



SCHOOL OF THE WEST

Electronics

First module: DC electronics basics

Chapter 1: Introduction

Concepts

Glossary

- **Energy** is the ability to do work, like heating a room or moving an object. It cannot be created or destroyed, but it can be transformed.
- **Electricity** is a form of energy that consists of moving electrons.
- **Circuit** is a path between two or more points where electricity passes through.
- **Power** in physics is the amount of energy in an unit of time.

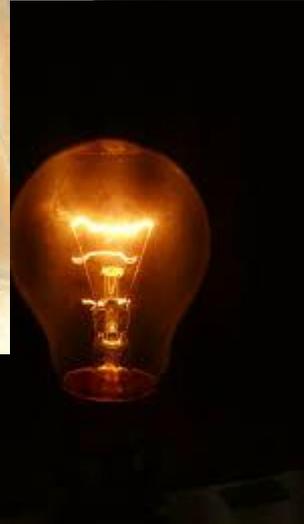
Electricity

- Electricity is a force of nature like gravity. It is related to magnetism, so we often call it electromagnetic force.
- Westernkind has learned to produce and use it. That is the science and technology of electronics.
- It is used as a way to transport energy, to then be transformed.



Uses of electricity - Examples at home

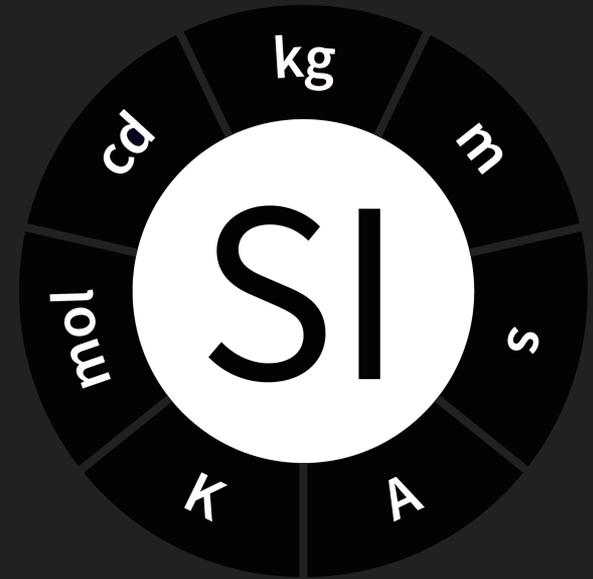
- Produce heat
 - Electric heating, electric oven or kitchen...
- Produce light (any wavelength)
 - Light bulb, screens, WIFI, TV, radio, flashlight...
- Produce angular movement
 - Washing Machine, refrigerator, fan, electric car...
- Detect changes or react to actions
 - Button, house alarm, camera...
- Run programs and do calculations
 - Clock, computer, mobile phone...
- Many more things! Can you think of some?



Math & Physics review

Review: SI (International system)

Symbol	Name	Quantity
s	second	time
m	metre	length
kg	kilogram	mass
A	ampere	electric current
K	kelvin	temperature
mol	mole	amount of substance
cd	candela	luminous intensity



Review: metric system

tera	T	1000000 000000	10^{12}
giga	G	1000000 000	10^9
mega	M	1000000	10^6
kilo	k	1000	10^3
hecto	h	100	10^2
deca	da	10	10^1

deci	d	0.1	10^{-1}
centi	c	0.01	10^{-2}
milli	m	0.001	10^{-3}
micro	μ	0.000001	10^{-6}
nano	n	0.000000 001	10^{-9}
pico	p	0.000000 000001	10^{-12}

Review: convert units

- Example: we know a wire is 80 inches long, and we need to calculate its electric resistance. The electric resistance formula works with meters, not with inches. How do we proceed?
- Convert 80 inches to meters. We know 1 inch is 2.54 centimeters, and we know 1 meter is 100 centimeters.

$$80 \text{ in} * \frac{2.54 \text{ cm}}{1 \text{ in}} * \frac{1 \text{ m}}{100 \text{ cm}} = 2.032 \text{ m}$$

Review: tolerance

- When you leave theory and get into practise, you will notice that most measures are not exact. For example, an 8 volt battery may actually provide 8.01 volts or 7.99 volts.
- There is a way to express these margins of error, called tolerance. For example, a tolerance of $\pm 10\%$ means the value can be 10% lower or higher than the stated value.
- To the example of the battery above, we need to calculate 10% of 8, which is 0.8. Therefore, we can say the battery will provide a value between 7.2 and 8.8 volts.

Review: formulas and equations

- Working with electronics you will need to use formulas, and often transform them to get the value you need.
- For example, we have the formula $A = B * C / D$
- If you have the values for B, C and D, you can get A
- But what if you have A, B and D? Can you get C from them?

$$A = B * \frac{C}{D} \quad \left| \quad \frac{A}{B} = \frac{C}{D} \quad \left| \quad D * \frac{A}{B} = C \right. \right.$$



SCHOOL OF THE WEST

Next lesson

Chapter 2: Basic Circuit