How a Transformer works?

When current is passed through a coil, the coil becomes surrounded by a magnetic field .This field is made up from lines of force and has the same shape as a bar magnet. If the current is increased, the lines of force move outwards from the coil. If the current is reduced, the lines of force move inwards. If another coil is placed adjacent to the first coil then, as the field moves out or in, the moving lines of force will "cut" the turns of the second coil. As it does this, a voltage is induced in the second coil. With the 50 Hz AC mains supply , this will happen 50 times a second. This is called Mutual Induction and forms the basis of the transformer. The input coil is called the Primary Winding, the output coil is the Secondary Winding. The voltage induced in the secondary is determined by the Turns Ratio.

$$\frac{\text{Primary voltage}}{\text{Secondary voltage}} = \frac{\text{Number of primary turns}}{\text{Number of secondary turns}}$$

For example, if the secondary has half the primary turns, the secondary will have half the primary voltage. Another example is if the primary has 5000 turns and the secondary has 500 turns, then the turns ratio is 10:1. If the primary voltage is 240 volts then the secondary voltage will be x 10 smaller = 24 volts. Assuming a perfect transformer, the power provided by the primary must equal the power taken by a load on the secondary. If a 24 watt lamp is connected across a 24 volt secondary, then the primary must supply 24 watts.

If it is a 240 volt primary then the current in it must be 0.1 amps.

To aid magnetic coupling between primary and secondary, the coils are wound on a metal Core. Since the primary would induce power, called Eddy current, into this core, the core is Laminated. This means that it is made up from metal sheets insulated from each other. Transformers to work at higher frequencies have an iron dust core or no core at all. Note that the transformer only works on AC which has a constantly changing current and moving field.

DC has a steady current and therefore a steady field and there would be no induction. Some transformers have an electrostatic screen between primary and secondary. This is to prevent some types of interference being fed from the equipment down into the mains supply, or in the other direction.