

PHYSICS
FORM 5
ELECTRICITY AT HOME

1. Domestic wiring is done in parallel. The reason being in the event that one resistor (load eg. Appliance, lightbulb) is non-functional, then the entire circuit will not become open.
2. With the parallel circuit, individual appliances may be turned on or off without affecting any of the other appliances. If it was a series circuit then in order to watch TV, every single other appliance must be turned on.
3. In a parallel circuit, the voltage is the same for every load/resistor. This means that there can be uniformity in the manufacture of appliances. It also means that a single appliance can work at any outlet.
4. In series, the voltage is found by adding the voltages across the individual loads. Therefore the more outlets in a home, the greater the total voltage that is required. If the house is supplied at a high voltage, it will pose as a fire hazard.

Fuse and Circuit Breakers

These are electrical devices that opens the circuit in the event that the current exceeds a certain maximum value.

Within the fuse there is a wire that heats up and eventually breaks when the current exceeds the maximum. The circuit becomes open, that is the flow of current is stopped. To close the circuit, the fuse must be replaced.

Circuit breakers perform the same job as the fuse, however the circuit breaker opens the circuit by tripping off. To restart the flow of current, the circuit breaker is turned on.

The cost of a fuse is very low. The cost of a circuit breaker is very high.

Despite the difference in price, circuit breakers are routinely used in domestic wiring. Although for circuit breakers, the initial cost is high but the daily running cost is zero (0). For a fuse the initial cost is low but the daily running cost is high.

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Rating

Circuit breakers and fuses are given a rating based on the maximum amount of current that it will allow to flow. The units of the rating is in amperes. The appropriate amp rating for a fuse should ideally be a few amperes above the optimum current for the electrical appliance. If the fuse amp rating is equal to the optimum current then any minor increases in the current would result in the circuit becoming open and the appliance non-functional. If the amp rating of the fuse is significantly greater than the optimum current then a large current is able to flow without the circuit opening. The end result is that significant heat is generated which can cause damage to the appliance.

International Insulation Colour Code

In domestic wiring there are 3 wires for every line/outlet. These are :

1. Live Wire
2. Earth Wire
3. Neutral Wire

Code:	Live Wire	Neutral Wire	Earth Wire
Colour (International Standart):	Brown	Blue	Green with yellow stripe

The live wire has an electrical current flowing through it. A fuse and circuit breakers are connected to the live wire.

The neutral wire has an exceedingly low potential difference which facilitates the flow of a current.

The earth wire is used for safety. It is connected to metal casings of appliances and domestic wiring boxes.

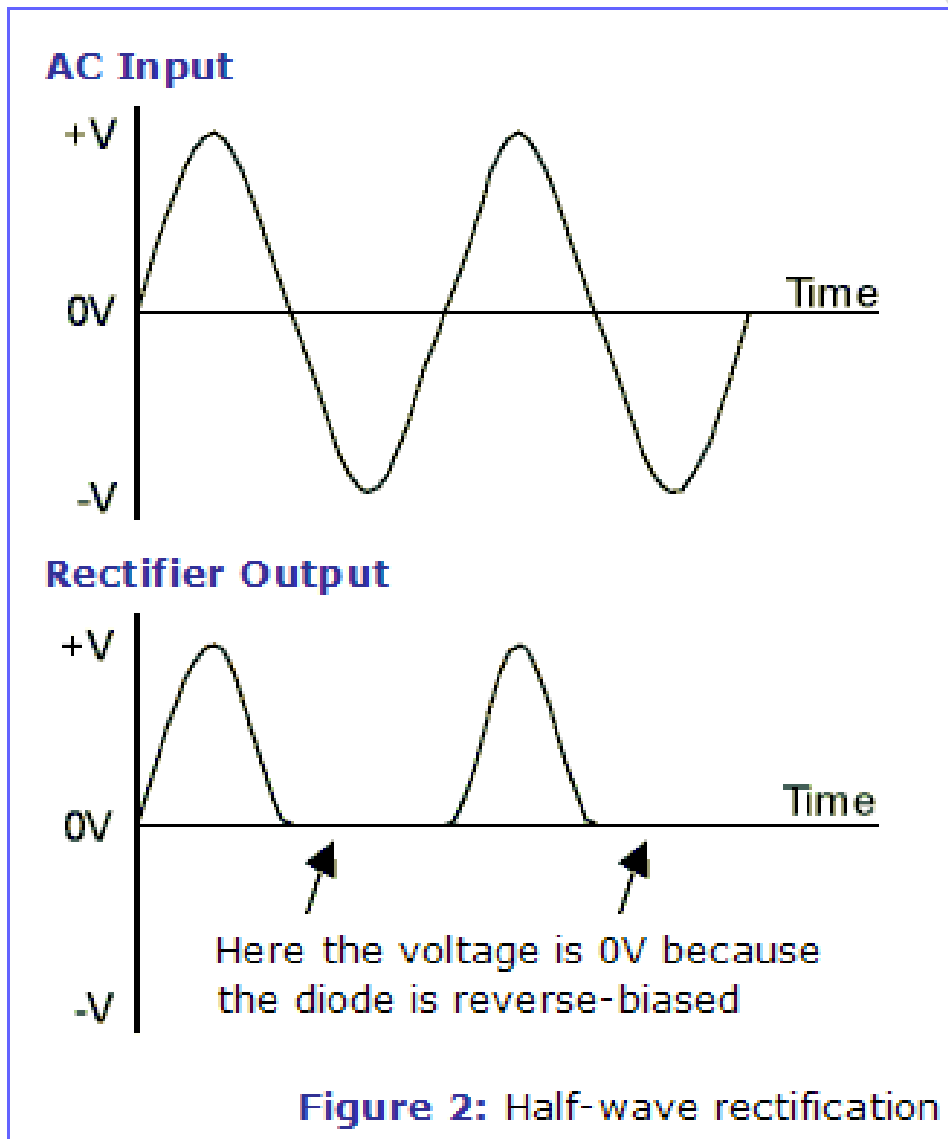
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In the event of faulty wiring or exposed live wires, an individual can become electrocuted due to the passage of current from the live wire to the metal casing and then to the individual.

