

# DYNAMO CIRCUIT

GREEN SCIENCE

TO PARENTS: PLEASE READ THROUGH THESE INSTRUCTIONS BEFORE GIVING GUIDANCE TO YOUR CHILDREN.

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

### A. SAFETY MESSAGES

1. This kit is intended for children aged 8 years and up.
2. We recommend constant adult supervision.
3. The wires and metal plates must not be inserted into socket outlets.
4. This kit and its finished product contain small parts which may cause choking if misused. Keep away from children under 3 years old.

### B. CONTENTS

ENGINE MOTOR COMPONENTS:				
C1. Motor housing set x 1	C2. Motor x 1	C3. Red and black wire x 1	C4. Motor pulley wheel x 1	C5. Screw x 2

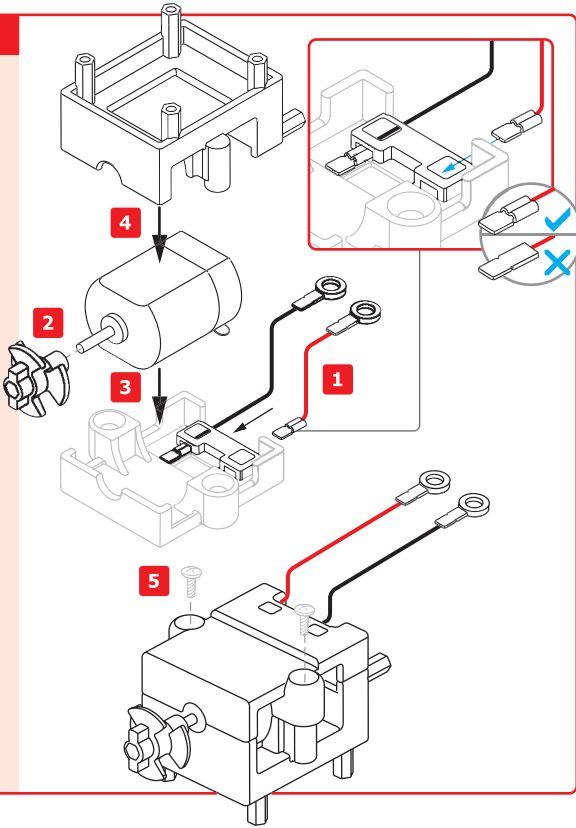
DYNAMO GENERATOR COMPONENTS:						
D1. Case top and base set x 1	D2. Handle cover set x 1	D3. Winding crank set x 1	D4. Motor with gear and wires x 1	D5. Gear cover x 1	D6. Gear wheel x 3	
				D7. Washer screw x 1	D8. Screw x 8	D9. Spindle x 3

COMPONENTS FOR ACTIVITIES E TO I:					
E1. Base plate x 1	E2. Propeller x 1	E3. LED with wire x 1	E4. Wheel x 3	E5. Wheel with pulley x 1	
E6. Axle x 2	E7. Bottle holder x 1	E8. Wire connector x 1	E9. Propeller holder x 1	E10. Terminal cap x 2	E11. Elastic band x 1

Also required but not provided in this kit: a clean plastic beverage bottle, some string, a small crosshead screwdriver.

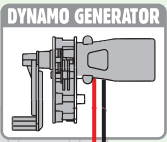
### C. ASSEMBLING THE ENGINE MOTOR

1. Select the motor housing set (C1), and the red and black wires (C3). Turn over the motor housing top. Insert the metal plate end (with the flat side facing downwards) of the red and black wires into the slots in the motor housing top. The end of the plates should touch the ridge across the underside of the plate.
2. Push the motor pulley wheel (C4) onto the axle of the motor.
3. Place the motor onto the motor housing top, with the metal plate of the motor touching the metal plate connected to the red and black wires.
4. Place the housing base, with the base pins facing upwards, onto the motor.
5. Tightly press together the housing base and top, and then turn them over. Secure the housing with two screws. Ensure that it is tight enough to keep the red and black wires from sliding out.

