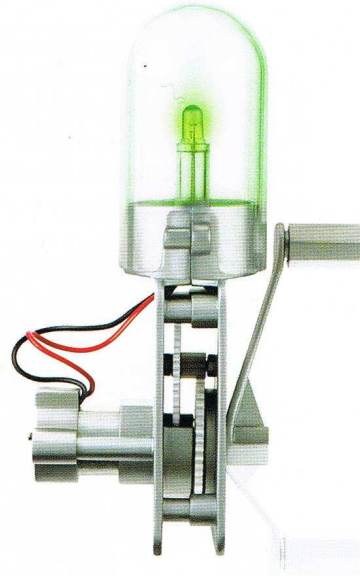


**GREEN SCIENCE**

# DYNAMO TORCH

Turn a simple toy motor into a generator that converts hand motion into electrical energy and powers a light bulb. No battery, no pollution, just amazement. The generator could be used as an awesome emergency torch. **Caution: High Voltage Inspiration and Fun!**

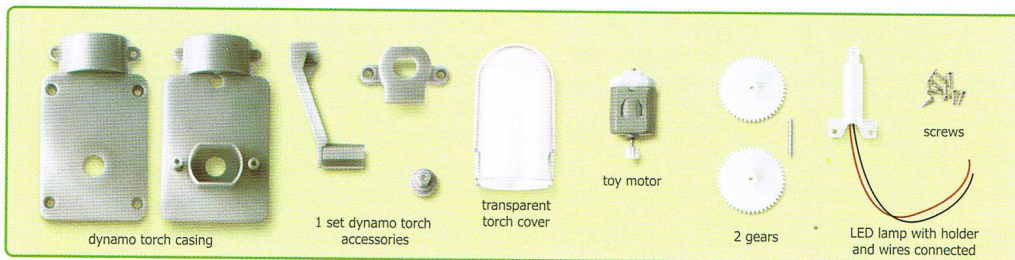
**WARNING:**  
**CHOKING HAZARD - Small parts.**   
Not for Children under 3 years.



## A. BEFORE YOU START

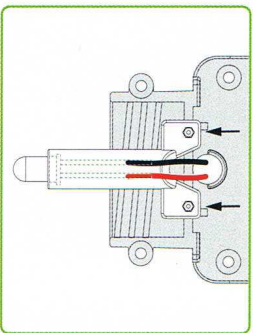
1. Please read all instructions before you begin.
2. Adult assistance and supervision is recommended.
3. The kit is intended for children ages over 8.
4. This kit and its finished products contain small parts which may pose a choking hazard. Keep away from children under 3 years old.
5. Do not connect any of the parts provided to any AC wall socket or batteries. This may cause electric shock or a short circuit.

## B. CONTENTS



1 LED lamp with holder and wires connected, 1 toy motor, 2 gears, 1 set dynamo torch casing accessories (assembly required), 1 transparent torch cover, screws, detailed assembly instructions with fun facts. (Pocket screw driver, for cross head screws, required from home; please ask an adult for assistance.)

- 1 Affix the Light Emitting Diode (LED) to the torch casing and gently thread the wires through the holes as shown in the Torch Assembly Diagram.

