

14.3 Power Supplies

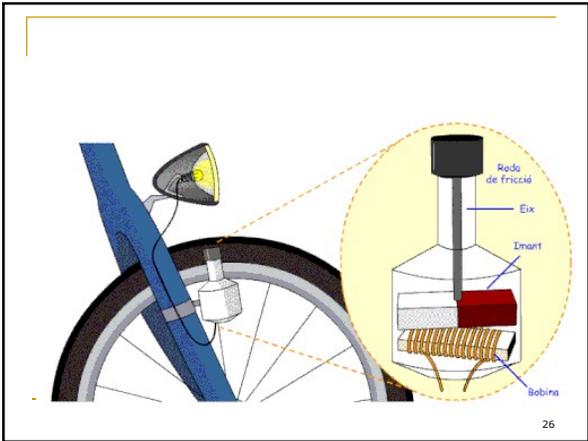
- Provide the energy to cause current to move through a circuit.
- Two types of current:
 - DC = Direct Current
 - Electrons move continuously in one direction.
 - Can be stored.
 - Eg. battery
 - AC = Alternating Current
 - Electrons move back and forth.
 - Easier to transport.
 - Eg. Output at outlets




Please Write

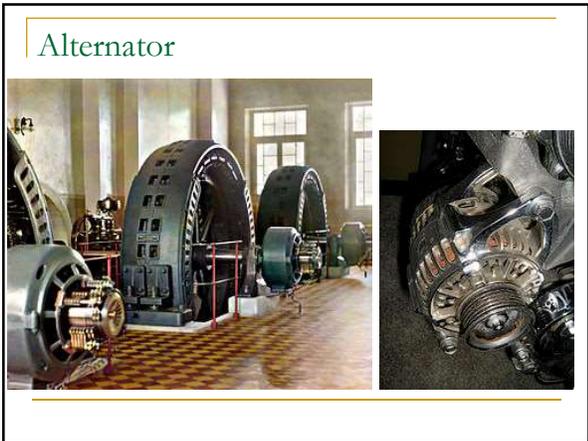
Power supply Symbols please add to table.

Component:	Symbol	Function
■ Battery		Power Supply
■ Alternating current AC		Power Supply
■ Direct current DC		Power Supply
■ Outlet		Power Supply
■ Photoelectric Cell Solar cell		Power Supply



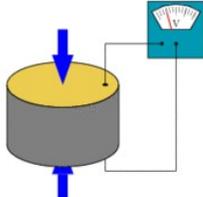
AC electrical generators Please Write

- Turns mechanical energy into electrical energy.
 - Makes AC current!
 - Using a rotating magnetic field with a stationary armature
 - Or I am an armature → 
 - rotating armature with a stationary magnetic field
- Types:
 - Combustion engine = Alternator (in a car)
 - Permanent magnets = Magneto
 - Steam engine (power plant) = Turbo-alternator



- A piezoelectric disc generates a voltage when deformed

Please Write



Symbols for power supplies

please add to table

Component:	Symbol	Function
■ Piezoelectric Crystal		Power Supply
■ Thermocouple		Power Supply

Batteries

0.5V 1V 3V 1.5 1.5

- One cell vs many cells
- How do they work?
 - Transforms chemical energy into electrical energy
- Advantage?
 - Portable
- Disadvantages?
 - Have to be replaced
 - Contain environmental hazards
- Where can you find one?
 - Watch, mp3, remotes etc
 - [link](#)

Please DO NOT Write

Outlets

Please DO NOT Write

- How do they work?
 - AC current is sent from a power plant to the outlets
- Advantage?
 - Stable
 - Long lasting
 - Low environmental effect (depending on source)
- Disadvantages?
 - proximity

Solar Panels

Please DO NOT Write

- How do they work?
 - Transforms light energy into electrical energy
- Advantage?
 - Portable
 - No GHGs
 - Long lasting
- Disadvantages?
 - Depend on sunshine
 - expensive

Please Write

	Advantages	Disadvantages
Battery (chemical E → electrical E)	Portable	Must be replaced Environmental Hazard
Electrical Outlet	Stable source	Close proximity
Photovoltaic cell (sun E → electrical E)	Portable No GHGs Long lasting	Weather dependant Expensive

14.4 Conduction, insulation & protection

P 464 - 468

Conductors: Please Write

- Conduction: is the movement of current.
- Ex:
 - Copper,
 - Aluminum,
 - Silver,
 - optical fibers.
(light is transmitted & then converted into electricity using a photovoltaic cell)

Printed Circuits: Please Write

1. Board = thin plastic sheet.
2. Cover with a thin copper sheet.
3. A circuit is etched in.
4. Extra copper is removed. (by leaching)
5. A plastic top coat is applied.
6. Electric & electronic components are then soldered on.