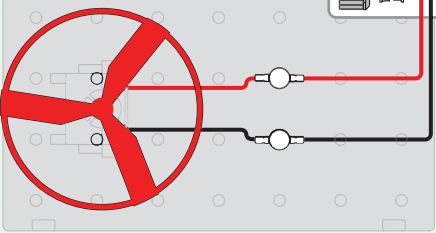


### E. ACTIVITY 1: DYNAMO FLYING PROPELLER

1. Push the pins situated in the end of the engine motor into the base plate (E1), with the motor pulley wheel facing upwards.
2. Fit the propeller (E2) onto the end of the motor pulley wheel. The propeller should sit loosely on the wheel.
3. Select a terminal cap (E10). Place the metal ring of the red wire from the engine motor, and the metal ring of the red wire from the dynamo onto the pin of the terminal cap. Push the terminal cap into a hole in the base plate. Repeat this step to connect the black wires.
4. Rapidly turn the winding crank, which will make the propeller spin for a few seconds, and then fly up into the air.



#### CIRCUIT DIAGRAM



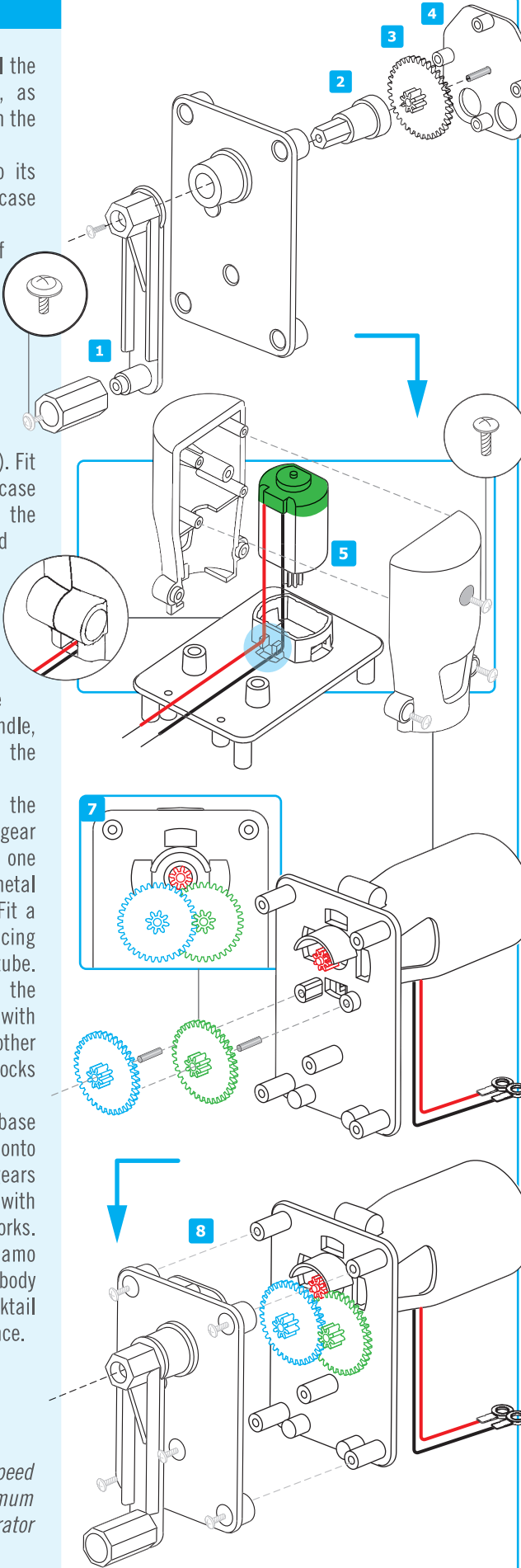
### Questions & Comments

We value you as a customer and your satisfaction with this product is important to us. If you have comments or questions, or you find any part of this kit missing or defective, please do not hesitate to contact our distributor in your country. You will find the address printed on the package. You are also welcome to contact our Marketing Support Team: Email: infodesk@4m-ind.com, Fax (852) 25911566, Tel: (852) 28936241, Web site: WWW.4M-IND.COM

