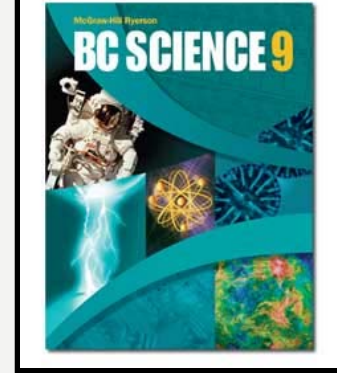


7.1 STATIC CHARGE

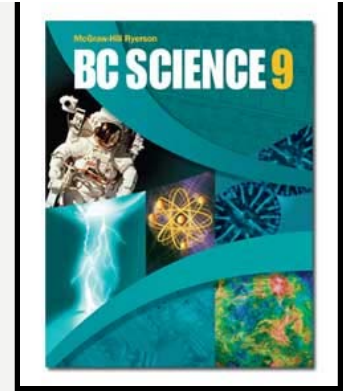


- Electrical charge that is collected in one place
- Static charge is often encountered in everyday life when objects rub against one another and transfer charge

Positive and Negative Charges

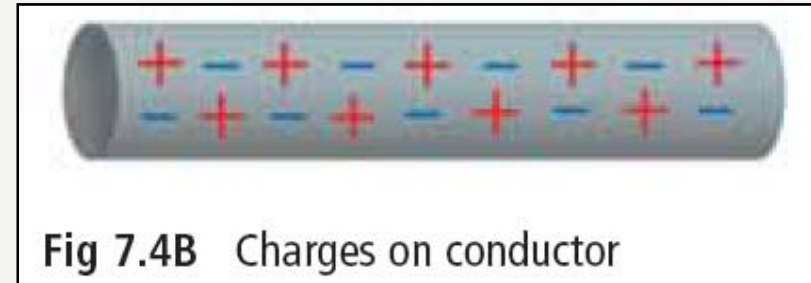
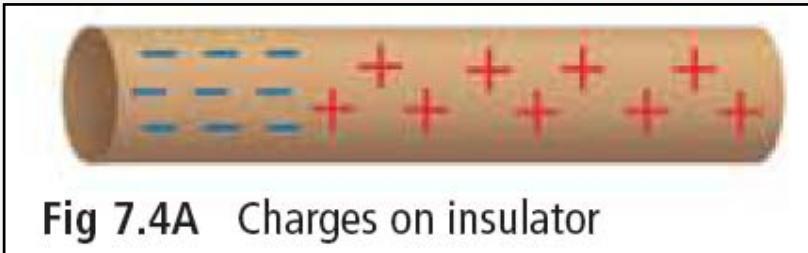
- All matter is made of atoms - at their centre is a nucleus containing protons (positively charged) and neutrons (no charge). Surrounding the nucleus are electrons (negatively charged)
- Solid materials are charged due to the movement of electrons - when electrons are gained, the object becomes negative. When electrons are lost, the object becomes positive.
- Electrons are most often transferred through friction, when objects rub against each other.

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7.1 INSULATORS AND CONDUCTORS

- Materials that do not allow charges to move easily are called electrical insulators
- Materials that allow electrons to travel freely are called electrical conductors
- Only insulators are good at retaining static charge

