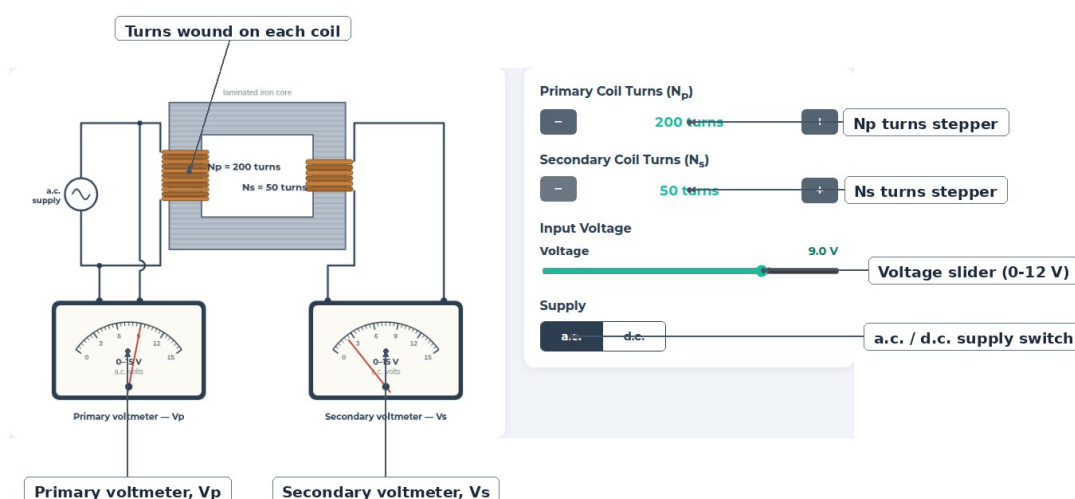


Investigating Transformers

Turns Ratio and Output Voltage

Aim:

You are investigating whether the output voltage of a transformer depends on the number of turns on each coil.



Prediction:

Set the supply to a.c., the input voltage to 6.0 V, and both coils to 100 turns. Read both voltmeters. Now predict: if you change only the number of secondary turns, will the secondary voltmeter reading change?

Test it in the simulation before you start your method.

Method:

1. Set the supply to **a.c.**, the **Voltage** to 6.0 V, and both **Np** and **Ns** to 100 turns.
2. Keep **Np** at 100 turns. Using the Ns stepper, record a table row for Ns = 50, 100, 200 and 400 turns.
3. Now keep **Ns** at 100 turns and, using the Np stepper, record a row for Np = 50, 100, 200 and 400 turns.
4. For every row, work out and record the **Vs ÷ Vp** and **Ns ÷ Np** columns on paper.
5. Set Np = 50 and Ns = 200 with a 12.0 V input. Before you switch to a.c., predict the secondary reading and write it down, then check the **Secondary voltmeter** and record the row.
6. Set up any combination that gives a healthy a.c. output, record it, then flip the **Supply** switch to **d.c.** and record what each voltmeter shows now.

Results:

#	N _p (turns)	N _s (turns)	V _p (V)	V _s (V)	V _s ÷ V _p	N _s ÷ N _p

Analysis:

Look at your rows from step 2, where N_p was fixed. Does changing N_s change the secondary voltage? Which changes make the output bigger than the input, and which make it smaller?

.....

.....

.....

Look at your rows from step 3, where N_s was fixed. Does changing N_p change the secondary voltage, and in which direction?

.....

.....

.....

Compare your V_s ÷ V_p column with your N_s ÷ N_p column, row by row. What do you notice?

.....

.....

.....

Did your prediction in step 5 match the voltmeter reading you measured? Does the pattern you found survive a change of input voltage?

.....

.....

Explaining why:

A transformer is just two separate coils of wire on an iron core — there is no electrical connection between them. Suggest how energy gets from the primary coil to the secondary coil.

Using your answer above, explain why the type of supply (a.c. or d.c.) matters. Refer to what you recorded in step 6.

What does your step 6 result suggest about whether a transformer could ever be run from a battery?