### D. ASSEMBLING THE DYNAMO GENERATOR

1. Select the winding crank set (D3). Install the rotating knob on one end of the crank, as demonstrated in the diagram. Secure it with the washer screw (D7).
2. Push the other end of the crank onto its spindle through the hole of the dynamo case base (D1). Secure it with a screw.
3. Insert a gear wheel (D6) into the spindle of the winding crank. The small gear fits inside the crank. Insert a metal spindle (D9) into the centre hole of the gear wheel.
4. Put the gear cover (D5) over the gear wheel (it will only fit when oriented properly). Now reserve this section of the dynamo for later use.
5. Select the motor with gear and wires (D4). Fit it into the housing on the top of the dynamo case (D1), with the wires facing towards the terminals. The gear wheel should extend through to the underside of the base.
6. Install the handle covers (D2), ensuring that the cover with a screw hole is on your right when looking from the back. Once the two handle halves are snapped together, the motor wires should emerge through the opening in the centre of the handle, leading towards the terminals. Fasten the handle covers with three screws (D8).
7. Turn over to look at the other side of the generator casing cover. Near the dynamo gear wheel, there are two short tubes, with one slightly longer than the other. Fit the two metal spindles into the two holes in the tubes. Fit a gear wheel (D6), with the smaller gear facing upwards, onto the spindle in the shorter tube. Ensure that the large gear interlocks with the motor's gear. Fit the other gear wheel, also with the small gear facing upwards, onto the other spindle. Ensure that the large gear interlocks with the small gear on the first gear wheel.
8. Next, carefully place the generator base structure assembled during steps 1 to 4 onto the cover casing, ensuring that all gears properly fit together. Secure the casing top with five screws. Next, check that the gear box works. Gently turn the crank and check that the dynamo gears spin. Lubricate the gears with some body lotion or cooking oil, applied using a cocktail stick. This will improve generator performance.

Remarks: Please use the normal winding speed of 1 cycle per second to achieve optimum performance. Please do not wind the generator too fast, as this could damage the gears.



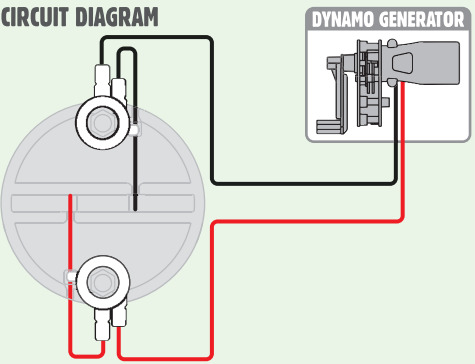
Caution: Be certain that you are in an open space when playing with the Flying Propeller. Be aware of your surroundings and avoid hitting anyone with the propeller.



E. ACTIVITY 2 - DYNAMO TORCH

1. Hold the bottle holder (E7) upside down. Insert the wires of the LED (E3) into the holes of the bottle holder. Push the legs of the LED into the slots inside the holder.
2. On the underside of the bottle holder there are slots for the wires. Push the red and black wires into the slots, as shown in the diagram.
3. Place the metal ring of the red wire from the LED, as well as the metal ring of the red wire from the dynamo, onto a pin on the bottle holder. Repeat this step to connect the black wires on the next pin. Push the wire connector (E8) onto the pins of the bottle holder to secure the wiring connection.
4. Insert the legs of the wire connector into the dynamo case top.
5. Push the neck of a clean plastic bottle into the bottle holder. The LED must be inside the bottle.
6. Turn the winding crank to make the torch light up. If the LED doesn't light up, turn the crank the other way. Turning the crank at different speeds can adjust the brightness. (Note: do not turn the crank too fast, as too much power might make the LED burn out.)

