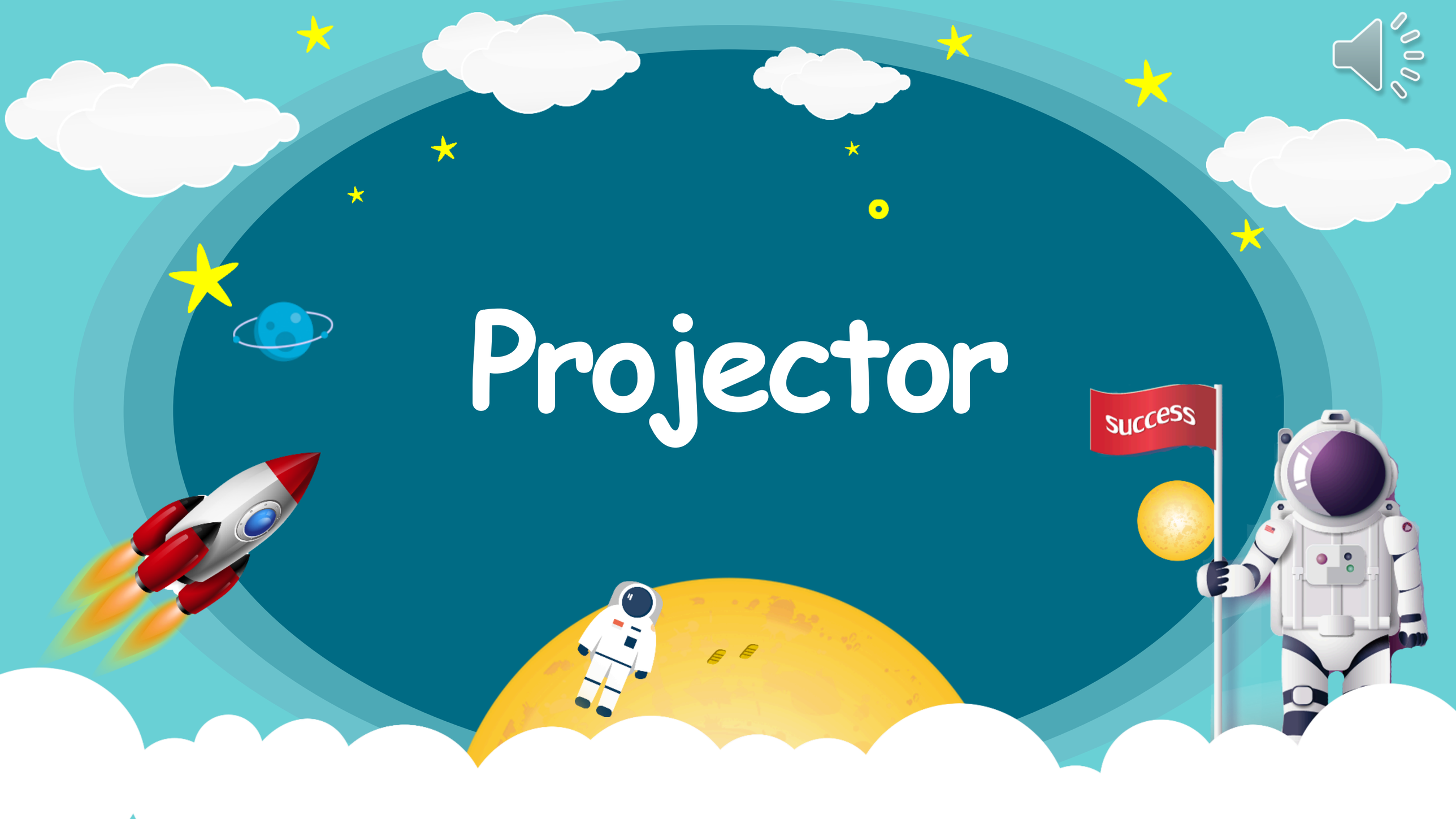
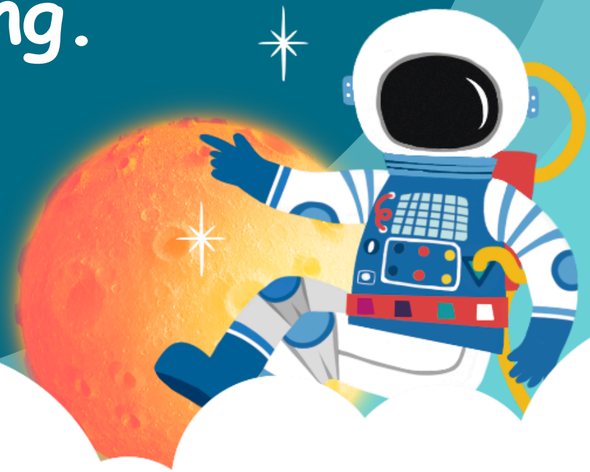
Projector