The earth wire is connected to lightning rod usually situated to the side of the house.

Semi-Conductor Diodes

A semi-conductor diode is an electrical device that allows current to flow in only one direction.



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Half wave rectification of alternating current produces a flow of current that exists in only one direction. Therefore half wave rectification of alternating current produces direct current.

Experiment to Determine if A Semi-Conductor Diode is Functional

R. Mondol Do Not Copy

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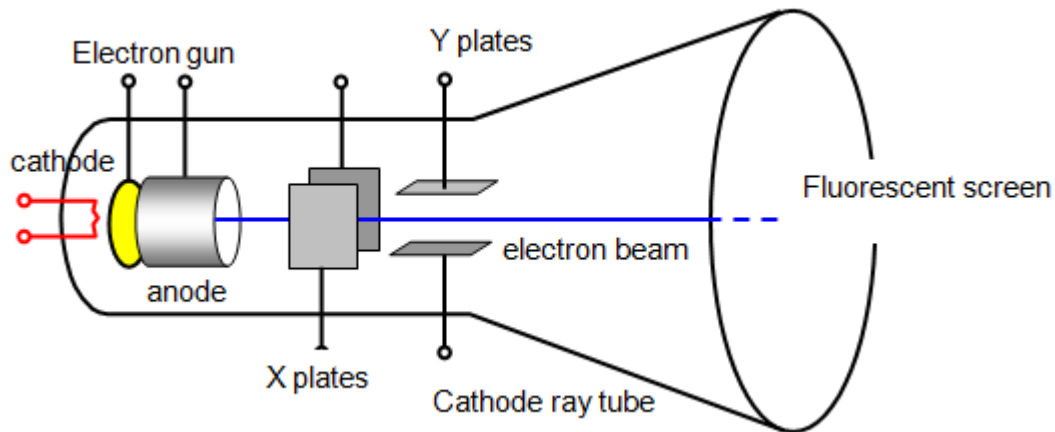
Method:

1. The circuit was set up as shown above
2. The switch was then closed and the status of the lamp was noted (lit/unlit)
3. The semi-conductor diode was connected in the reverse order.
4. The state of the lamp was checked again.

