

## Lesson Plan: Electromagnetism (age 14 – 16) – Transformers.

### Objectives:

The aim of the lesson and experiment is to help the student to understand the principles and purpose of the transformer.

### Lesson introduction (15 min):

Recap on any previous learning on electromagnetic induction. Introduce subject area and refer students to the Transformers Student Revision Notes in the 'Education' section of [www.twothirtyvolts.org](http://www.twothirtyvolts.org). Allow time for students to review these. Explain experiment and learning objectives.

### Lesson activity (25 min):

Group students in pairs and task them to:

- Perform the experiments detailed in the Student Sheet to understand the principles of how transformers work.

### Lesson demonstration (10 min):

Select some of the students to inform the rest of the class about their findings.

### Lesson review (10 min):

Recap on learning from the experiments and how transformers work, and get students to complete the Transformers Student Quiz at [www.twothirtyvolts.org](http://www.twothirtyvolts.org) to establish levels of understanding.

### Resources required:

For each student pair: two iron C cores, 2 one metre lengths of insulated wire, a 1.5V cell, a clip, a variable resistor and a 0 – 100  $\mu$ A meter.

Access to internet for [www.twothirtyvolts.org](http://www.twothirtyvolts.org)

### Expected Outcomes:

By the end of the session students will understand the principles and purpose of the transformer.

## Student sheet: Electromagnetism – Transformers.

### Objectives:

By the end of the session you will understand the principles and purpose of the transformer.

### Resources required:

Two iron C cores, 2 one metre lengths of insulated wire, a 1.5V cell, a clip, a variable resistor and a 0 – 100  $\mu$ A meter.

Access to internet for [www.twothirtyvolts.org](http://www.twothirtyvolts.org)

### Introduction:

Access and review the Transformers Student Revision Notes at [www.twothirtyvolts.org](http://www.twothirtyvolts.org).

### Activity:

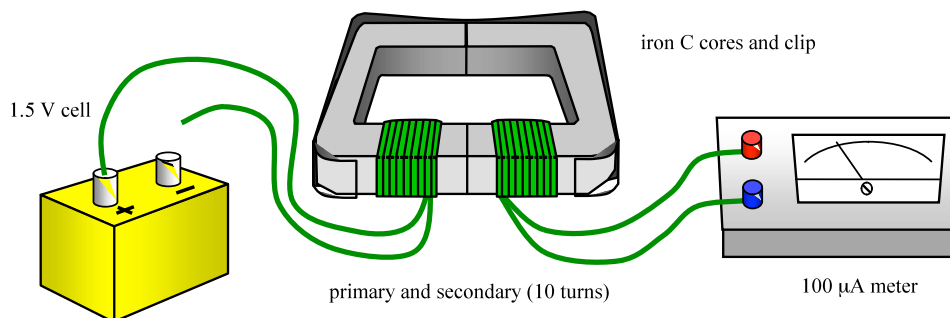
Working in pairs undertake the following tasks:

#### Experiment 1

Set up the apparatus as shown in the diagram. There should be ten turns on each coil. Connect one coil to the galvanometer and record what happens to the meter reading when:-

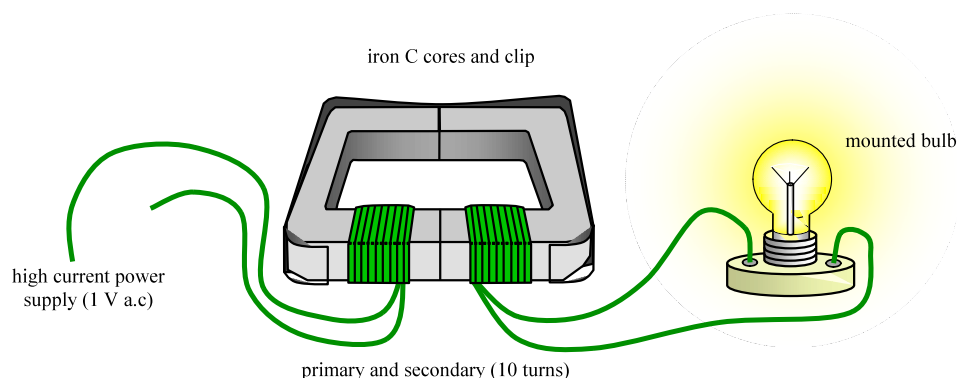
- (i) the other coil is connected to the 1.5 V cell
- (ii) the other coil has a steady current flowing in it
- (iii) the other coil is disconnected

Now connect the variable resistor in series with the cell and the cell coil. Vary the resistance quickly and record what happens to the meter reading. Record all readings and observations on the Worksheet.



#### Experiment 2

You will need similar apparatus to the first experiment, but a high current power supply and a bulb in place of the cell and meter.



Connect the apparatus as shown with one coil fixed to the 1 V AC output of the power supply. Record what happens to the bulb. Now try reducing the number of turns on the secondary, and then reducing the number of turns on the primary. What happens to the bulb in each case? Describe and explain what happens if the C cores are slightly separated. Record all readings and observations on the Worksheet.

## **Further work:**

Complete Transformers Student Quiz at [www.twothirtyvolts.org](http://www.twothirtyvolts.org) .

## **Linked Resources**

[www.twothirtyvolts.org](http://www.twothirtyvolts.org):

Transformers 14 -16 Student Revision Notes  
Transformers 14 -16 Revision Quiz

## **Worksheet: Electromagnetism – Transformers.**

**Experiment 1 Notes:**

**Experiment 2 Notes:**

**Other Observations:**