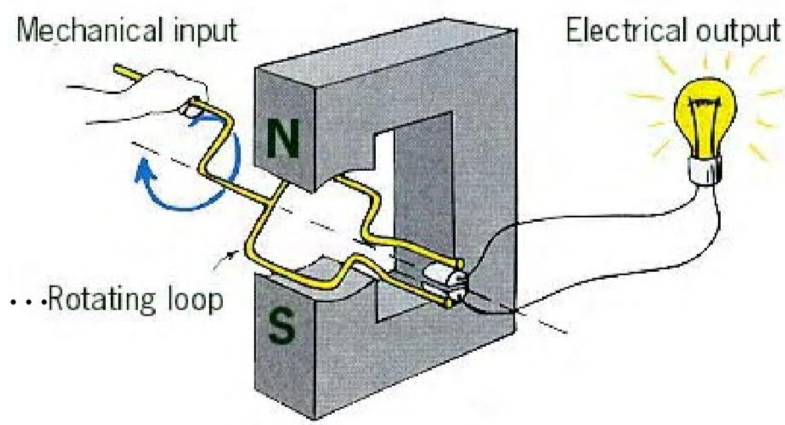
Name: ______________________________ Phys 12

6.8 Back EMF

Let's do a quick recap comparing electric motors and electric generators:

	Electric Motors	Electric Generators
Energy input	electrical energy	mechanical energy
Energy output	mechanical energy	electrical energy
How is the electricity interacting with magnetism?	A current moving perpendicular to a magnetic field generates a magnetic force.	A changing magnetic flux near a coil of wire produces an electric current.
Type of current involved	Direct current is enough	Produces alternating current



What problem do you get when you have coil of wire rotating in a magnetic field?

The rotating coil of wire in field generates a changing magnetic flux. According to Lenz's Law, this will produce an EMF.

This induced EMF turns out to oppose the original current, thus opposing the motion of the motor. We call this **back EMF**. It works against the applied EMF.

Back EMF can be calculated from

$$V_{back} = \varepsilon - Ir$$

ε = Applied EMF (V)

I = Current (A)

r = Resistance of motor (Ω)

Ex. 1: A 120V motor draws 12 A when operating at full speed. The armature has a resistance of 6.0 ohms.

a) Find the current when the motor is initially turned on. (ANS: 20. A)

$V_{back} = 0V$

$0 = \varepsilon - Ir$

$\varepsilon = Ir$

$I = \frac{\varepsilon}{r} = \frac{120V}{6.0\Omega} = 20.A$

b) Find the back EMF when the motor reaches full speed. (ANS: 48V)

$V_{back} = \varepsilon - Ir$

$= 120 - 12(6.0)$

$= 48V$

HW: Worksheet 6.8 #ALL