THE STRIVING

MUSLIM ACADEMY

Islamic and Academic Education

SCIENCE PROJECTS FOR CHILDREN AND PARENTS

Robots and Machines

Eight builds that light up, buzz, lift, grip and move

WHAT IS INSIDE

- Your first circuit
- Steady hand buzzer game
- Nail electromagnet
- Balloon-powered car
- Syringe hydraulic arm
- Cardboard gripper claw
- Scribble robot
- Bristlebot

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Ages 6 to 12, done together with a grown-up

Written for a parent teaching at home. No training assumed, and nothing else to buy.

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ROBOTS AND MACHINES

For the grown-up

This book has eight projects. Each one builds a small machine that lights up, makes a sound or moves, and each one shows one idea about electricity, forces or machines.

Read the whole project before you start and gather everything on the materials list. The steps marked for the grown-up are jobs only you do: cutting with knives, sharp points, stripping wire and handling coin batteries.

Most things come from a supermarket, stationery shop, pharmacy or hardware shop. LEDs, small motors, vibration motors, buzzers and battery holders come from a small electronics shop or hobby shop. You can also take a motor or buzzer out of an old broken toy, with its batteries removed first.

Let your child do as much of the building as they safely can. When something does not work, such as a loose wire or an LED the wrong way round, solve it together. Ask: what did you see? Why do you think it happened? What could we change?

Coin batteries need special care. Fit them yourself, keep them away from babies and young children, and put them away as soon as the project is finished.

Some projects say 7 to 12 because they need careful timing, small parts or steady winding. Younger children can still join in, with the grown-up doing more of the steps.

Some builds in this book, like the gripper claw and the hydraulic arm, are machines you work by hand. The scribble robot and the bristlebot have a motor and move by themselves once they are switched on, so in this book we call those robots.

Start with Know your parts and A circuit must be a complete loop. In each electric project, ask your child to find the loop: follow it from the battery, through the part, and back to the battery.

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Lab rules for every project

- A grown-up is with you for every project.
- Read all the steps before you start.
- Only a grown-up handles coin batteries, cuts with a knife and strips wire.
- Use batteries only. Never use mains electricity or a wall socket.
- Never join the + and - ends of a battery with only a wire. The one exception is the nail electromagnet, where the grown-up switches it on for no more than 5 seconds at a time.
- If anything gets hot, switch off or have the grown-up take the battery out, and tell a grown-up.
- Never put anything in your mouth, and never taste anything.
- Take the batteries out when you finish.
- Tidy up and wash your hands at the end.

The projects

1. Your first circuit
2. Steady hand buzzer game
3. Nail electromagnet
4. Balloon-powered car
5. Syringe hydraulic arm
6. Cardboard gripper claw
7. Scribble robot
8. Bristlebot

Share your builds

Send us a photo of each finished build, showing the build only and no faces: by email to strivingmuslimacademy@gmail.com, through our website at strivingmuslimacademy.com/share.html, or with the WhatsApp code on the last page. We add them to our Achievement Wall, and your child can choose any one material from our shop at 50% off.

Know your parts

LED: a tiny light. LED is short for light-emitting diode.

An LED gives out light when electricity flows through it.

A diode lets electricity flow in only one direction, so an LED works only one way round.

Look at your LED: one leg is longer than the other. In this book the long leg always goes to the + side of the battery. If an LED does not light, turn it round.

Battery: look at the two ends of your battery and find the one marked +. Look at an AA battery: it is long and thin. Look at a coin battery: it is small and flat.

On a coin battery, the main body is the + end and the small cap on the other side is the - end.

Look for the + mark on your coin battery: that side goes to +.

Switch: a part that opens or closes a gap in the loop.

Motor: a part that turns round when electricity flows through it. Inside a motor there are loops of wire in a magnetic field.

Buzzer: a part that makes a buzzing sound when electricity flows through it. Join its red wire to the + side and its black wire to the - side.