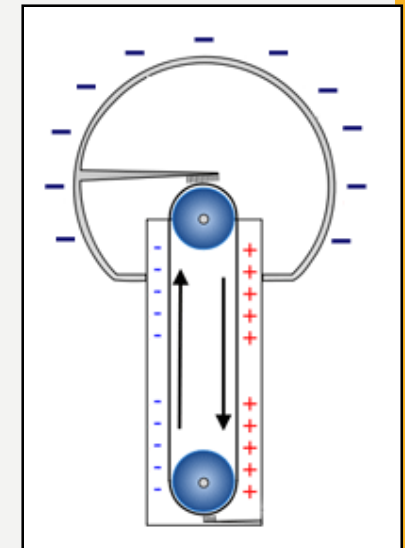
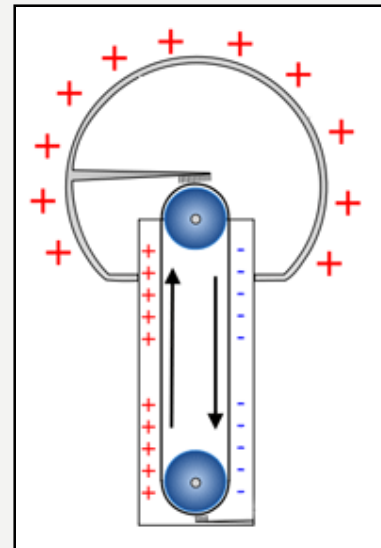
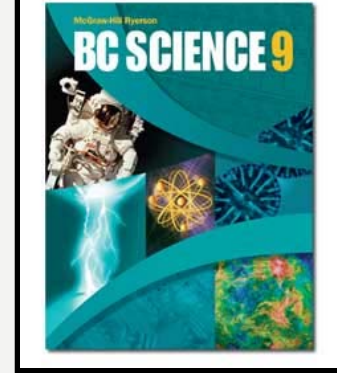


- Charge is measured with a unit called the coulomb (C)

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7.1 GENERATING STATIC CHARGE

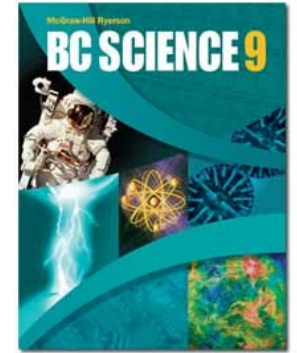
- Van de Graaff generators (VDG) use friction to produce large amounts of static charge.
- As a rapidly moving belt moves over rollers, contact between the two results in a transfer of charge.
- A moving belt produces static charge on a metal dome - the charge resulting on the dome depends on the materials used in the VDG belt and rollers.



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7.1 APPLICATIONS AND DANGERS

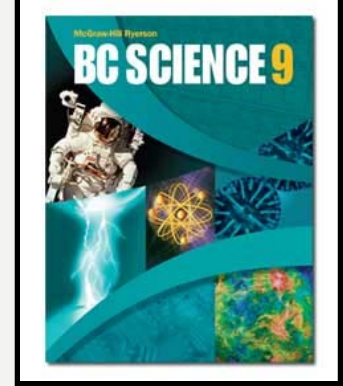
- Static charge can be very useful - electrostatic filters can be used to clean air, paint automobiles, and hold objects with electrostatic attraction.
- Static charge can also be dangerous - when it builds up it can discharge and cause serious shocks, explosions or fires. Those pumping flammables must ensure objects are grounded (connected to the Earth so that static charge is discharged).
- Lightning is especially dangerous - buildings can be protected with lightning rods.



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[Take the Section 7.1 Quiz](#)