CIRCUIT DIAGRAM



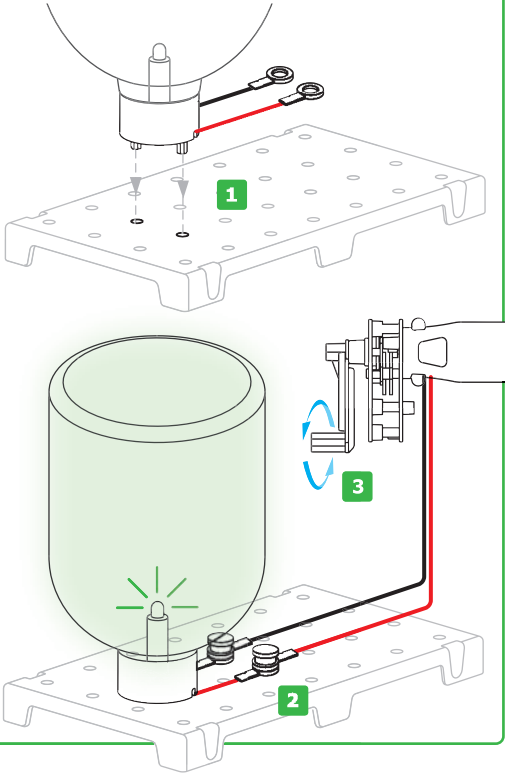
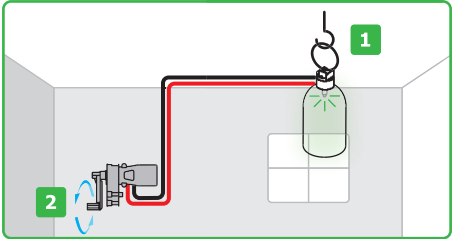
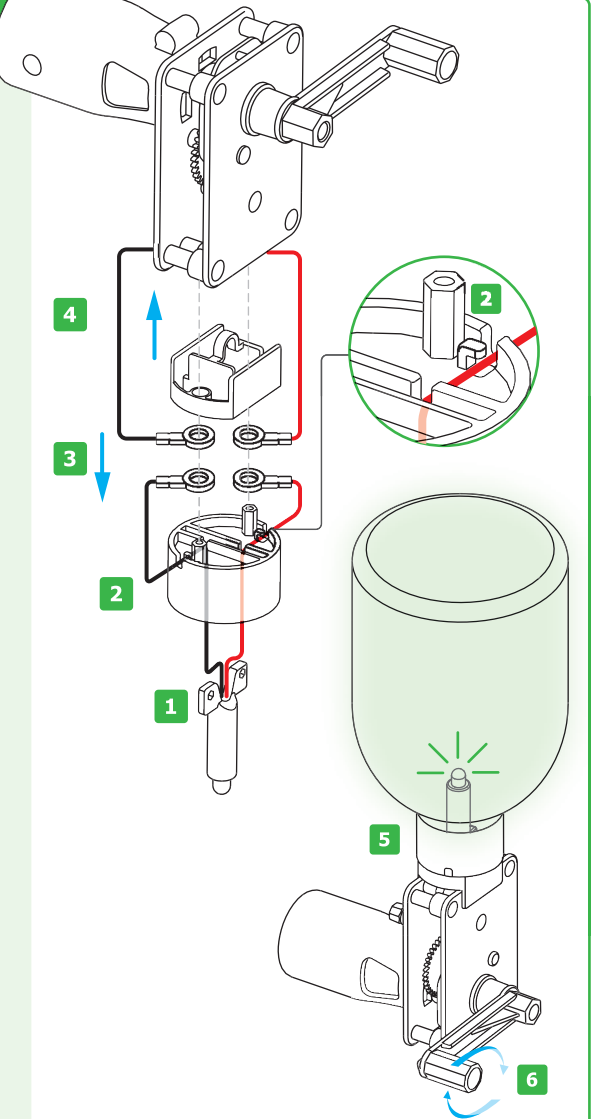
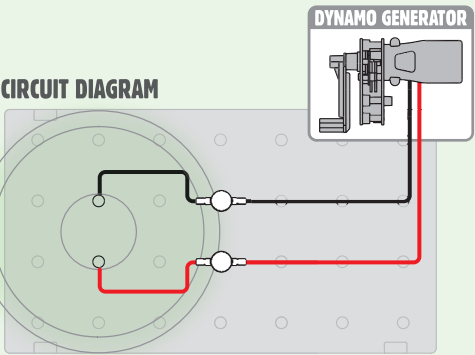
Dynamo Light Bulb Assembly Instructions:

1. Thread a string through the inverted U-shaped structure in the centre of the wire connector (E8), and tie a knot.
2. Hang it up. Turn the winding crank to power the Light Bulb.

Dynamo Desk Lamp Assembly Instructions:

1. Push the bottle holder base pins into the base plate.
2. Using the terminal caps, connect the two red wires and the two black wires from the dynamo and LED.
3. Turn the winding crank on the dynamo to make the Desk Lamp light up.