Experiment Objectives

1. Learn the basic knowledge and principles of a projector.
2. Learn how to assemble a projector.
3. Stimulate children's interest in learning through scientific experiments and cultivate their scientific thinking.



Introduction

Projector

Think about it

- What is the structure and principle of a camera?
- What is the structure and principle of a projector?
- What is the principle of a magnifying glass?

Camera

Projector

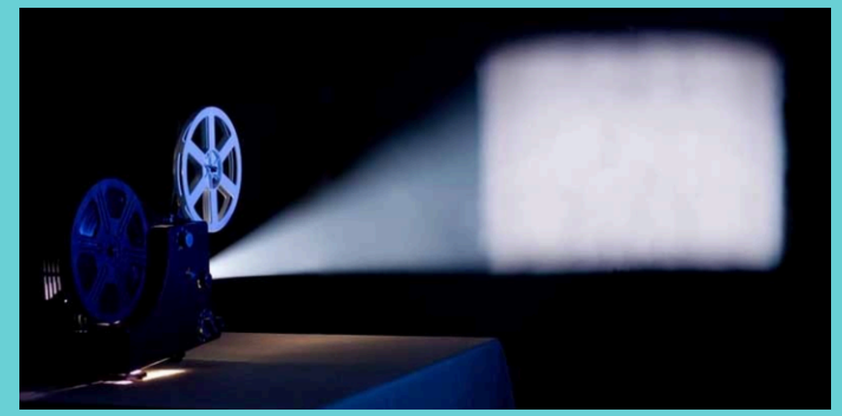
Magnifying Glass

Basic Knowledge of Projectors

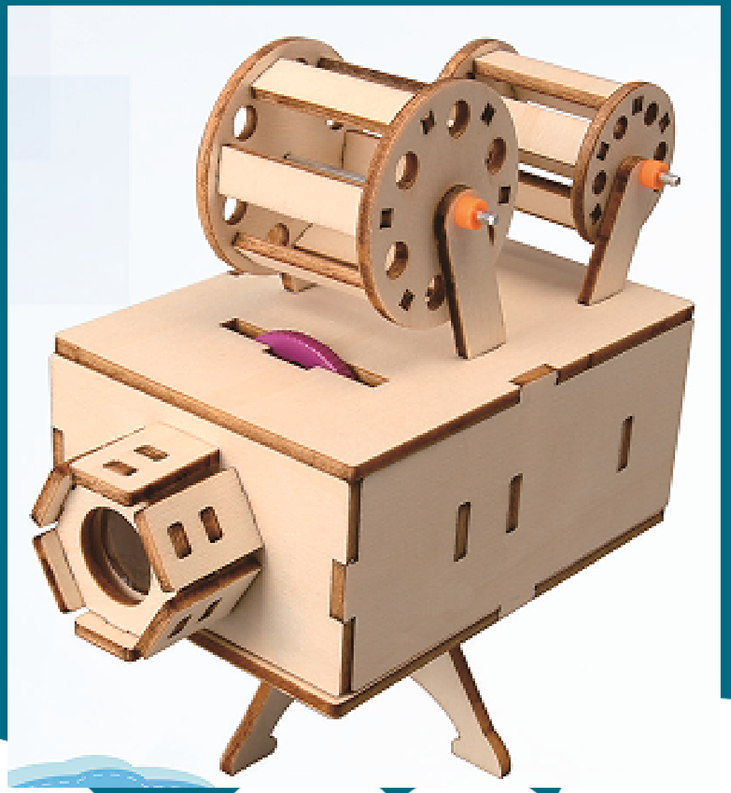
1. A projector is a device used to project images, such as for movies or slides.
2. It mainly consists of a lighting system, projection system, sound system, and mechanical parts.
3. The lighting system usually uses high-pressure xenon or mercury lamps.
4. The projection system is mainly composed of lenses, light sources, and mirrors.
5. The sound system includes speakers, amplifiers, and mixers.
6. The projection ratio refers to the ratio of image width to projection distance.
7. The contrast ratio refers to the ratio of brightness between light and dark areas.
8. Vertical stripes may appear due to the “rainbow effect” and rotating lenses.
9. The lens is the key component that focuses light to form an image.
10. The projector lens adjusts projection distance and image size.
11. The light source lifespan is generally several thousand hours.