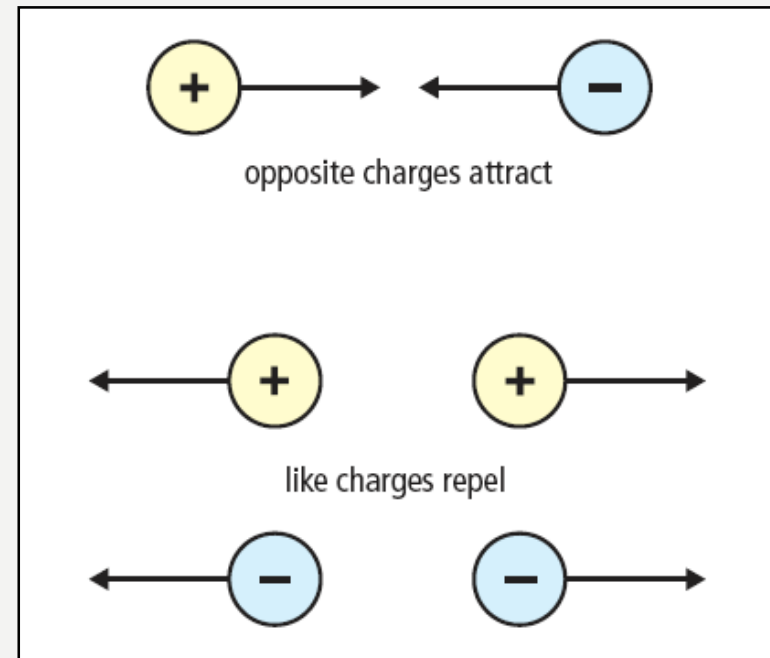
7.2 ELECTRIC FORCE



- Force is a push or pull - electric force can do both, without touching the object - it is an action-at-a-distance force.

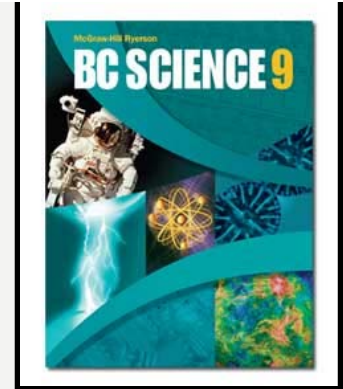
Laws of Static Charge

- Like charges repel
- Opposite charges attract
- Neutral objects are attracted to charged objects



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CHARGING OBJECTS



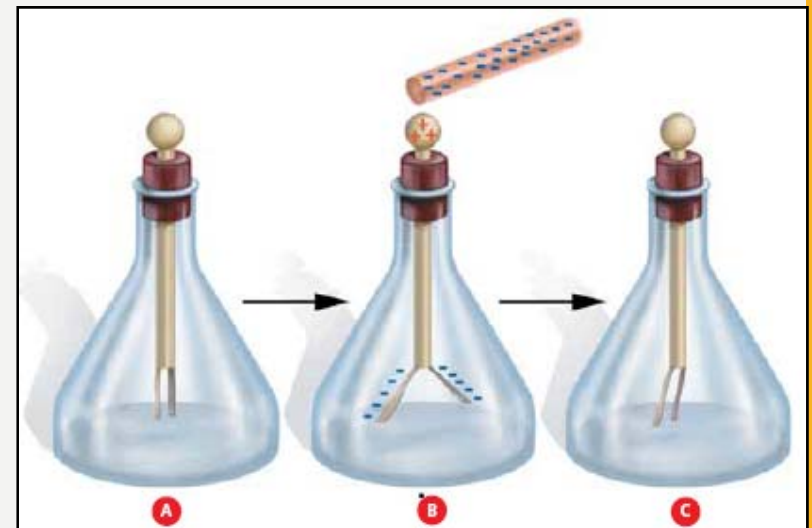
Charging By Conduction

- Charging through direct contact
- Extra electrons will move to a location where there is less of them



Charging By Induction

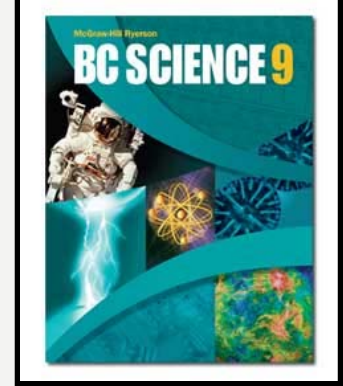
- Bringing a charged object nearby a neutral object will cause charge movement and separation in the in the neutral object.



[Take the Section 7.2 Quiz](#)

See pages 259 - 260

8.1 ELECTRIC POTENTIAL ENERGY AND VOLTAGE



- Electrochemical cells convert chemical energy into electrical energy. Connecting cells together forms batteries.
- The ends of batteries are terminals - connecting to them can allow electrons to flow from the battery through a device that converts electric energy into different forms.

