


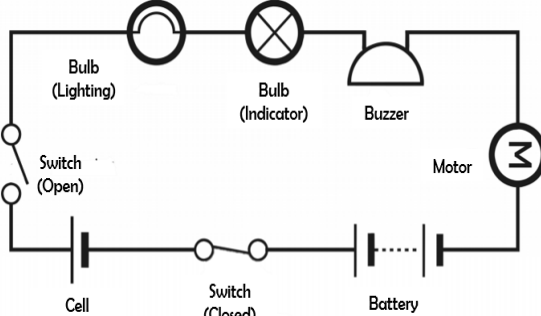
⚡ YR 4 D.T: ELECTRICAL SYSTEMS KNOWLEDGE ORGANISER ⚡

Overview


More Complex Switches and Circuits

Electricity is a type of energy. It is used to power lots of things


- Electricity can flow through circuits. A circuit is the path the electric current follows. It must have no breaks in it (a closed circuit) for electricity to flow. The symbols for different objects in electrical circuits are shown on the right.
- The electricity flowing through a circuit is known as the current. It can be used to power an output device.
- Switches can be positioned so that electrical currents can flow through them (closed switch) or cannot flow through them (open switch). This alters the way that output devices function.
- In a series circuit, two output devices are controlled by one switch. In a parallel circuit, two output devices can be controlled separately by switches.
- Switches can be used alongside control boxes, to set up timed systems (e.g. traffic lights) and monitoring systems (e.g. alarms).


Research and Examples



Thomas Edison



Traffic Lights



Burglar Alarm

-Thomas Edison was a famous American inventor, who is best known for inventing the domestic lightbulb and the electrical power system that enables them to work. He investigated new materials for filament that allowed immediate and long-lasting lighting. He also invented safety fuses and on/ off switches for light sockets.

-The most basic types of traffic lights work on a timer system (e.g. giving a minute of green light in each direction) to ensure that there is a consistent flow of traffic in all directions. This works best in places where there is a consistently busy flow of traffic. In some quieter areas, sensor-based traffic signals use monitoring to detect when there are vehicles. Sometimes this is done with 'inductive loop' systems (a coil in the ground that detects the weight of a car), or sometimes with LDR or video camera systems.

-Burglar alarms are another example of a monitoring system. They generally work using micro-switch, LDR, laser, or video camera systems, and can be controlled to act in certain ways (e.g. sounding a buzzer) via a control box.

Designing

-You need to think about who your product is for – what is its purpose and who is going to use it?

-Consider which type of circuits you will need to use.

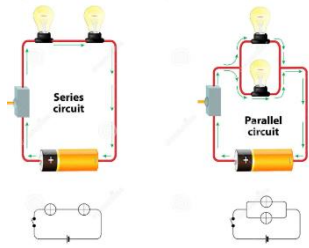
-In a series circuit, there is only one path which the electricity follows. The electricity flows from the input source, around one path (on which the components are positioned) and returns to complete a closed circuit.

-In a parallel circuit, the components are positioned on different branches of the wire. If one component breaks or becomes disconnected, the other components can still work.

-Consider which type of circuits you will need to use.

-Micro-switch: a small switch that is extremely sensitive to motion, used in automatic monitoring systems. -Reed Switch: a switch that it operated by a magnet. -Light Dependent Resistors: operates when light is shined on it. As the light increases, the resistance of the device decreases. -Push-to-Make Switch: on when switch is pressed – Push-to-Break Switch: off when the switch is pressed. – Tilt Switch: A switch that works when held at angle. – Toggle Switch: works when a lever is pressed.

In designing you should be able to sketch and annotate different ideas, and should also be able to create either a making checklist, a storyboard, or a flowchart.



Key Vocabulary

Series Circuit

Parallel Circuit

Input/ Output Devices

Control Boxes

Timed Systems

Monitoring Systems

Micro-switch

Light Dependent Resister (LDR)

Push-to-break/make Switches

Reed Switch

Tilt Switch


Making

Making

-In addition to the making skills that you used throughout your electrical systems DT topics in lower KS2, you also need to learn how to write a sequence of instructions using a control program.

-This 'control language' or flowchart enables the system to act in a particular way e.g. when a switch is pressed.

-You will develop an understanding of using standalone/ interface control boxes.



Example control program

```

graph TD
    Start([Start]) --> Input{Is Input 1 on}
    Input -- No --> Start
    Input -- Yes --> Output1[/Turn Output 1 on/]
    Output1 --> Delay[Delay 8]
    Delay --> Output2[/Turn Output 1 off/]
    Output2 --> Start
        
```

Evaluating


-How well does your electrical system work? Does it work as planned?

-Does it meet its purpose?

-What would your audience think about your product? What would they like about it? What would they not like?

-What type of switch did you choose to use? Why? What are the pros and cons of this type of switch?

-What instructions did you input into your control box? How did this work? What could you still improve about your product? How would you do things differently next time?



Health and Safety

-Remove any jewellery and tie back long hair. Wear an apron.

-Do not put fingers or objects in outlets.

-Never use anything with a plug, wire or cord around water.

Keep metal objects away from electrical heat sources – e.g. knife away from toaster.

Never pull a plug out by its cord.

Follow electrical signs and guidance carefully.

Return all equipment to the correct zoned areas of the classroom/ workshop.

Remember that electricity can cause burns, shocks, serious injury & even death.

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