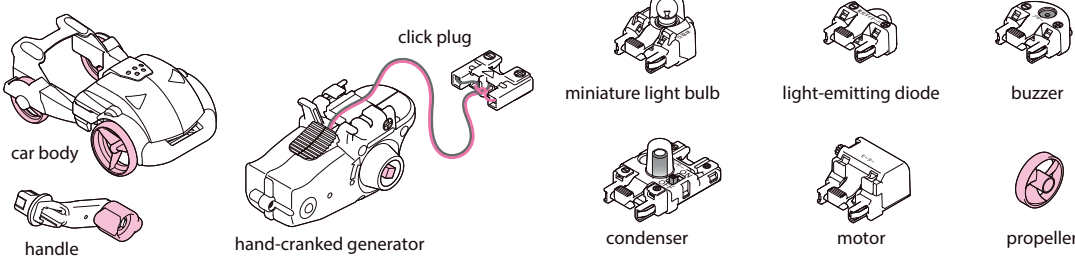


Note

- Please read the instructions carefully before experimenting
- Do not use a power supply for this material
- Do not use this material for any purpose other than experiments
- Do not store too much electricity in the condenser. If too much electricity builds up, it may break, so please stop storing electricity after the power storage notification light comes on
- Do not use a generator other than the one included in the set
- Do not use the generator for products or parts other than the set
- Do not look directly into the light of the light-emitting diode
- Do not hold the buzzer close to your ear
- Do not turn the hand-powered generator too fast when shining a miniature light bulb or light-emitting diode. It may cause the bulb to blow out
- Do not disassemble or modify the hand-powered generator
- Do not drop or otherwise subject the hand-powered generator or condenser to strong shocks
- Do not turn the hand-cranked generator too fast when reversing the flow of electricity to the light-emitting diode and buzzer
- Please run the condenser car or power generator in a safe and wide area where no vehicles can pass by

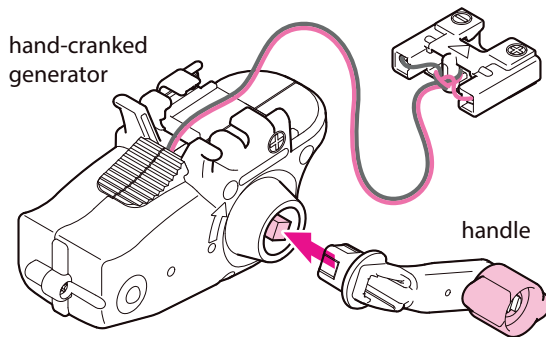
Let's get ready for the experiment.

\*Make sure you have everything you need before you start.

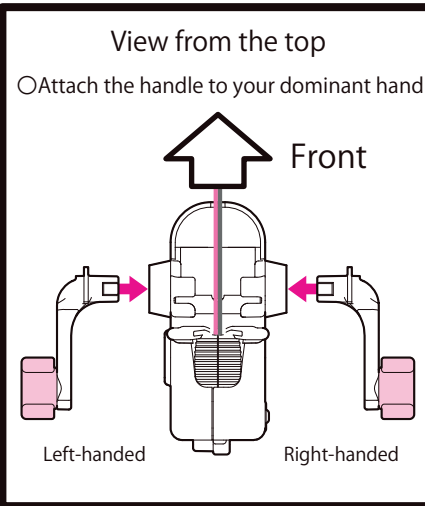


Preparation A  
Preparing the hand-powered generator

○Attach the handle to the hand-powered generator



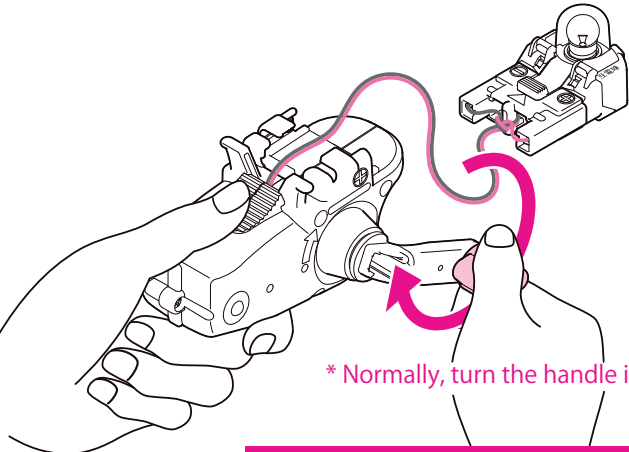
\* Insert it in.