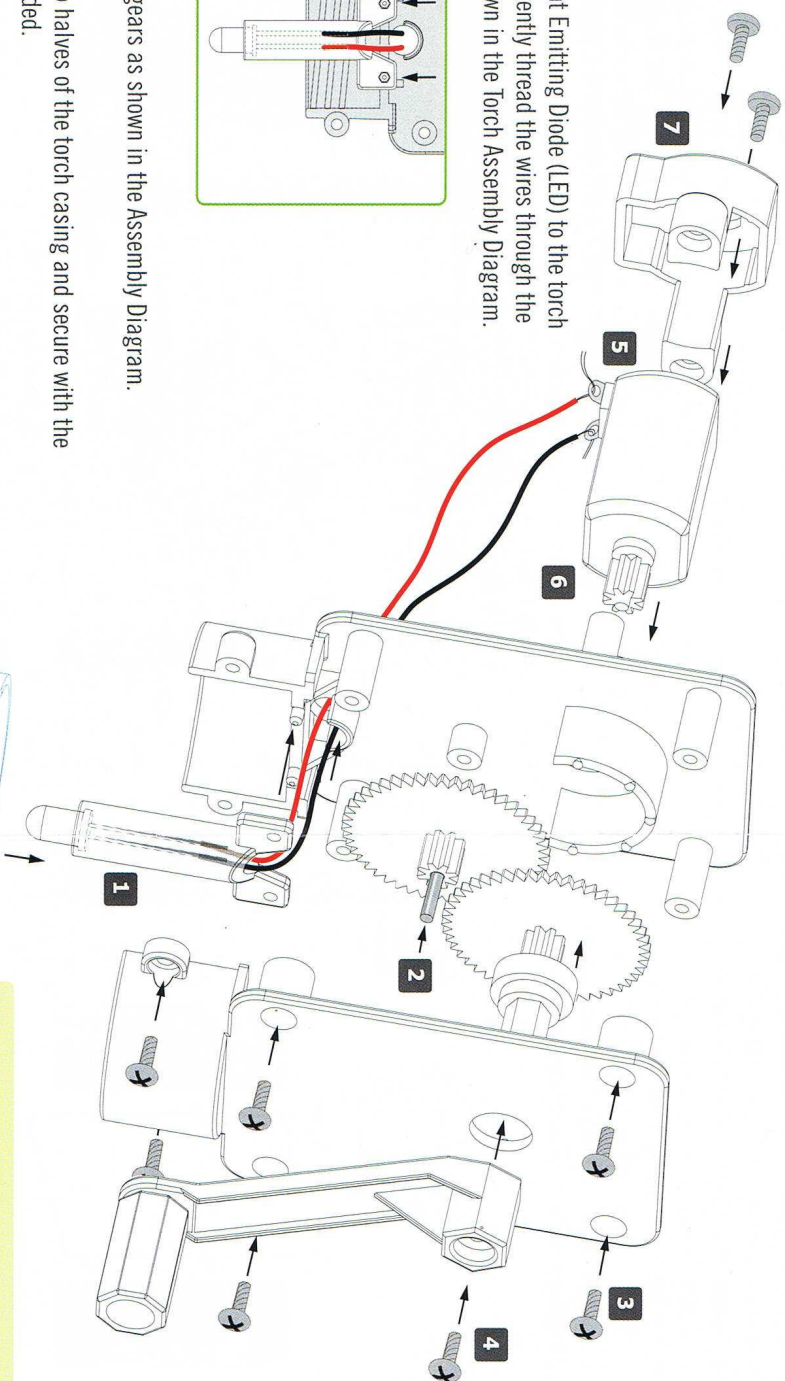
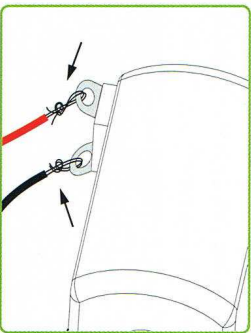


- 2 Install both gears as shown in the Assembly Diagram.

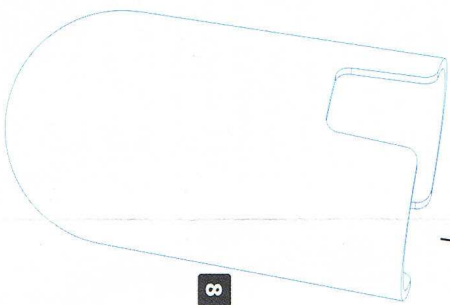
- 3 Align the two halves of the torch casing and secure with the screws provided.

- 4 Attach the crank handle to the torch casing.

- 5 Connect the wires to the motor as indicated. Follow the position for different coloured wires as indicated in the diagram. Thread the metal ends of the wires through the holes of the metallic plates protruding from the motor. Gently twist the wire ends to secure the connection.



8



**TROUBLE SHOOTING:**

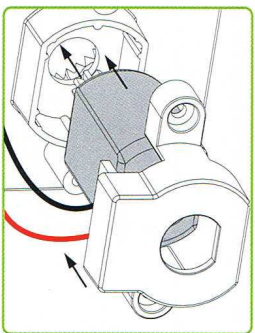
1. If the crank could not be turned smoothly, add some grease to the gears as lubricants. Most cooking oil from the kitchen will serve the purpose. Ask an adult for assistance. You may also loosen the screws at the 4 corners of the casing. Turn the crank until the gears move smoothly, then gently tighten the screws again.

