Power

Power is the rate at which energy is delivered to a circuit.

$$P = E/t$$

Total energy depends on amount of charge:

$$E = QV$$

The power depends on the voltage and the current:

$$\mathbf{P = IV}$$

Measured in watts (W).

1 kilowatt (kW) = 1000 watts

Electric Power is a measure of the rate at which electricity does work or provides energy.

Electric Energy is the amount of power used over a period of time.

Measured in kilowatt-hours (kWh).

Energy = Power x Time

$E = P \times t$

Kilowatt-hours = Kilowatts x hours

Power Consumption Cost

$$\text{Cost} = \frac{\text{Power x time x unit price}}{\text{KWh (kilowatt hours)}}$$

Household Circuits

Cable consists of three wires in a protective casing.

Two wires run parallel and have a potential difference of 120 volts.

The third wire is connected to ground.

Two-prong plug - one terminal connected to high potential wire; other to low potential wire.

Three-prong plug - third terminal connected to ground.

Household Wiring

Household circuit – many resistances in parallel (i.e. lights, appliances)

Source – power company

Due to resistance some of the electric energy passing through a wire may be converted to light or heat.

Adding resistance (i.e. plug in appliance) decreases total resistance, increasing current.

Too much resistance → too much current → wire burns!

Protection: fuse or circuit breaker

Circuit Safety

Short circuit - Wires on opposite sides of the load (appliance) touch, creating a low resistance pathway that allows current to bypass the load.

Ground wire provides shorter circuit for current.

If too many appliances are running on the same circuit or if the wires have become old and frayed, heat can build up in the wiring.

Fuses - Thin strip of metal acts as an emergency switch, melting and breaking the flow of electricity if current too high. (Must be replaced.)

Circuit breakers - Switch flips open when current flow becomes too high, opening the circuit. (Can be reset.)

Small Appliance Safety

Most small appliances are just special forms of resistance which give off heat.

They are built to work at a specific voltage and current range.

They wear out over time.

Old, cracked and frayed wires may cause a short circuit.

In a short circuit a wire may bypass the resistance of the circuit.

The small resistance of the "short" causes an increase in current.

If the path cannot handle the increase, it will burn.

If the path is your body, you will feel an electric shock, which may be lethal.

Electricity Study Guide - Senior 1 Science

Sources of Electricity: Batteries, Photocells, Thermocouples

Circuit Symbols
What makes a circuit complete
Current Notes
- Current Direction
- Current Problems $I = Q/t$
- Voltage (Potential Difference) Notes + Problems $V = E/Q$
- Voltage + Current Notes
- Resistance - What it is + what it is measured in
- Power Problems: $P = E/t$ / Power Formulas
- Parts of a circuit
- Series + Parallel circuits
- Household Wiring / Circuits
- Circuit Safety
- Use of a fuse
- Short Circuit.
- Safety around Electricity (Video)
- Electrostatics questions
  eg: insulator / conductor
  attract / repel
  What makes an object negative/positive
  etc.