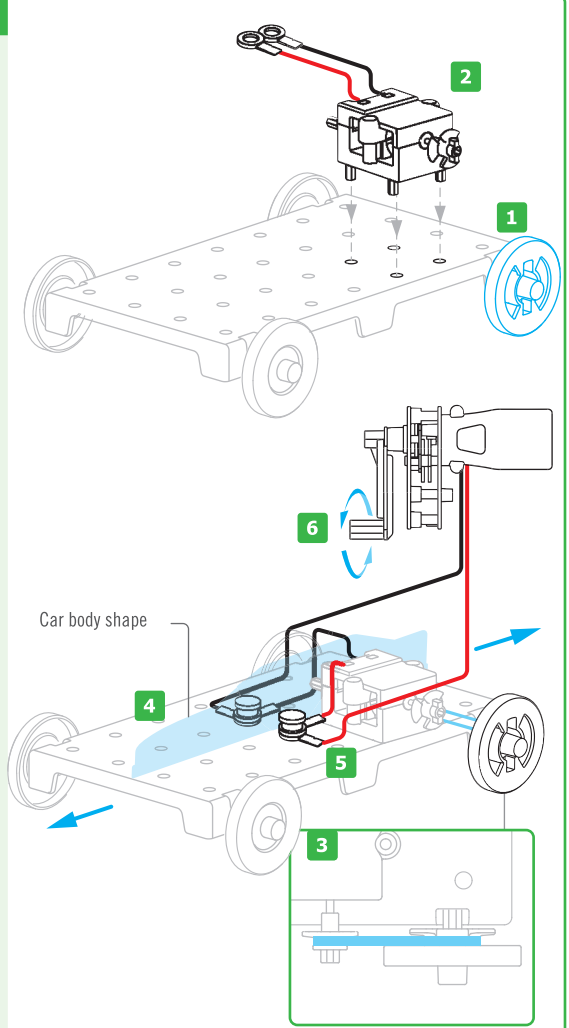
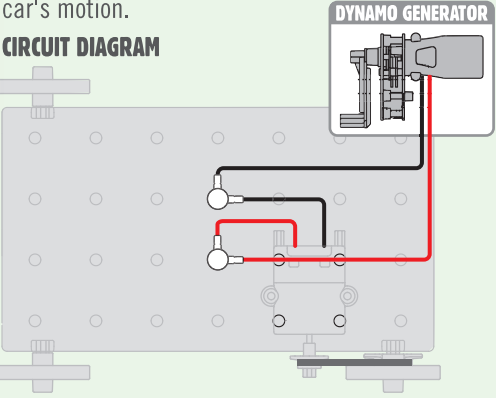
CIRCUIT DIAGRAM



H. ACTIVITY 4 - DYNAMO CAR

1. Make use of the chassis assembled in Activity 3. Locate the special wheel (E5) with a pulley on its inner side.
2. Install the engine motor with the motor pulley wheel (C4) facing outwards, at the second and third row of holes from the end of the base plate (E1), as shown.
3. Stretch an elastic band around the motor pulley wheel and the pulley on the special wheel.
4. Gently pop out the car body shape from the side of the box. Slide the base pins of the engine motor into the body shape holes.
5. Using the terminal caps, connect the two red wires and the two black wires from the dynamo and the engine motor.
6. Rapidly turn the winding crank to make the motor turn. The car should move forward or backward. Turn the other way to reverse the car's motion.