Features of a Projector

A projector uses optical principles to enlarge images from film or digital media and project them onto a screen.
It directly reads film or digital content and outputs the image to the screen, emphasizing hardware output.
Key components include lenses, film, light sources, and optical lenses.
The projection effect depends on film quality, optical system, and environment.
Film projectors have high image clarity but relatively lower color reproduction and brightness.

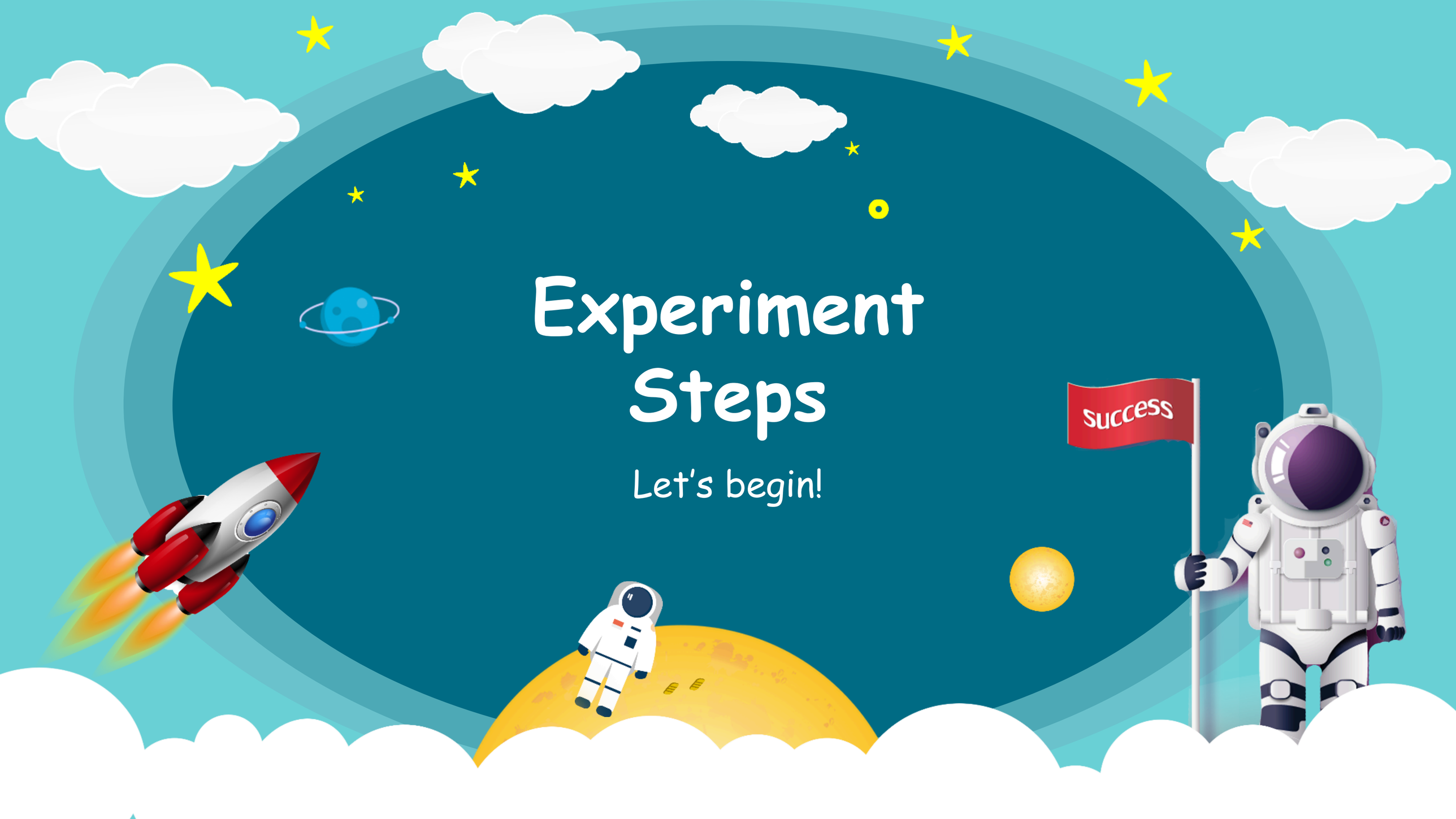


Let's make a magical slide projector!