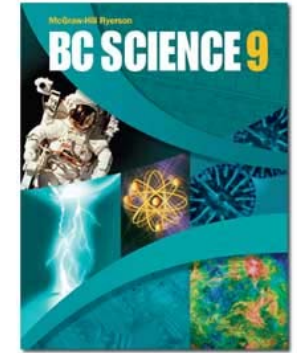
Electric Potential Energy

- Electric energy can do work. Electric energy that is stored is potential energy; when it is moving it is kinetic energy.



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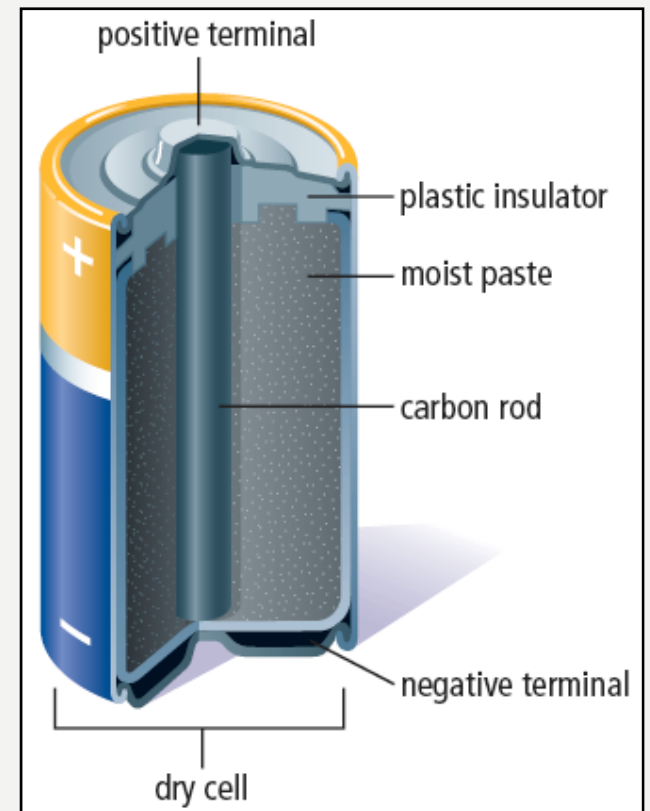
ELECTRIC POTENTIAL DIFFERENCE



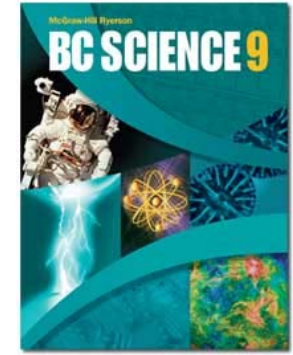
- The amount of electric potential energy per coulomb of charge is called the potential difference or **voltage**. This can be measured with a voltmeter.
- Extra electrons will move to a location where there is less of them

Producing Voltage

- Electrodes in an electrolyte chemically react to produce electrons and relatively difference charges on each electrode. This creates a potential difference.



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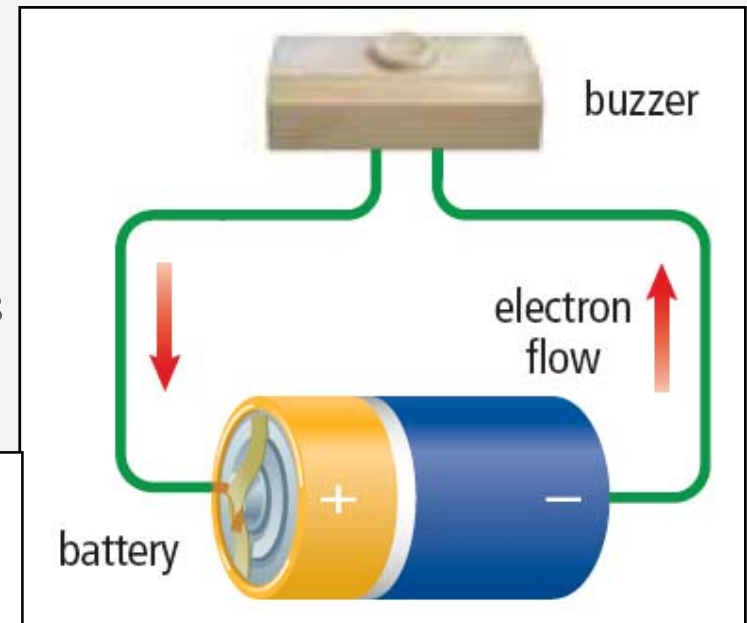


