Generating Electricity

We can generate a voltage by moving a wire in a magnetic field. The wire must be moving through the magnetic field and not just back and forwards. It needs to cut the field lines. We can increase the voltage generated by

* Increasing the speed of motion,
* Using a stronger magnet (increasing the strength of the magnetic field)
* Using more coils of wire.

This is used in transformers.

Transformers change the magnitude (size) of the voltage. A step-up transformer increases the voltage, a step down transformer decreases the voltage.
A step-\_\_\_\_\_\_\_\_\_ transformer is used in a mobile phone charger, a step- \_\_\_\_\_\_ transformer is used in factories to increase the voltage across large pieces of equipment.

**How do transformers work?**

A transformer needs an *alternating current* that will create a **changing magnetic field**.

* The primary coil is connected to an AC supply.
* An alternating current passes through a primary coil wrapped around a soft iron core.
* The changing current produces a changing magnetic field.
* This induces an alternating voltage in the secondary coil.
* This induces an alternating current (AC) in the circuit connected to the secondary coil.

The formula for a transformer is $\frac{Np}{Ns}=\frac{Vp}{Vs}$ or $\frac{Ns}{Np}=\frac{Vs}{Vp}$

Where Np = number of turns in the primary coil

Ns = number of turns in the secondary coil

Vp = Voltage across the primary coil

Vs = Voltage across the secondary coil

As Power = Current x Voltage then increasing the voltage across a transformer must lead to a decrease in the current. If this were not the same then the power generated would be increasing. This cannot be the case. So the formula for current in a transformer is $\frac{Np}{Ns}=\frac{Is}{Ip}$

(ie the current in the primary is on a different line to number of turns in the primary) Again turn the equation upside down on both sides if you need to find something on the bottom of the equation.