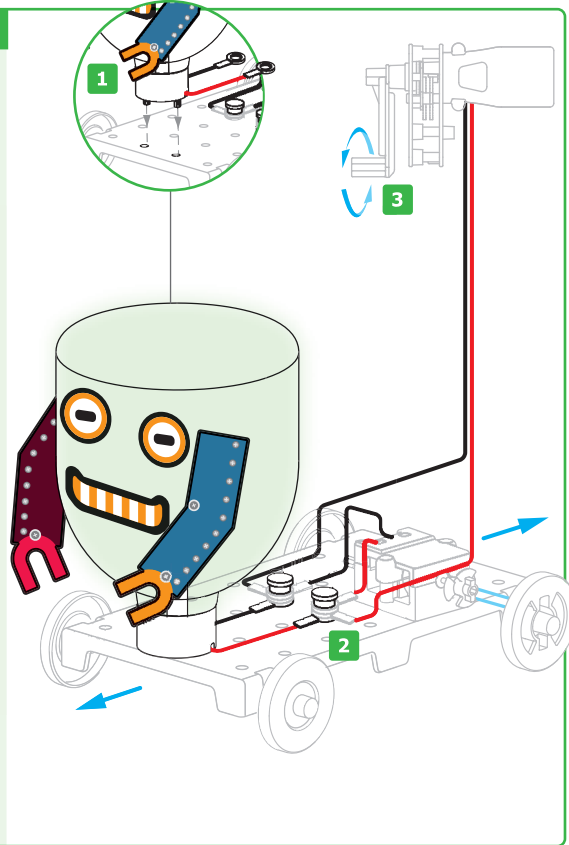
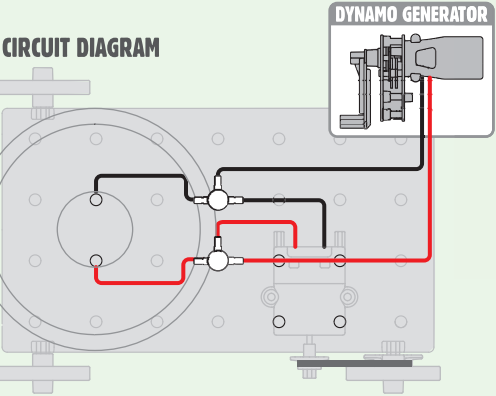
CIRCUIT DIAGRAM



I. ACTIVITY 5 - DYNAMO ROBOT

1. Make use of the chassis assembled in Activity 4. Remove the car body shape. Remove the shapes from the side of the box and use them to decorate a used, clean bottle so as to resemble a robot. Push the pins on the bottle holder (E7) into the base plate (E1).
2. Using the terminal caps, connect the red and black wires from the dynamo, LED and the engine motor, as shown in the diagram.
3. Rapidly turn the winding crank to light up your robot and move it forward and backward.

CIRCUIT DIAGRAM



J. TROUBLESHOOTING

If the engine motor does not turn when you turn the crank:

- Check that all wires are properly connected inside the dynamo and engine motor, as well as on the base plate (E1).

If the Dynamo Flying Propeller does not fly upwards:

- Check that all wires are properly connected.
- Check whether the propeller (E2) is installed too tightly on the motor pulley wheel.
- Try turning the crank the other way.
- Be sure to include a brief pause as you wind the dynamo crank.

If the LED does not light:

- Check that the wires are properly connected.
- Try turning the crank the other way.

If the Dynamo Propeller Racer does not move:

- Check that the wires are properly connected.
- Ensure that you have pushed the propeller holder (E9) onto the motor pulley wheel (C4).
- Ensure that you are turning the dynamo crank fast enough.

If the Dynamo Car and Dynamo Robot do not move:

- Check that the wiring has been done correctly.
- Ensure that the rubber band is stretched around the pulley wheels of the motor and the special wheel.
- Check that the engine motor is properly positioned.

K. HOW IT WORKS

The dynamo contains coils of wire mounted on a spinning rod, and magnets in a fixed position inside the case. When you turn the crank, the coils turn, but the magnets don't move. Since this makes electricity flow through the wires in the coils, the dynamo's function is to produce electricity. A motor contains the same components as a dynamo, but they work in the opposite way. Electricity flowing in the coils between the magnets produces a force that turns the coils.

L. FUN FACTS

- A generator is a device that turns mechanical energy into electrical energy.
- The generator was invented in the 1830s by Michael Faraday.
- A dynamo is a generator that produces direct current (DC). Direct current always flows in one direction.
- In a power station, huge generators turn mechanical energy into electrical energy for use in our homes, offices and factories.
- Cars have generators that are turned by the engine to make electricity for the car's lights and other electrical equipment.

G. ACTIVITY 3 - DYNAMO PROPELLER RACER

1. Push the propeller holder (E9) onto the motor pulley wheel (C4).
2. Install the engine motor with the motor pulley wheel facing outwards, as shown.
3. Push the propeller (E2) onto the propeller holder.
4. Slide the two axles (E6) into the slots under the ends of the base plate (E1). Push the wheels (E4 & E5) onto the axle ends.
5. Using the terminal caps, connect the two red wires and the two black wires from the dynamo and the engine motor.
6. Rapidly turn the winding crank to spin the propeller and move the Racer forward and backward. Turn the other way to reverse the Racer's motion.

CIRCUIT DIAGRAM

