Electricity and Circuits

Philipp Koehn

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Still Magic?

diagram:
- top of battery
- power wire
- bottom of battery
- light bulb
- ground wire
water
Flow of Water

- Water is stored in bucket
- Gravity pulls water through pipe
- Core concepts
  - water pressure
  - size of the pipe
  - amount of water flow per time unit
More Pressure

- Bucket filled twice as much
- Double water pressure

⇒ Double water flow
Bigger Pipe

- Pipe twice as big
- Twice as much water in pipe

⇒ Double water flow
Electricity

- Electrons are stored in battery

- Electric field pulls electrons through wire

- Core concepts
  - \textit{voltage} = electron pressure
  - \textit{ampere} = size of the pipe
  - \textit{watt} = amount of electrons flow per time unit
  - \textit{watt hour} = amount of electrons

- 1 kWh costs about 10 cents
generating electricity
Water Power

Generator

Stator

Rotor

Shaft

Turbine

Water flow

Wicket gate

Blades
Wind Power
Steam Power
Electric Generator

- Coil
- Slip Ring
- Axle
- Brush
- Wire
- Lamp
- Magnet
- N
- S
- Coil rotated
Right Hand Rule
Creating a Magnetic Field
circuits
Light Bulb

top of battery

power wire

light bulb

ground wire

bottom of battery
Light Bulb with Switch
AND

key D

key E

light

[Diagram of an AND gate circuit with a battery, two keys labeled D and E, and a light bulb]
Electromagnet
Relay
Normally Closed Relay: NOT
gates
Light Bulb with Switch
Relay

top of top battery

light wire

light bulb
electromagnet

bottom power wire

bottom key
electromagnet wire

relay in dashed box
**AND Gate**

- **Symbol:**

![AND gate diagram](image)

- **Key A**
- **Input wire A**
- **Key B**
- **Input wire B**
- **Key D**
- **Key E**
- **Output wire C**
- **Light**

**Diagram:**

- AND gate in dashed box
- Key D
- Key E
- Light
- Output wire C
- Input wire A
- Input wire B
- Key A
- Key B
OR Gate

Symbol:

OR gate in dashed box

key D

light

output wire C

key E

input wire B

key B

input wire A

key A
NOT Gate

Symbol:

Diagram:

Not gate in dashed box

Key A
Input wire A

Key D
Output wire C

Light