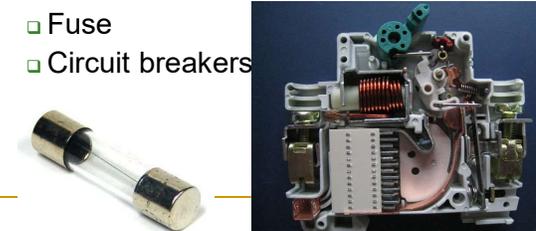
Insulation: Please Write

- Function: to prevent current flow!
- Allows current to stay within the wire and reach its destination.
- Prevents:
 - Injury to people
 - Short circuits
- Ex: Ceramics & plastics



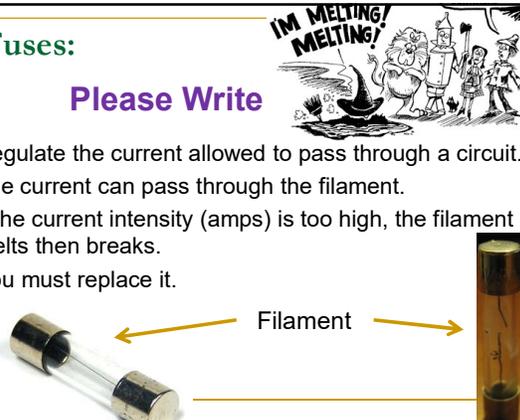
Protection: Please Write

- Components that stop current if there is a short circuit or a power surge.
- Ex:
 - Fuse
 - Circuit breakers



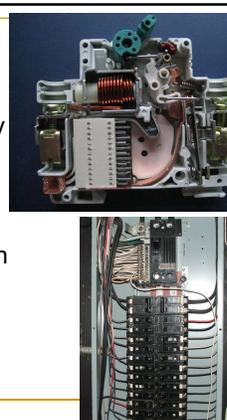
Fuses: Please Write

- Regulate the current allowed to pass through a circuit.
- The current can pass through the filament.
- If the current intensity (amps) is too high, the filament melts then breaks.
- You must replace it.



Breaker Please Write

- How it works:
 1. When the current intensity gets too high....
 2. The bimetallic strip heats up, gets longer & bends.
 3. As it bends the connection is broken and it snaps to the off position.
 4. You then go to your breaker panel and reset the switch to ON.



Component	Symbol	Function
Fuse or Breaker		Protection
Wire		Conduction

Please Write onto table

Please Write

14.5 ELECTRICAL RESISTANCE

- Resistors lower the current flow through a circuit.
- You can add or remove resistors to meet the needs of your components.

- Refer to your Ch5 notes for reading resistors Ω

Component	Symbol	Function
Diode		protects the circuit Guides current flow (turns AC into DC)
Light emitting diode		all of the above + Emits light.

Please Write onto table

Draw a circuit diagram that would work with the following descriptions.

- A flashlight having 1 switch, 1 regular bulb, 1 fuse and using 2 AA batteries (1.5 V each).
- A set of Christmas lights that plug into **6V battery**. They are LEDs and therefore require a resistor. There are 9 LED lights that are set up in parallel (in groups of 3).

14.6 Control

Please Write

- The "Control" function is the ability to open or close a circuit.
 - Closed circuit = has electricity flowing in a loop.
 - Open circuit = does not have electricity flowing (due to an opening in the wires).
- Eg. switches & pushbuttons

Types of Switches

Please Write

- Pole = # of contact points
 - Single-pole** = opens/closes one contact at a time (unipolar)
 - Double-pole** = opens/closes two contacts at a time (bipolar)

Please Write

- Throw = # of paths that the electrons can flow in.
 - Single-throw = electrons may only follow one path (unidirectional)
 - Double-throw = Electrons have a choice of two paths (bidirectional)

Add to table please

Component	Symbol	Function
Single-pole Single-throw switch		Control
Single-pole Double-throw switch		Control
	or	
Double-pole Single-throw switch		Control
Double-pole Double-throw switch		Control