2. If your torch does not light up

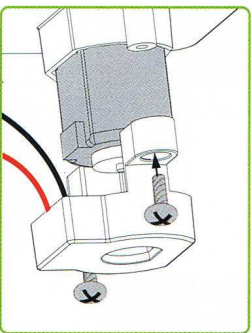
- Check that all connections are intact.  
 - Try reversing the turning direction, if the lamp lights up again, the wires to the motor have not been connected in the correct position. You may remove the motor cover and reposition the wires; or you could leave it as it is; however, you need to turn in this reverse direction when you want to light up the torch.

- 6 Insert the end of the motor into the torch casing as shown.

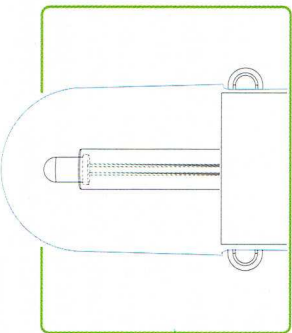
**NOTE:** To avoid having to disassemble the torch, take a moment to turn the crank clockwise and verify that the LED illuminates. If the light does not come on, verify that the wires are correctly attached to the motor, and that you are turning the crank in a clockwise direction.



- 7 Using 2 screws, secure the motor by aligning the cover to the base.



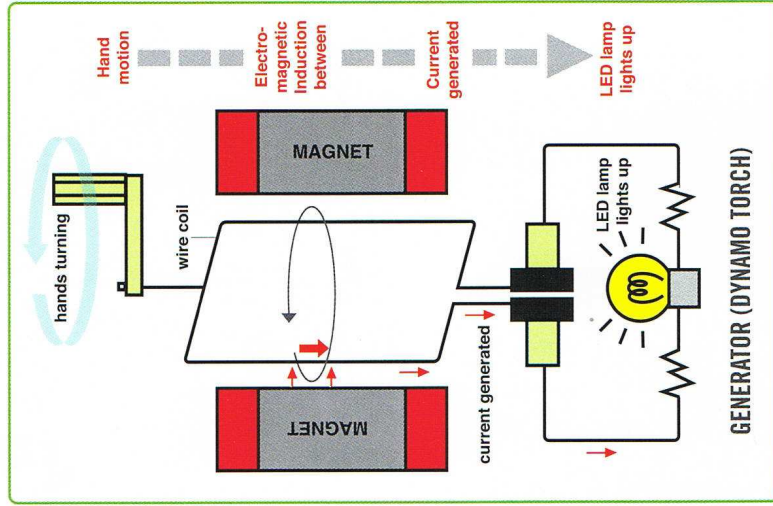
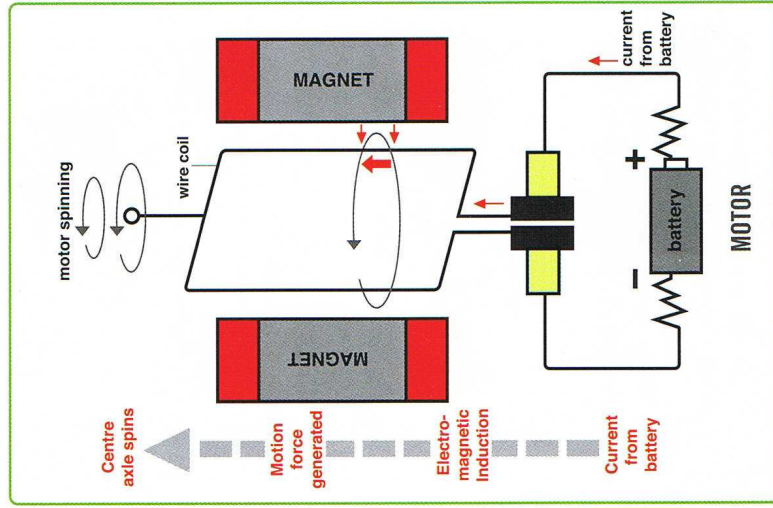
- 8 Cover the LED with the transparent cover. Press gently until it fixes into place. Your very own Dynamo Torch is complete. Turn the crank in a clockwise direction and the torch will light up.



## D. FUN FACTS

### 1. How does a motor work like a generator?

Michael Faraday is not well known to a lot of people today, but his work as a scientist in the 1800's was really remarkable. His experiments with electricity and magnets, eventually led him to the invention of the electric motor. He continued his work for many years and began to experiment with different methods to create electricity. He figured out that by passing a magnet through loops of wire, (or by moving a coil against a magnet) he could generate a current! With the toy motor we used in this kit, wires are coiled around the center axle. There are two magnets placed at the inside wall of the motor casing. When we turn the crank, the center axle spins, and a current is produced, which is strong enough to light up the LED lamp. We refer to this as electromagnetic induction, which is the basis of a generator! While today's generators are much more powerful than those Faraday created, the basic theory is still the same, and the source of power for your dynamo torch!