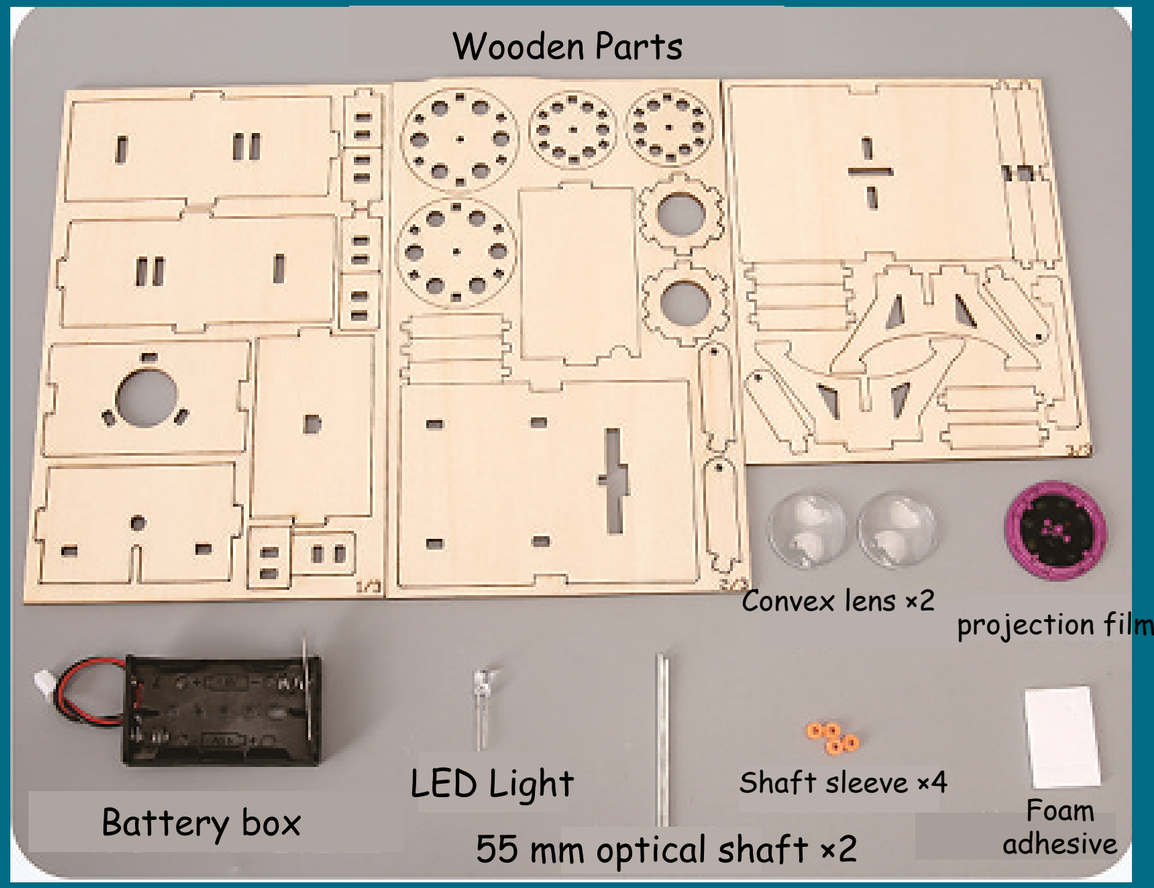