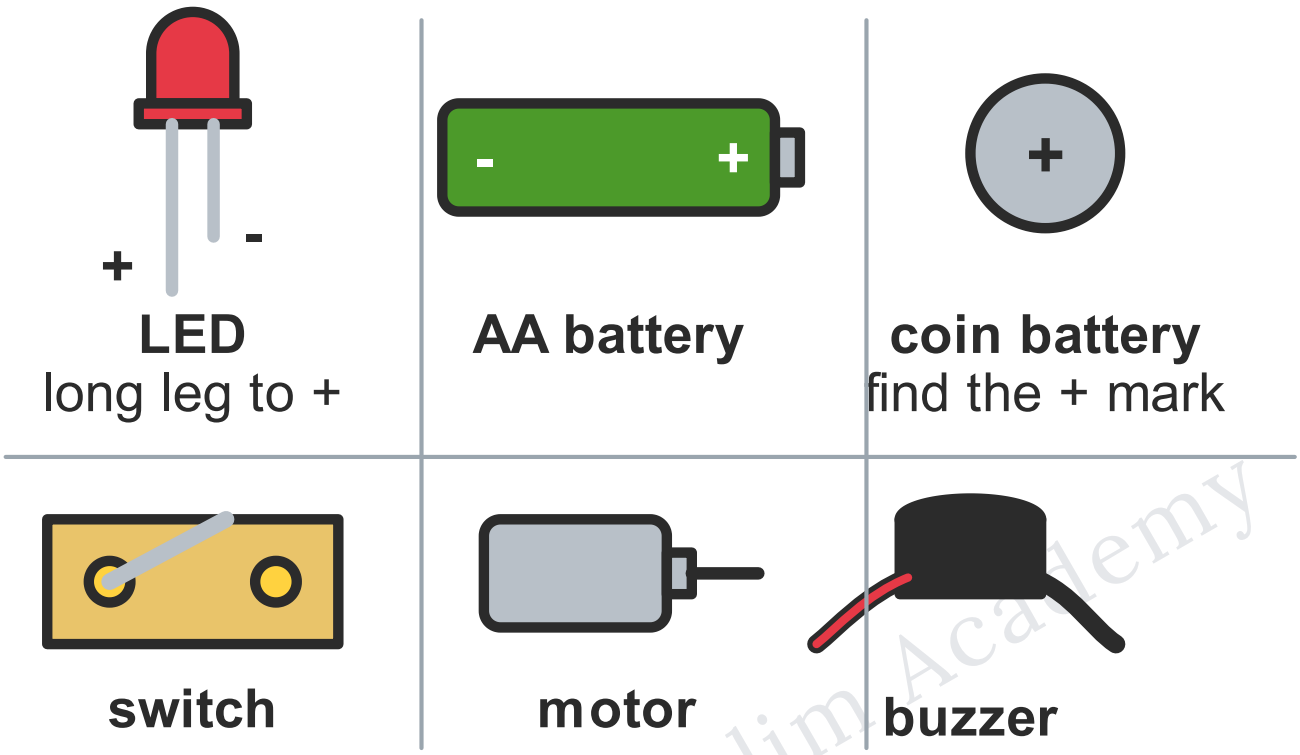
Wire: metals let electricity move through them easily, so the metal inside a wire carries the electricity.

Plastic and rubber are insulators: they do not let electricity through.

So the grown-up takes the plastic coat off the ends of a wire before it is joined.

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A circuit must be a complete loop

Electricity flows round a closed path of wires that joins a part, such as a buzzer, to both ends of a battery.

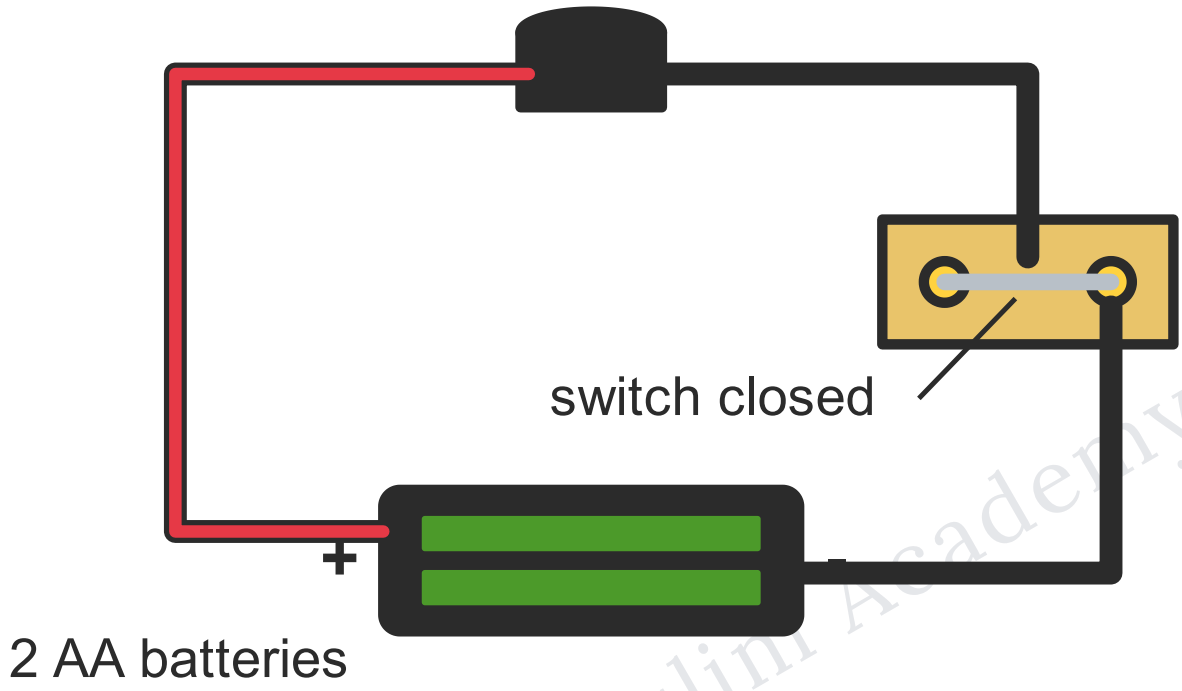
Follow the loop in the drawing with your finger: start at one end of the battery, go through the wires, the buzzer and the switch, and come back to the other end.

Now open the switch, or unhook one wire, and watch. Then close it again and watch. Write down what happens each time.

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a complete loop: the buzzer sounds



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