DC v. AC
- Batteries are DC (Direct Current) devices - i.e. current flows in one direction
- Household electrical power is AC (Alternating Current) in which the current direction varies back and forth 50 times a second (50 Hz).
- The ‘average’ voltage is 240 V AC

AC power
- What you actually pay the electricity supplier for is energy, which is power multiplied by the time it is used. The usual unit used by a power company is the kilowatt-hour (kWh):
  \[ 1 \text{ kWh} = 10^3 \text{ W} \times 3600 \text{ s} = 3.6 \times 10^6 \text{ J} \]
- The cost of energy in Sydney (2004) varies but one rate is about 17 cents per kWh. Thus running a 1 kW room heater while you’re reading your Physics book for 1 hour at night might cost you around 17 cents. In practice it may be somewhat less if the heater has a thermostat which turns it off periodically.

Electrical Power Network
- All devices are connected in parallel so that all are presented with a voltage of 240 V AC.
- so their operation doesn’t depend on any other device being “on”

Household power
- All devices are connected in parallel so that all are presented with a voltage of 240 V AC.
- so their operation doesn’t depend on any other device being “on”

Electrical Power Network
- The usual Australian power point (a general purpose outlet or GPO). The diagram shows wiring conventions for the active, neutral and earth conductors, as seen looking at the outlet.
  - All devices within the house are connected in parallel - so all see 240 V - maximum current allowed is typically 15 A.
  - The amount of power a device draws depends on their resistance. For example, in a 100 W light bulb the current and resistance are given by:
    \[ I = \frac{P}{V} = \frac{100 \text{ W}}{240 \text{ V}} = 0.42 \text{ A} \]
    \[ R = \frac{V^2}{P} = \frac{(240 \text{ V})^2}{100 \text{ W}} = 576 \Omega \]

Electric shock from a toaster
- The usual Australian power point (a general purpose outlet or GPO). The diagram shows wiring conventions for the active, neutral and earth conductors, as seen looking at the outlet.
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Effects of electric shock

<table>
<thead>
<tr>
<th>Shocking current</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3 mA</td>
<td>No observable effect</td>
</tr>
<tr>
<td>3 mA to 10 mA</td>
<td>Tingling sensation</td>
</tr>
<tr>
<td>10 mA to 100 mA</td>
<td>Loss of control; the most you can let go - C, muscular paralysis - still not dangerous</td>
</tr>
<tr>
<td>100 mA to 1000 mA</td>
<td>劳力/呼吸停止，呼吸可能继续但可能自发恢复</td>
</tr>
<tr>
<td>1 A to 10 A</td>
<td>Ventricular fibrillation - random twitching and heart will not recover spontaneously</td>
</tr>
<tr>
<td>10 A to 100 A</td>
<td>Intense and skin burns - may be less dangerous since it clamps the whole heart - I A used to clinically defibrillate the heart</td>
</tr>
</tbody>
</table>

The effects of electric shock do not suddenly occur at definite values of current. Variation occurs with age, sex and health of the victim and with the path taken by the current in the body. There are also differences between the effects of alternating and direct currents.

Briefly, if someone is struck by electric shock:
1) interrupt the current
2) if breathing has stopped, apply mouth-to-mouth resuscitation
3) if there is no pulse, apply full CPR
4) get an ambulance quickly.

It is vital to realise that if the heart has gone into ventricular fibrillation it will not restart spontaneously. The victim will not survive unless CPR is started promptly and continued until expert medical treatment, including defibrillation, is applied.

See on-line version for print that is too small