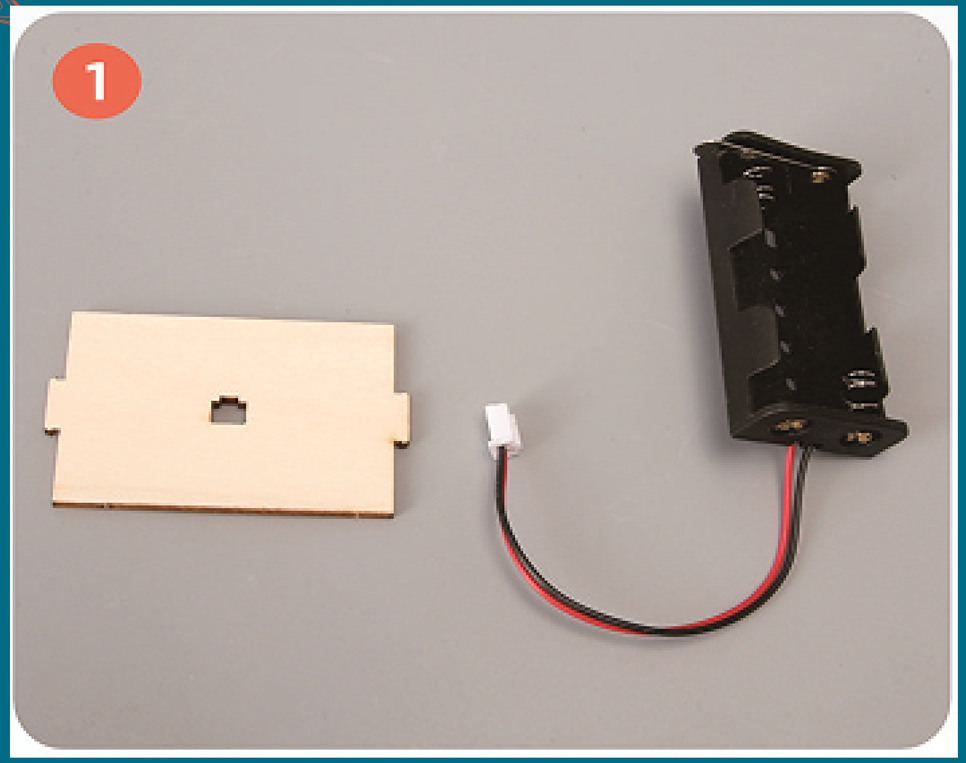
Experiment Steps

Let's begin!

