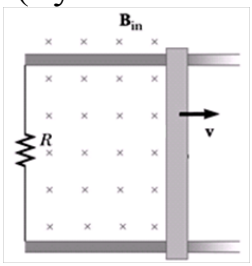
8. A conducting bar is moved to the right at a constant speed by an external force, as shown.

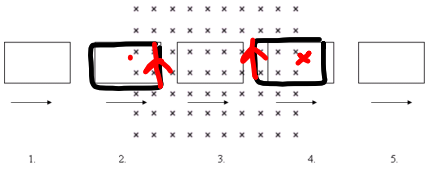
a) Determine the direction of the induced current.(try both methods)

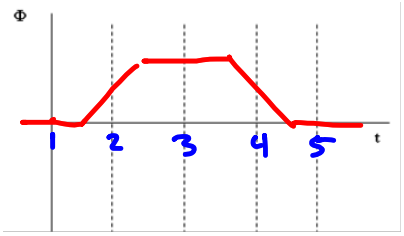


b) Explain why work must be done to move the bar. What becomes of the mechanical energy supplied to do this work?

An opposing magnetic force (BIL) resists the applied force – work must be done to overcome this resistive force – mechanical energy is transformed into electrical energy (the induced current) and then into thermal energy due to resistive heating (Joule heating) - conservation of energy

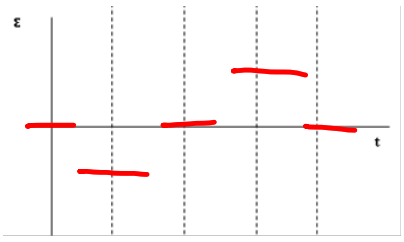
9. A conducting loop moves at a constant speed into and through a uniform magnetic field as shown in the diagram.





a) Determine the direction of the induced current in each section. (Try both methods.)

b) Graph the flux through the loop and the induced emf as a function of time.

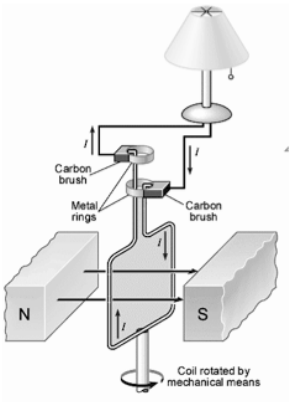


Alternating Current Generators

IB 12

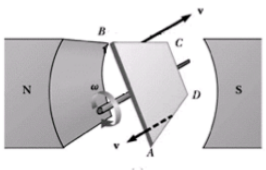
Basic Operation:

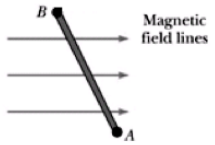
1. coil of wire is turned by mechanical means in an external magnetic field
2. emf and current are induced in coil as coil cut flux lines
3. current varies in magnitude and direction as flux linkage changes – current and emf variations are sinusoidal
4. brushes and rings maintain contact with external circuit without getting tangled



Rotation of a Coil in a Uniform Magnetic Field induces an EMF

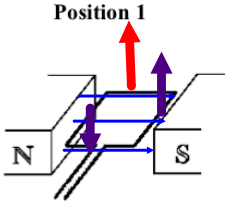
As the coil rotates, the flux linking it changes





Mark when the coil is in positions 1 and 2.

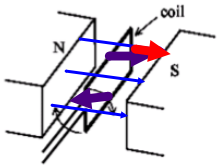
Position 1



Maximum EMF and Current

1. plane of coil || field
2. normal of coil perp. field
3. enclosed **B** is zero

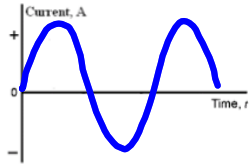
Position 2



Minimum EMF and Current

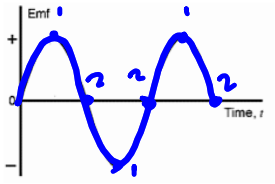
1. plane of coil perp. field
2. normal of coil || field
3. enclosed **B** is max

Sketch the graph of the induced current.



Sketch a graph of the induced emf for a coil with:

twice the frequency of rotation.



half the frequency of rotation.