

Electromagnets

1. Voltage and resistance

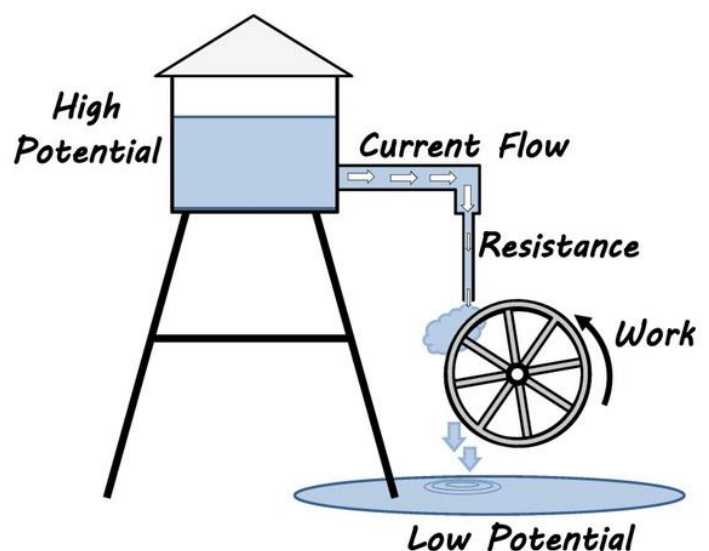
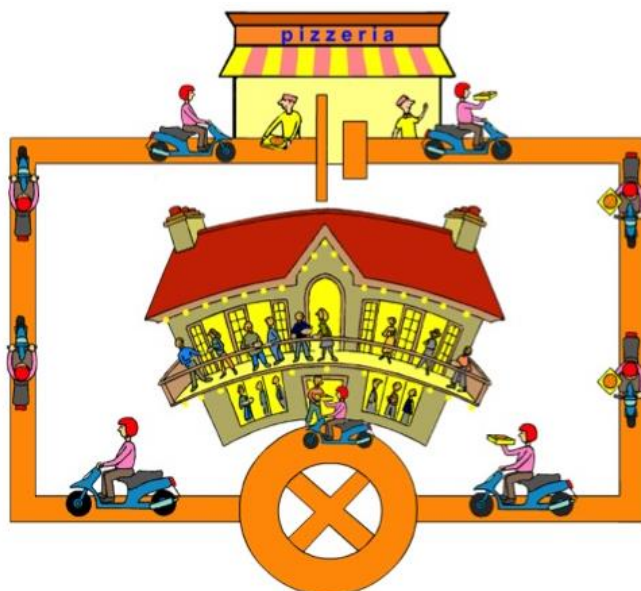
CONCEPT 1

ELECTRIC CIRCUITS

NOTES

Firstly, you know more than you think from Primary school - <https://www.bbc.com/bitesize/topics/zj44jxs>