How to hold and use the hand-powered generator

○When you turn the handle of a hand-powered generator; you can make electricity.

○When the direction of the handle changes, the current direction also changes, so decide which way to turn the handle.



\*Please do not turn the hand-cranked generator too fast, stop it abruptly, or forcibly turn it. This can cause the gears to become damaged.

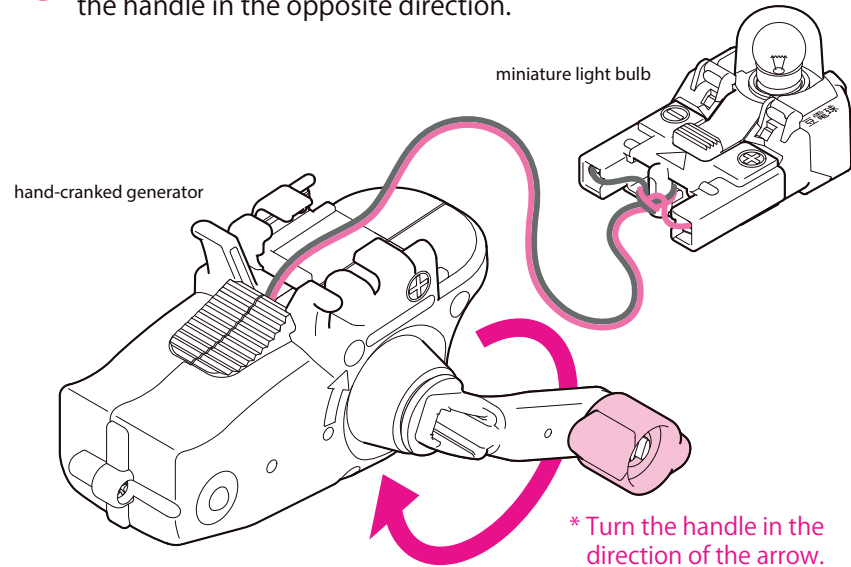
\* Normally, turn the handle in the direction of the arrow.

Do not use this other than experimental purposes

## Experiment 1: Produce electricity with a hand-cranked generator. Let's make electricity

### Power generation experiments

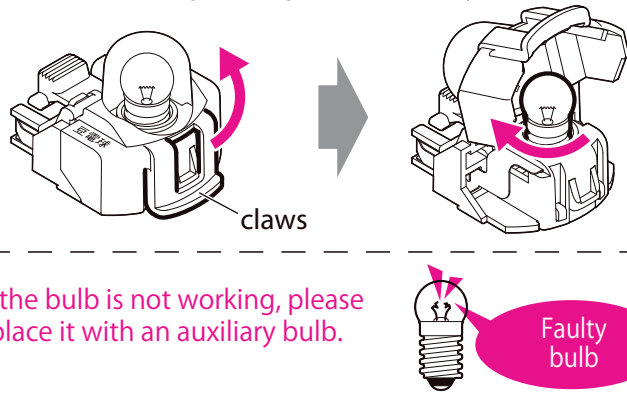
- 1 Attach a miniature bulb to the hand-powered generator and slowly turn the handle.
- 2 Turn the handle fast and check if there is a difference in how the miniature bulb shines.
- 3 Find out what happens to the miniature bulb when you turn the handle in the opposite direction.



\* Turn the handle in the direction of the arrow.

