voltage drop across the coil, IR. The resistance of the motor coil, (or armature) is R. The coil consists of many loops of a thin copper wire, which has a small resistance. Assume that the battery has a negligible internal resistance.

Problems:

1)a) The emf of a battery is 6.0 volts. It is connected across a motor which has a back emf of 4.7 volts. What is the voltage drop across the armature coil?

b) If the current is 2.8 amps, when the motor is running, what is the coil resistance?

2) The windings of a rotor have a resistance of 2.5 Ω. The motor is connected to a 12 volt battery.

a) Find the initial current.

b) Once the rotor is rotating at full speed, the current is 0.90 amps. Find the back emf.

Answers: 1)a) 1.3 volts, b) 0.46 ohms, 2)a) 4.8 amps, b) 9.8 volts.