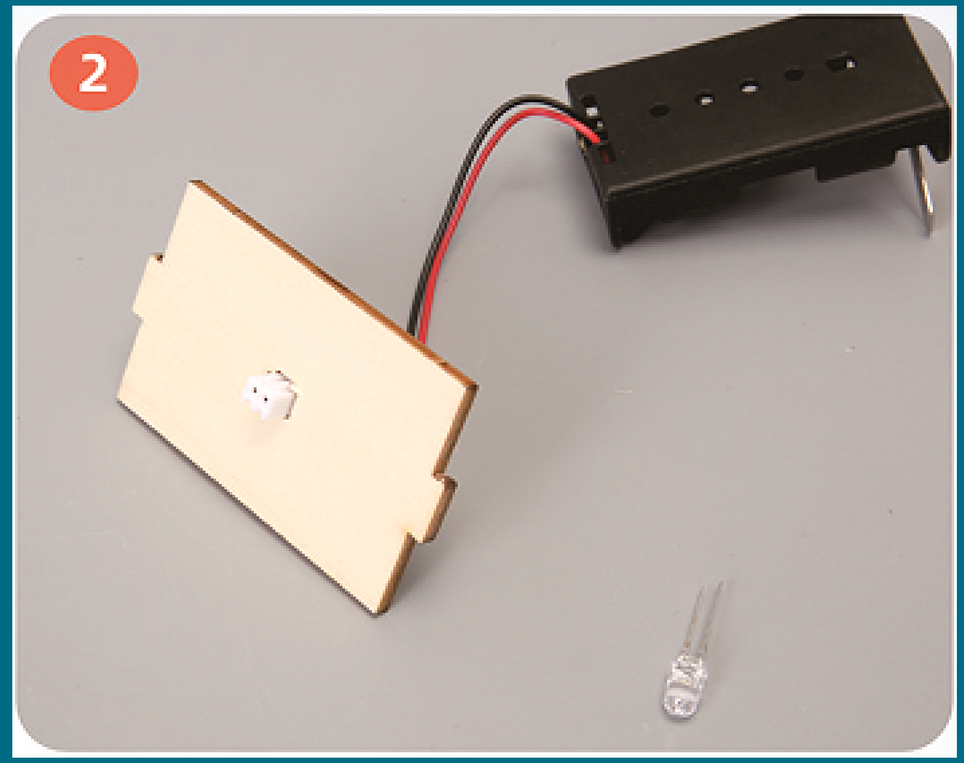


Recognize the Materials

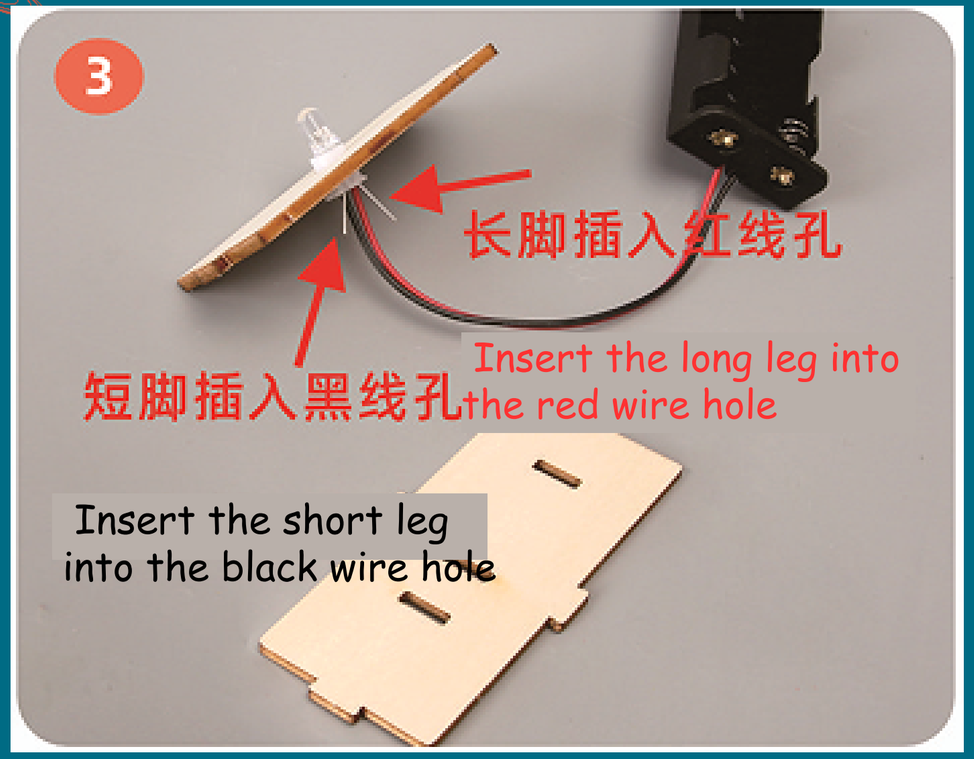




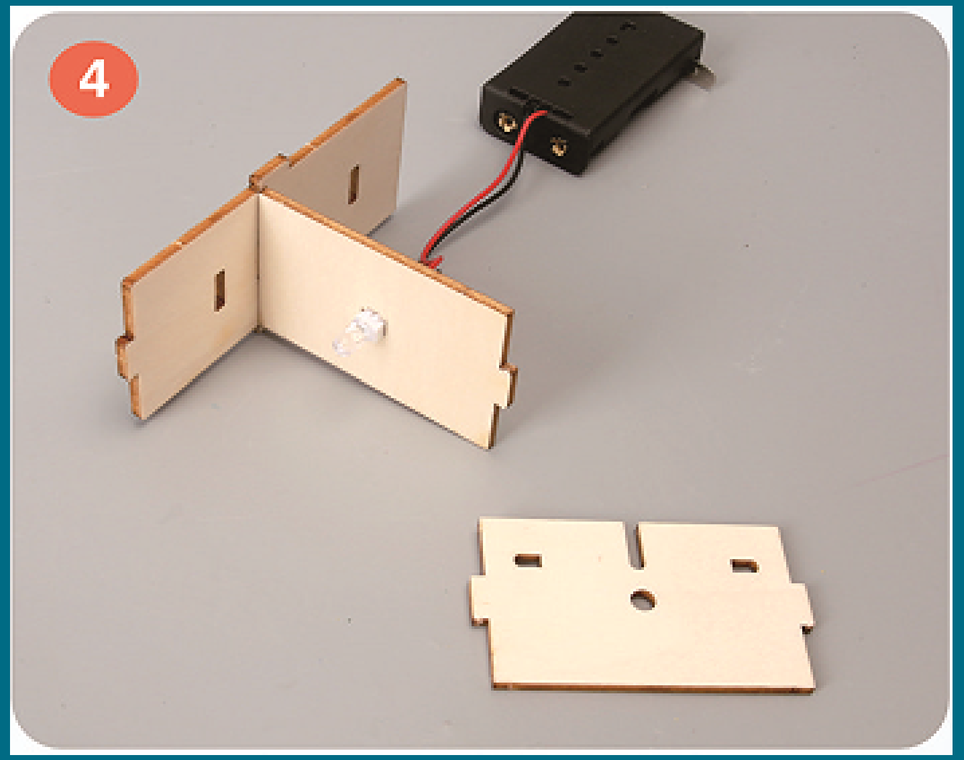
