Proposal

Faraday's Law

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Objective:

The main aim of this experiment is to find out the relation between the amplitude of generated AC current with the velocity of the magnet that passes through the coil and number of turns in the coil through the magnet is passed upon.

The concept we'll be experimenting upon is called Faraday's Law which states that when the magnetic flux upon a circuit changes, the electromotive force (emf) generated is proportional to the rate of change of magnetic flux. We would be performing the experiment twice, once for to find the relation between increasing velocity and the amplitude of the current generated, while keeping the number of turns in coil constant, and the second time, keeping the velocity at which the magnet cuts through the magnetic flux constant, while variating the number of turns per coil. Given below is a list of apparatus we will be required to set up the experiment

Apparatus:

1. Rod-shaped magnet
2. Copper wire (10m)
3. Ammeter
4. Inextensible string
5. A.C. Motor
6. D.C Power supply
7. Retort Stand

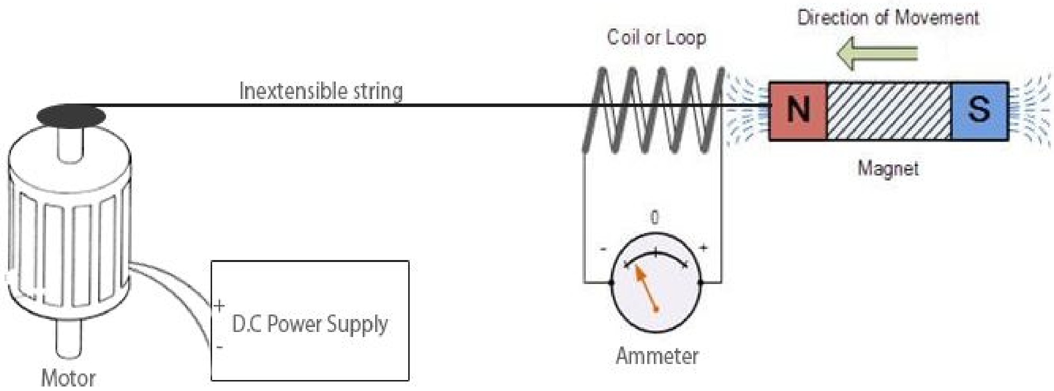
Formulae Used:

$$\varepsilon = -N\Delta\Phi\Delta t$$

$$\varepsilon = IR$$

$$v = \omega r$$

$$\omega = \frac{2\pi r}{T}$$



Method:

We setup the experiment on the retort stand and on the top of the stand we cannot an AC motor to provide movement to our magnet, we attach an inextensible string from one end of the magnet, to the rotational pulley of the AC motor, which would be used in pulling up the magnet through a coil with a number of turns that would be connected to an Ammeter to calculate the change in current generated through the rate of change of magnetic flux due to the movement of the magnet. For part one of the experiment since the speed of the magnet needs to be varied for data sets, but needs to stay constant, we would require an AC motor, which upon the change in current changes the rotational velocity of the motor, in turn changing the tangential velocity of the string used in pulling up the magnet through the coil. If incase such AC motor is not available, we will variate the tangential velocity by adding a known mass to magnet which would slow it's velocity down, and we will find it using the rotational dynamics and circular motion. For the second experiment which will require us to find the relation between the generated current, and number of turns of the coil, would be done with the same method, but the speed of the AC motor would stay constant throughout the whole experiment, only the number of turns of coil, will be changed. Hence this will provide us with the related between the two.

We will calculate our values for the both the experiment in these tables

The Table for Experiment 1

Number of turns (N)	Velocity of the Magnet (m/s)	Ammeter Reading (A)

Table for Experiment 2

Number of Turns (N)	Velocity of the magnet (m/s)	Ammeter Reading (A)

We will record the values of our variables and dependent variables in the tables provided above, and then will plot graphs for our data provided. There will be two graphs one, for (current against velocity), the second will be (current against number of turns of the coil).

Expected Results:

Since we can see that the Faraday's Law states that the EMF Induced is dependant upon the rate of change of magnetic flux and the number of turns in the coil. It can be said that for the first experiment if velocity is constant (no acceleration) then it would have no effect on the current produced, hence increasing the value of velocity would not change the current induced in the coil. Meanwhile because EMF is directly proportional to the N (number of turns in the coil), it will be produced greater Current upon greater number of coils, hence the relation between them would be linear.

References:

1. http://demoweb.physics.ucla.edu/content/experiment-1-magnetic-fields-coils-and-faradays-law
2. https://byjus.com/physics/faradays-law/
3. Giancoli, 6th edition, Physics for Scientists and Engineers with Modern Physics, Person.