



Science In Action 9

Unit 4

Electrical Principles and Technologies

Section 1.0

Electrical Energy can be transferred and stored

- **Static** electricity (electrically charged particles not flowing)
- **Current** electricity (flowing charged particles)
- **Voltage** - a measure of how much electrical energy each charged particle has. **Current** – rate of charged particle flow
- Safety with electrical energy is vital
- Electricity can be produced with chemical reactions and stored in cells – **Cells** combine to form **batteries**

Section 2.0

Technologies used to transfer and control current

- Different levels of **resistance** can be provided by different substances
- **Conductors** allow electricity to flow more easily than **insulators**
- Electrical resistance is measured in **ohms**. **Voltage** is measured in **volts** and current is measured in **amperes**.
- **Ohm's Law** – current flowing through a conductor is proportional to the voltage applied to it
- **Voltmeters** measure (voltage), **Ammeters** (current), **Ohmmeters** (resistance), **Multimeters** (measure all three)
- **Series Circuit** (1 pathway) **Parallel Circuit** (multiple pathways)

Section 3.0

Devices and Systems convert energy

- **Energy forms**: chemical, thermal, mechanical, electrical
- Energy can be **transformed** from one form to another
- **Motors** convert electrical energy to mechanical energy
- **Power** is the rate at which a device converts energy (current*voltage)
- **Input energy** and useable **output energy** are compared to determine **efficiency**
- Reducing **waste energy** increases efficiency

Section 4.0

Using electrical energy affects society and the environment

- Alternative energy sources: **fossil fuels, nuclear, geothermal, biomass, hydroelectric, tides, wind and solar**
- Energy sources can be **renewable** or **non-renewable**
- Electrical generation produces by-products that harm the environment
- Energy can be conserved with responsible use and reduction choices
- **Sustainability** – using resources at **indefinite** maintenance rate