8.2 ELECTRIC CURRENT

- A complete pathway that allows electrons to flow is called an electric circuit. Electrons flow through devices (loads) in the circuit that convert electricity to other forms of energy.

Basic Circuit Components

- Source: source of energy
- Conductor: wire where current flows
- Load: turns electricity into other forms
- Switch: turns circuit on or off

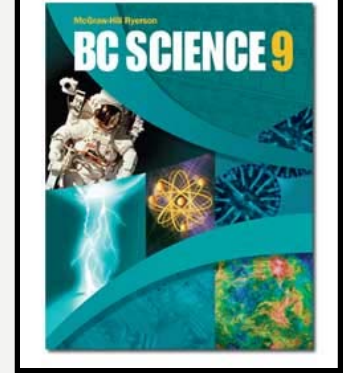


	conducting wire		bulb
	voltmeter		open switch
	cell		closed switch
	battery		

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CURRENT FLOW

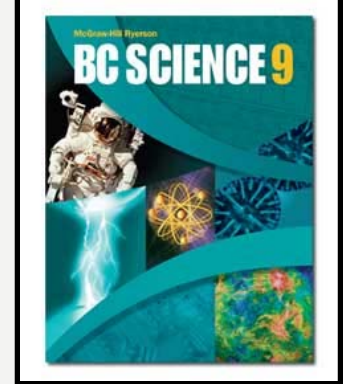


- The continuous flow of charge in a complete circuit is called current electricity. Electric is defined as the amount of charge passing a point in a conductor every second.
- Current is measured in amperes (A), and can be detected with an ammeter.

[Take the Section 8.2 Quiz](#)

See pages 283 - 285

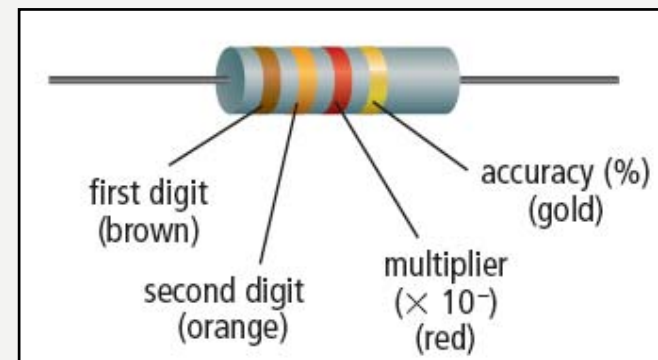
8.3 RESISTANCE AND OHM'S LAW



- Resistance is the property of any material that slows down the flow of electrons, and converts electrical energy into other forms.

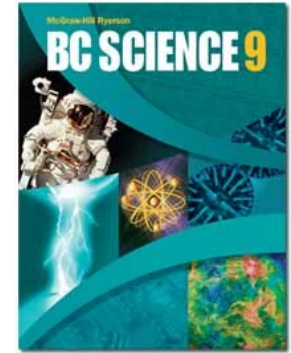
Ohm's Law

- The greater the amount of resistance, the lower the current
- Resistance = Voltage \div Current
- Unit of resistance is the ohm (Ω)
- Resistance can be measured in a circuit with an ohmmeter
- Switch: turns circuit on or off
- Circuit resistors are marked with coloured bands that allow you to determine the ohm value of the resistor.