#### When miniature light bulb does not light up

Pull the claws to open the cover and turn the bulb inside to the right to tighten it securely.

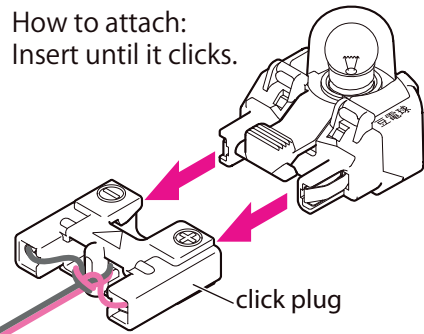


\*If the bulb is not working, please replace it with an auxiliary bulb.

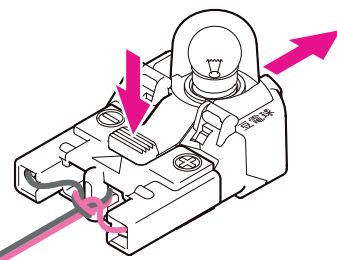
Faulty bulb

#### How to use click plug

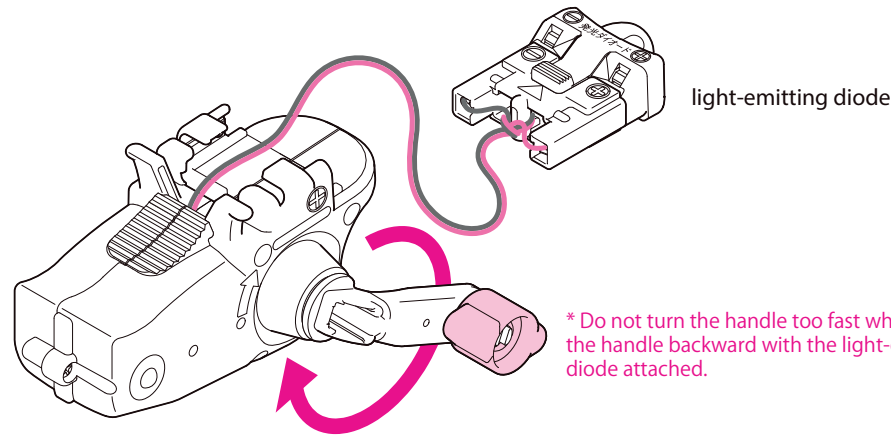
How to attach:  
Insert until it clicks.



How to remove:  
Push and pull



- 4 Replace the light bulb with a light-emitting diode and try turning the handle in the same way. Compare the difference in response to turning the handle with the light-emitting diodes. (If it is difficult to see the difference in response, switch the light-emitting diode and bulb several times) If you turn the handle quickly, check if there is a difference in how the light-emitting diode shines.
- 5 Find out if the light-emitting diodes glow differently when the handle is turned faster.
- 6 Find out what happens to the light-emitting diode when you turn the handle in the opposite direction.