### 2. Clean Energy!

By using your arm (physically power) to repeatedly turn the handle, you can turn the light on, over and over again. The problem is that your arm would get awfully tired if you had to use it to keep that light lit all night! Most generators today use fossil fuel e.g. petroleum to power a fast spinning turbine to generate electricity. However, the use of fossil fuel releases carbon dioxide which is hazardous to the environment. And they will be used up one day too. That's why scientists across the world are experimenting with different renewable energy sources, like wind, sunshine (solar power), and water (hydropower). The electricity YOU generated to light your torch is also one example of renewable energy! Renewable energy doesn't run out and it doesn't

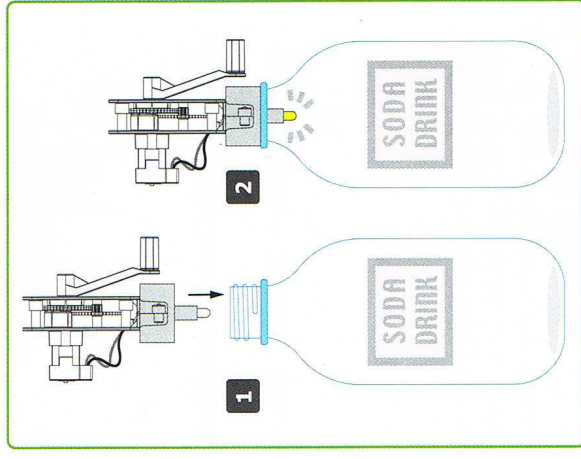
We have taken great steps to use these renewable sources: wind turbines (like giant windmills) are used in several countries and provide energy to millions of homes and businesses. Hydropower is used in many countries as well - in the United States, the Grand Coulee Dam produces enough energy to provide power to more than 2 million homes!

However, some of these sources of energy are only available some of the time (you can't get solar energy on a cloudy, rainy day, or at night, and we can't always count on the wind blowing hard enough to power our mills). Scientist's haven't figured out how to store the energy in a way that is inexpensive and reliable. The search of a new, reliable and clean energy source is still continuing. Do you have any suggestion?

Millions of used batteries are dumped every day. They contain toxic materials and are hazardous to our environment. Your dynamo torch is a unique Green Energy lighting device. It requires no batteries and could be used anytime, anywhere, and forever. It is an ideal project for any science fair, and a great way to show and tell others how electricity is generated. It is a cool science gadget for any sleeper or camping gathering. It makes a good emergency torch to be put in the car boot, -an ideal gift for your dad!

### 3. Recycle!

Around the world, millions of plastic drink bottles are wasted everyday. It takes a long time for the Earth to disintegrate the plastic materials and this has caused serious environmental problems. Help save our environment by recycling one of them to make something interesting. Your Dynamo Torch has a specially designed screw cap which fits most plastic bottle openings. Simply remove the original transparent torch cover. Screw the plastic bottle to your dynamo torch. A super cool dynamo bottle is made! You can decorate the bottle body with your own designs. You can also fill the bottle one third full of water. Turn on your torch and watch the light reflected in the water. It's fun.



There are many other ways you can help to recycle a plastic bottle. Here are a few quick projects you can try. **Vortex in a Bottle** - Fill 1/2 bottle with vegetable oil, fill the remainder of the bottle with water. Add several drops of food coloring and pour in glitter. Place a few drops of

glue on the cap and secure tightly. Shake the bottle and watch as the vortex spirals up and down the bottle. **Yarn Holder** - To keep yarn from tangling, cut the bottom of a bottle and insert yarn. Pull the strand of yarn through the top opening then tape bottom back on using duct tape. The bottle keeps the yarn from getting tangled. **Make a Bank** - Are you saving up for something special? Why not use a pop bottle to save that change? Have an adult cut a rectangular hole in the top portion of the bottle. Tear different color tissue paper in small pieces and glue them onto the bottle until it is completely covered. Mix a little water with the glue and paint over the tissue paper (this will make the paper more transparent). When your bank is full, have an adult cut it open for you! **Door Stop** - Need a door stop? Nothing could be easier! Simply fill a large