[Take the Section 8.3 Quiz](#)

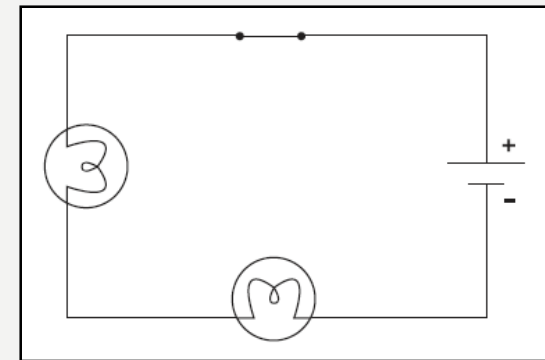
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9.1 SERIES AND PARALLEL CIRCUITS

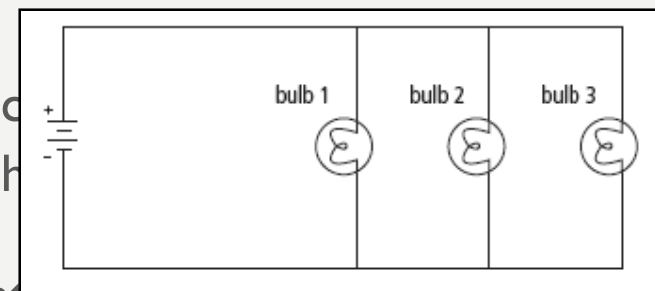
Series Circuits

- There is only a single pathway for current to flow
- The sum of the voltages lost on the loads equals the total voltage supplied by the battery
- Current measured anywhere in the series circuit will be the same



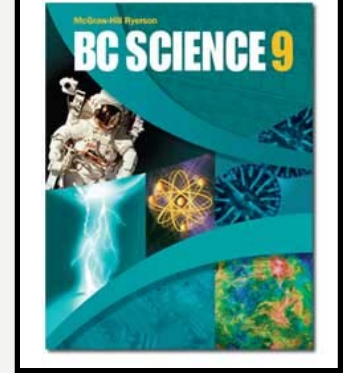
Parallel Circuits

- Multiple pathways for current to flow, adding more pathways lowers resistance
- Voltage remains the same through each pathway of the parallel circuit
- Current splits up between the different current pathways



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9.2 THE POWER OF ELECTRICITY



Power

- Power is the rate of change in energy, the rate at which work is done.
- Power is measured as units of energy (joules) per second, one joule per second is a watt (W)
- Electrical power is the rate of change in electrical energy. For example, a 25 W fluorescent bulb converts 25 joules per second of electrical energy into other forms

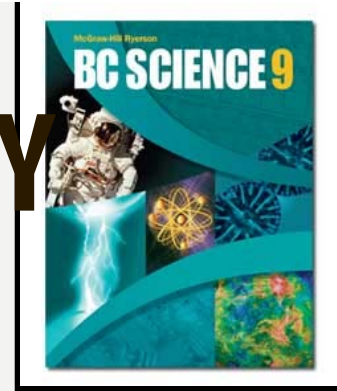
Calculating Power and Energy Consumption

- $\text{Power} = \text{Voltage} \times \text{Current}$
- $\text{Energy} = \text{Power} \times \text{Time}$
- Therefore, if you know the voltage a device is connected to, and how much current flows in it, you can calculate the power of the device. Knowing how long the device is used allows you to calculate how much energy it consumes.



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PAYING FOR ELECTRICITY



A Larger Unit for Energy

- A joule is a very small amount, so the energy supplied to the home is usually calculated in much bigger units
- Instead of using watts - kilowatts are used
- Instead of using seconds - hours are used
- The company keeps track of **kilowatt•hours**

Paying Your Power Bill

- When the power company has determined how many kilowatt•hours you have used, they then bill you by multiplying how much you have used by the cost per kW•h
- The power company keeps track of your energy usage by reading your electric meter



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