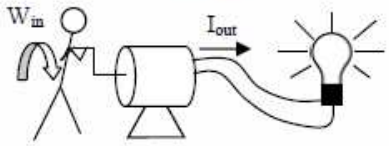
Name: _____

Period: _____

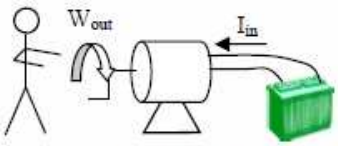
Motors and Generators

4.5

Any motor can be a generator and vice versa. The only difference is whether electricity goes in or comes out.



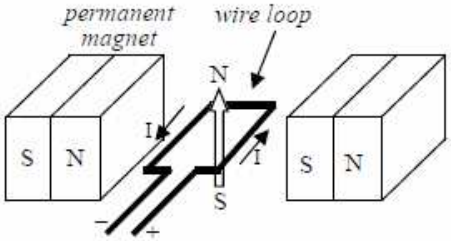
Generators generate electricity from work.



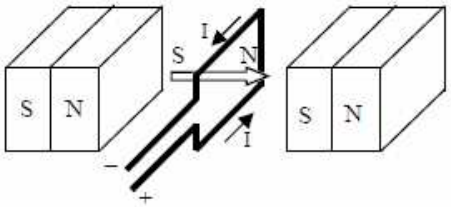
Motors make work (turn) from electricity.

A Basic Motor

Every motor works by electromagnets pushing against permanent magnets causing motion.



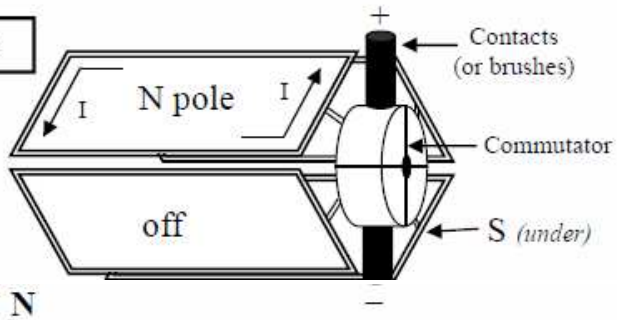
The north pole of the electromagnet loop is attracted to the south pole and is repelled by the north pole of the permanent magnets.



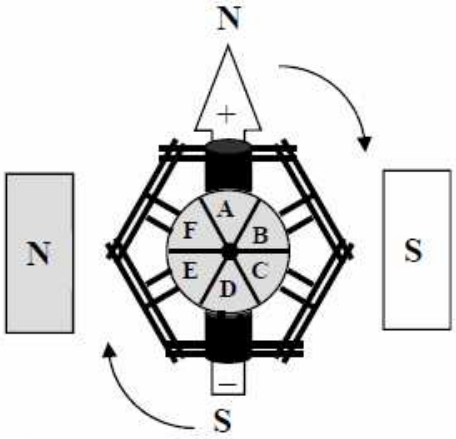
If the current in the electromagnet stays on, the motor will stop once it points toward the permanent magnets.

Commutators

Armature: the part that rotates (all of it, except the contacts)

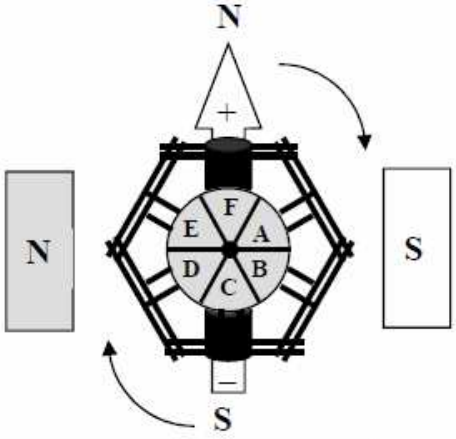


Actual motors have multiple wire loops around the moving part (the armature) of the motor. A commutator allows the electricity flowing to the wire loops to be turned on and off, keeping the armature moving. Otherwise, the electromagnet loop would turn once, sticking to the permanent magnets.



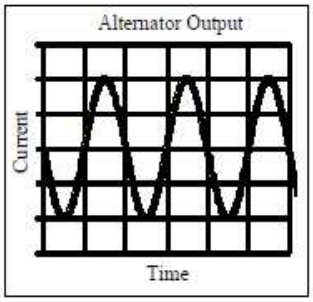
When the contacts are touching the commutator at sections A and D, the loops behind them, are magnetized, causing the whole armature to move.

Once the armature moves, loops A and D have no electricity and turn off. The contacts then energize sections F and C, which continues to move the armature.

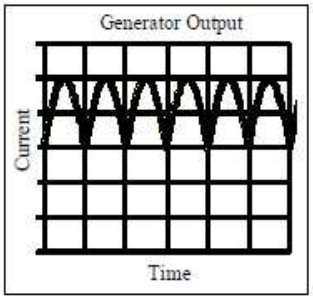


Alternators vs. Generators

Alternators and generators are the reverse of motors. Mechanical energy in any form (falling water, a hand crank, a piston pushed by combusting chemicals) moves loops of wire inside a magnetic field and produces electricity.

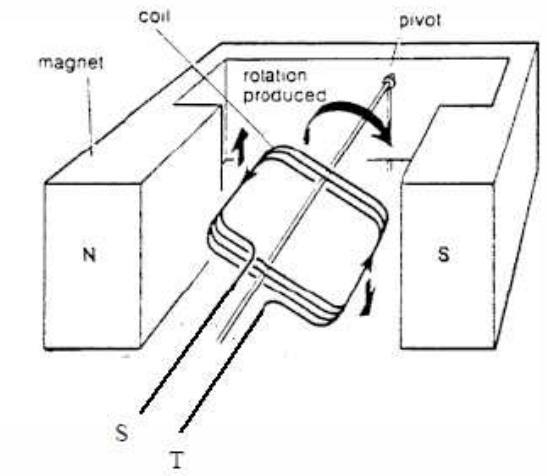


Alternators produces alternating current (AC). An alternator can be as simple as a loop of wire spinning between magnets. The output current can be converted into DC (direct current) thru rectifiers, which include diodes, in which current can flow in only one direction.



Generators (or dynamos) produced DC current because they have commutators to keep the electricity always going out the same direction. Cars once used generators, but they only produced sufficient voltage at high rotational speed, making them unable to recharge the car's battery while at idle.

1. The picture shows a square loop inside a horseshoe magnet.



   A) How could you tell if it was a motor or a generator just by looking at it?

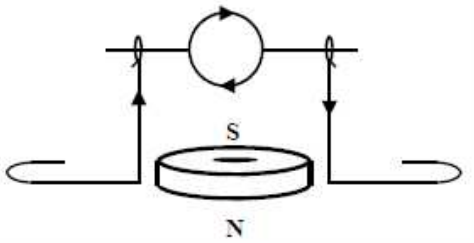
   B) What would you need to know to know if it was a motor or a generator?

   C) If this did not have a commutator, what would happen if electricity were put in side S?

   D) If it were a generator, without a commutator, would it produce DC or AC current?

   E) When will it break more magnetic field lines: when vertical or horizontal?

   F) If a generator, is the turning coil due to B or an external force?



   G) So, is the moving wire I or F for the RHR?

   H) On the right side the loop is going down, so which way is the current going, out S or out T?

   I) As the loop moves from horizontal to vertical does B increase or decrease inside the loop?