Double double please 😊

Double-pole, double-throw

Double-pole, Single-throw

Examples Please Write

- Rocker Switch
 - Single-pole single-throw
- Toggle switch
 - Single-pole double-throw

Toggle switches can also be single-pole single-throw

Other examples: Please add to table

- Magnetic switch

- Push button **Please add to table**

Please Write

14.7 Energy Transformation

- Changes electrical energy into another form of energy.
- Examples of electrical components that transform electricity:
 - Incandescent bulbs
 - Turns electrical E → **luminous E**
 - Current flows through a tungsten filament, as it resists the current it heats & emits light!
 - Heating element
 - Turns electrical E → **thermal E**
 - Ex: ovens & kettles



Please Write

- Piezoelectric crystals
 - Turns electrical E → **mechanical E** (or sound E)
 - Current causes the crystals to vibrate
 - Ex: watches & speakers
- Electromagnets
 - Turns electrical E → **magnetic E**
 - Current flows through a coil creating a magnetic field
 - Ex:
 - **electromagnets**
 - **motors**



Please Write Title

14.8 Components with other functions

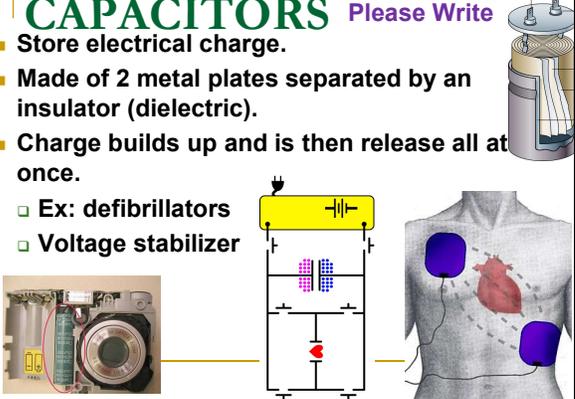
- CAPACITORS
- DIODES
- TRANSISTORS (**AST ONLY**)
- RELAYS (**AST ONLY**)



Please Write

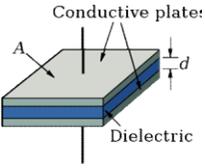
CAPACITORS

- Store electrical charge.
- Made of 2 metal plates separated by an insulator (dielectric).
- Charge builds up and is then release all at once.
 - Ex: defibrillators
 - Voltage stabilizer



How the capacitor works.

- The right plate builds a negative charge.
 - Because it is receiving electrons from the battery.
- The plate on the left builds a positive charge.
 - Because the electrons are going to the battery leave behind a positive charge



- Once the dielectric is pushed out of the way the charge jumps to even itself out.
- High charge in a short period of time.
- [link](#)

Please Write

Diode

- Allows current to flow in one direction.
- Is made of semiconductor material (silicon)
- Roles
 1. Guides the direction of current.
 2. Protects circuits from current flowing the wrong way
 - Someone inserted a battery backwards!
 3. Rectifies current (changes AC to DC)
 4. LED = light emitting diode
 - Visually tells you what way the current is flowing.
 - Emits a lot of light with low voltage.



Component	Symbol	Function
SPEAKER		Energy transformation (electrical → sound)
BUZZER		Energy transformation (electrical → sound)
MOTOR		Energy transformation (electrical → mechanical)
Heating element		Energy transformation (electrical → thermal)

Please Write onto table

Component	Symbol	Function
Light (non LED)		Energy transformation (electrical → luminous)
Resistor		Slows current

Please Write onto table

Please Write

Transistors

- Block or amplify current
- Parts:
 - Collector
 - Emitter
 - Base
- Current goes from the collector to the emitter, through the base
- The base acts as a door
 - It is controlled by a weak current

Please Write

Please Write

Relays

- A relay opens/closes a circuit using an electrical signal from another circuit. The magnetic field closed the switch.

Please Write

Component	Symbol	Function
Capacitor		Stabilizes current (builds charge – defibrillator)
Transistor		Blocks/amplifies current
Relay		Control <i>This relay has a coil from a low-voltage circuit that activates the contact in a high-voltage circuit.</i>

Please Write onto table

Please Write

- The signal can come from:
 - another computer
 - Closing a switch
 - Photoelectric cell (yard light)
- Has 2 parts:
 - Receives signal & sends command
 - Receives command & starts 2nd circuit
- EX:
 - High voltage circuits controlled from a safe distance
 - Theater lighting
 - X-ray machines

Please Write