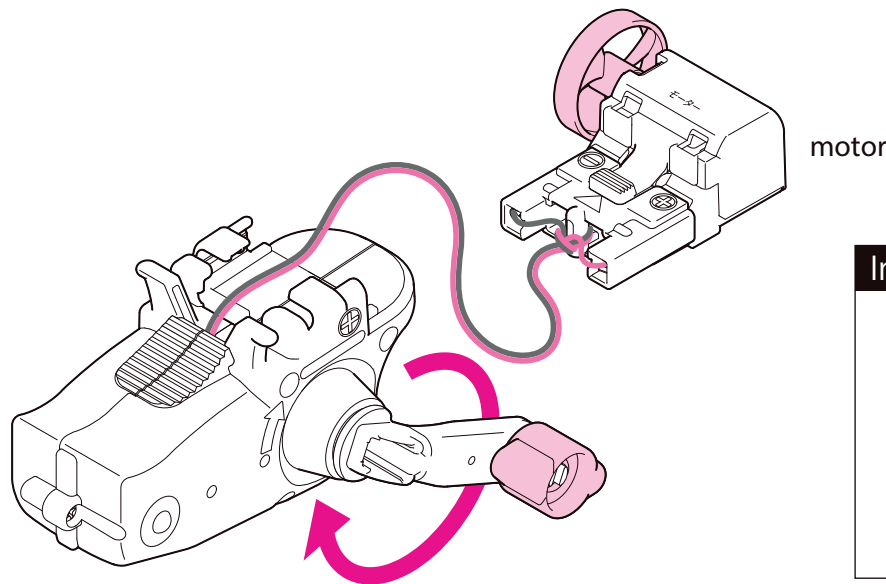


\* Do not turn the handle too fast when turning the handle backward with the light-emitting diode attached.

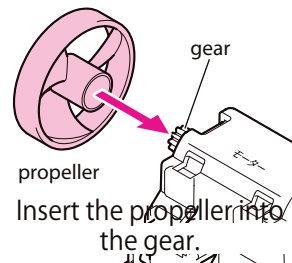
\* Do not turn the hand-powered generator too fast. It may cause the miniature bulb or light-emitting diode to burn out.

Do not look at the light from light emitting diode from the front. It may hurt your eyes.

- 7 Switch to a motor and try turning the handle in the same way. Compare the feeling of turning the handle with that of a miniature bulb.
- 8 Turn the handle faster to find out if there is a difference in rotation.
- 9 Turn the handle backward to find out if there is a difference in rotation.

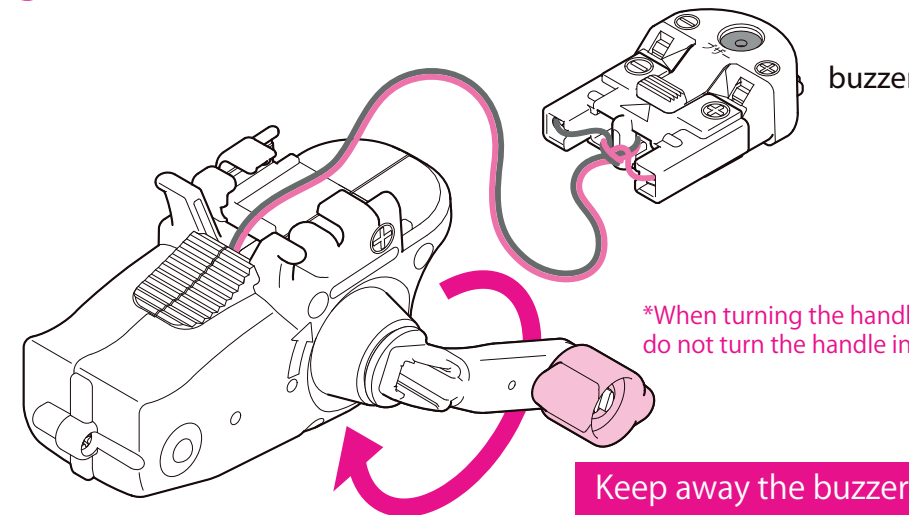


#### Installing the propeller



Insert the propeller into the gear.

- 10 Replace it with a buzzer and turn the handle in the same way.
- 11 Turn the handle fast and see if there is a difference in sound.
- 12 Find out what happens to the buzzer when you turn the handle backward.



\*When turning the handle with the buzzer on, do not turn the handle in the opposite direction.

Keep away the buzzer from your ears

### Let's summarize the results of experiment 1 in the table below.

	miniature light bulb	light-emitting diode	motor	buzzer
Response to turning				
When turning slowly				
When turning fast				
When turned in the opposite direction				

☆Write the words in brackets ( ) about power generation.

- If you generate electricity slowly, you generate ( ) electricity, and if you generate electricity quickly, you generate ( ) electricity.
- If we generate electricity in the opposite direction, the flow of electricity will be ( ).

☆Let's summarize what we have learned about power generation.



