

Experiment 1: Transformer Basics I

Introduction

When an alternating current passes through a coil of wire, it produces an alternating magnetic field. This is precisely the condition needed for the electromagnetic induction to take place in a second coil of wire. In this lab you will investigate several of the factors influencing the operation of a transformer.

Equipment Needed - Supplied

1. The four coils from the PASCO SF-8616 Basic Coils Set
2. The U-shaped Core from the PASCO SF-8616 Basic Coils Set
3. Optional: the additional coils from the PASCO SF-8617 Complete Coils Set

Equipment Needed - Not Supplied

1. Low voltage ac power supply 0-6 VAC, 0-1 amp such as PASCO Model SF-9582
2. AC voltmeter 0-6 VAC
3. Banana connecting leads for electrical connections

Procedure

1. Set up the coils and core as shown in Figure 1. In the diagram, the coil to the left will be referred to as the primary coil, and the one to the right will be the secondary coil. Note that we are putting in an alternating current to the primary at one voltage level, and reading the output at the secondary.

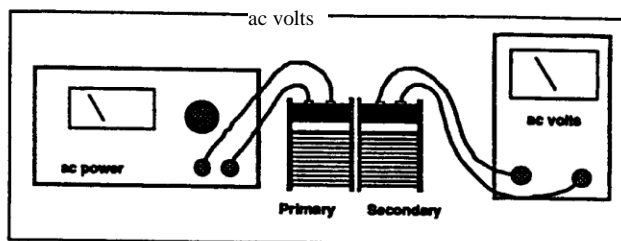


Figure 1

2. With the 400-turn coil as the primary and the 400-turn coil as the secondary, adjust the input voltage to 6 volts a.c. Measure the output voltage and record your results in Table 1.1.
3. Repeat step 2 after inserting the straight cross piece from the top of the U-shaped core. Record your results. (See Figure 2.)

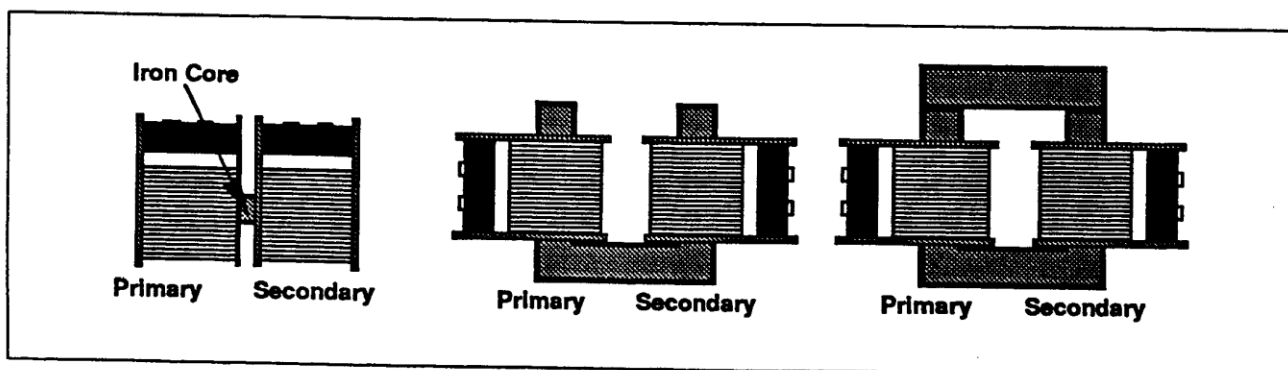


Figure 2

4. Repeat step 2 after placing the coils on the sides of the open U-shaped core. Record your results.
5. Finally, repeat step 2 after placing the cross piece over the U-shaped core. Record your results.
6. Using the core configuration which gives the best output voltage compared to input voltage, try all combinations of primary and secondary coils. Use a constant input voltage of 6.0 volts a.c. Record your data in Table 1.2.

Analysis

1. Which core configuration gives the maximum transfer of electromagnetic effect to the secondary coil? Develop a theory to explain the differences between configurations.
2. From your data in table 1.2, for a primary having a constant number of turns, graph the resulting output voltage versus the number of turns in the secondary. What type of mathematical relationship exists between numbers of turns of wire and the resulting output voltage? Is the data ideal? Why or why not?
3. Consider further improvements to your transformer. What additional changes might you make to increase the transfer from one coil to the other?

Data and Calculations

Table 1.1

Number of Turns				
Primary Coil	Secondary Coil	Input V	Output V	Core

Table 1.2

Core Configuration: _____

Number of Turns				
Primary Coil	Secondary Coil	Input V	Output V	Core