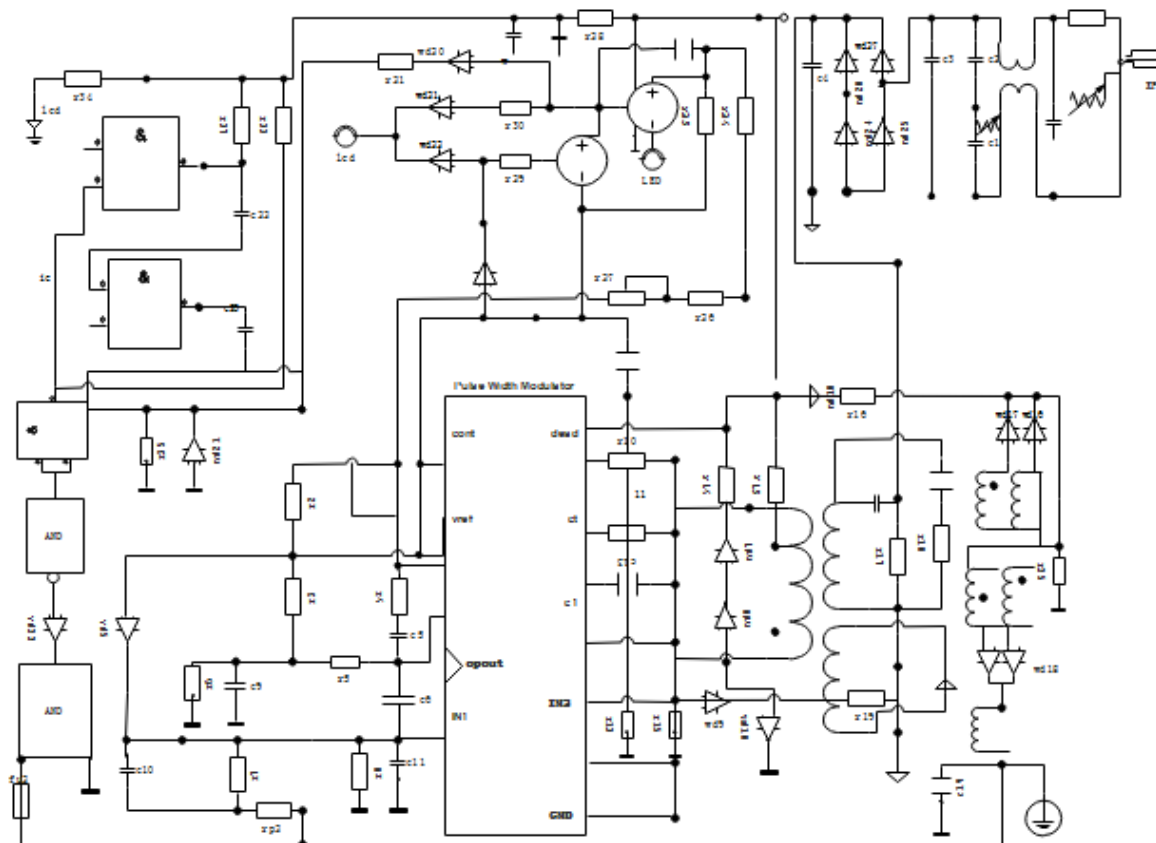
This lesson is a fundamental part of your understanding of Voltage and Resistance and in the future, current. A model allows us to visualise something that we cannot normally see (but often can see the effects of, for example the wind – you can see the tree leaves move). Models are good at explaining some things, but would be flawed at explaining others. The classic models of how electrical circuits work would include a pizza delivery model and a water system model (see below):



These models are poor at explaining the concepts of voltage and resistance, as it implies some 'stuff' is used up and that there are waste products. A much better model of electricity is the rope model promoted by the IOP (detailed in the next section).

Things to remember are:

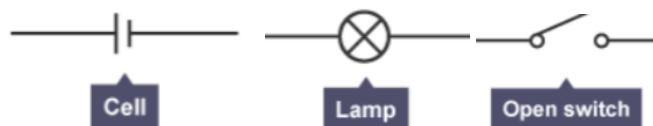
1. Electrons do not get used up.
2. Electrons do not whiz out of one end of the cell and deposit themselves in the components.
3. Energy is the thing that best describes what flows around a circuit.
4. Voltage is the 'push' that moves the energy around the circuit and is measured in voltage. This is analogous to a football on a hill – it will roll down the hill due to the potential (gravitational) difference.
5. Resistance is the ability of a component to resist the flow of energy and is measure in Ohms.



The next important thing to do is to get them actively engaged with circuits – so give them access to some basic components (1 cell, wires and two bulbs) and ask them to build a working circuit that would light to bulbs as bright as they can. They might come up with some strange ideas.

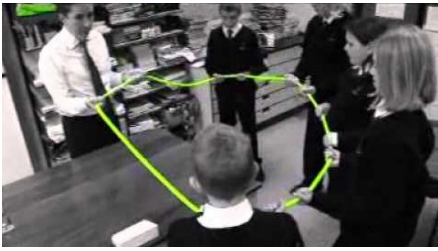
Then ask them to sketch the circuit in their book – they will undoubtable draw what they see using the skills from Art. Then display the correct diagram on the board using the key basic symbols defining what they are (see below). You should also ask the question “Why do we use symbols?” for which there are multiple answers – breaks any language barrier, saves space and makes it efficient, stops different looking components from being mistaken for something else etc.

Then get them to redraw the circuit using the symbols you have shown them:



The next stage of this lesson is to get them to explain how the circuit works – by evaluating models of ways of thinking about electricity. This is done by explaining each model and guiding the class in the evaluation process, for example the water model shows that (through compression of a liquid) as the pump/water tower tap is turned on, the whole system starts to work. But the model doesn't help when you think about there being a hole in the pipe and water leaking – this doesn't happen is you cut wire, the energy flows or it doesn't.

Demo of the rope model: - Follow this link for good questions and answers - <https://spark.iop.org/rope-loop-electric-circuit-model>



As an activity they should choose one of the models presented and evaluate it with a picture of the model one page of their book. They could then think of their own model and evaluate this or evaluate the rope model.

As a plenary they could go around with some post-it notes used to evaluate the model evaluations – things they might have missed or things they explained well.

<https://www.youtube.com/watch?v=UcCHRW8G9yY> – Gallery music for those of us old enough.