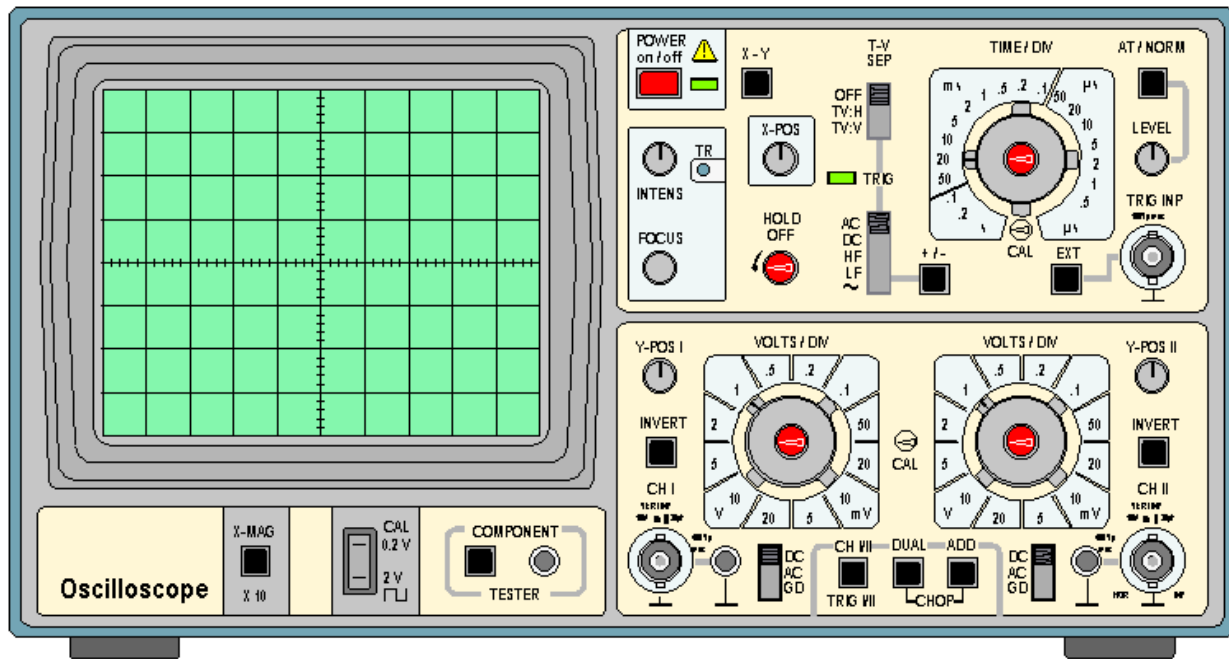
Discussion:

If the lamp remain unlit at both observations then the semi-conductor diode is non-functional. If the lamp remain lit in both observations then the semi-conductor diode is non-functional. If the lamp was lit in one observation and unlit in the other, then the semi-conductor diode is functional.

CRO (Cathode Ray Oscilloscope) [<http://fiziknota.blogspot.com/2009/04/cathode-ray-oscilloscope.html>]



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Cathode Ray Oscilloscope (CRO) uses a cathode ray tube to produce visible graphical representations of electrical signals.

The graphs produced consist of a horizontal axis which is normally a function of time, and a vertical axis which is a function of the input voltage.

Many physical quantities can be converted into a corresponding electric voltage. The oscilloscope is a useful tool in many physics experiments.

The components in a cathode ray tube consists of a vacuum glass tube with an electron gun, a deflection system for deflecting the electron beam and a fluorescent coated screen.

Electron Gun

In a cathode ray tube, a beam of electrons is produced by heating the filament with a small voltage supply. The power supply can be AC or DC. The electron beam emerging from the electron gun passes between two pairs of deflection plates, i.e. X and Y - plates mounted horizontally and vertically.

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Deflection System

CRO has a fluorescent screen. When the screen is struck by a beam of electrons, wave forms will be traced out on the screen. The kinetic energy of the electrons is changed to light energy.

There is a bright spot on the screen when the beam strikes. By changing the vertical gain on the Y-plates, the beam is deflected vertically. The beam can be moved up and down and if it moves fast enough, the dots will appear as a line.

When an AC supply is connected to the Y-plates, the electron beam will move vertically. The amount of vertical movement can be amplified by increasing gain control. The vertical movement of the electron depends on the vertical gain control and it can be adjusted, using the VOLTS/DIV control. The control is adjusted so that the resulting display is neither too small nor too large, but it fits the screen.

The horizontal deflection plates or X-plates produced a left to right movement. The movement is produced by a circuit called the time base inside the oscilloscope. The time base produces a saw tooth wave form. During the rising phase (the rising line) of the voltage, the spot is driven at a uniform rate from left to right across the screen. During the falling phase, (the straight vertical line downwards) the electron beam returns rapidly from right to left.

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