Prepare the parts as shown.



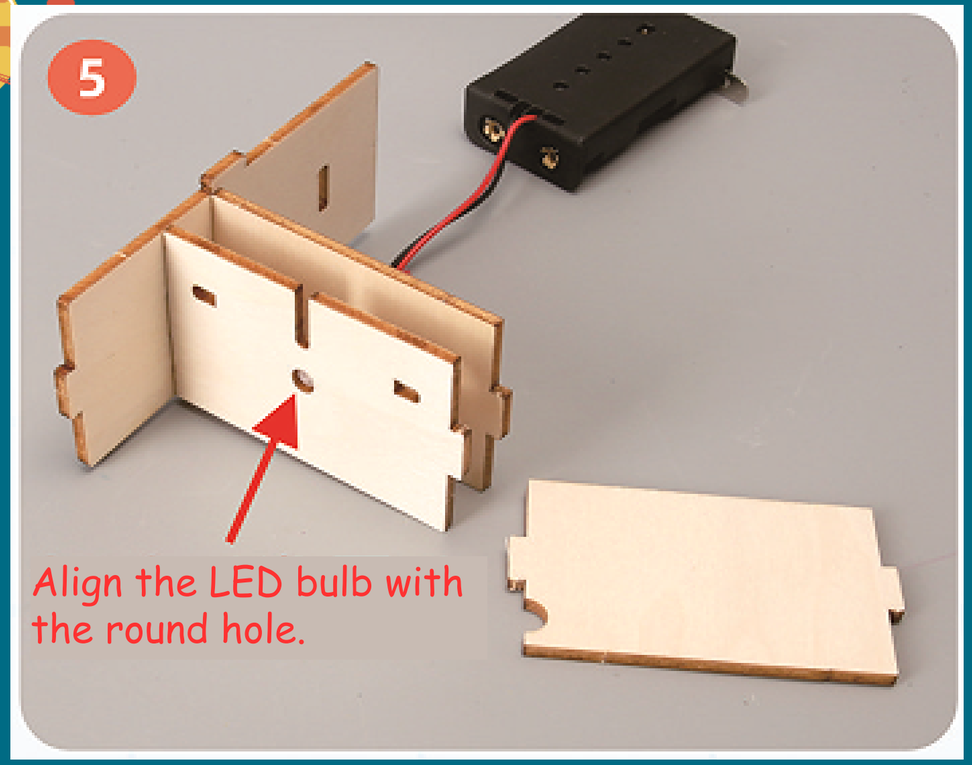
Insert the wire terminal through the hole as shown and prepare the LED bulb.



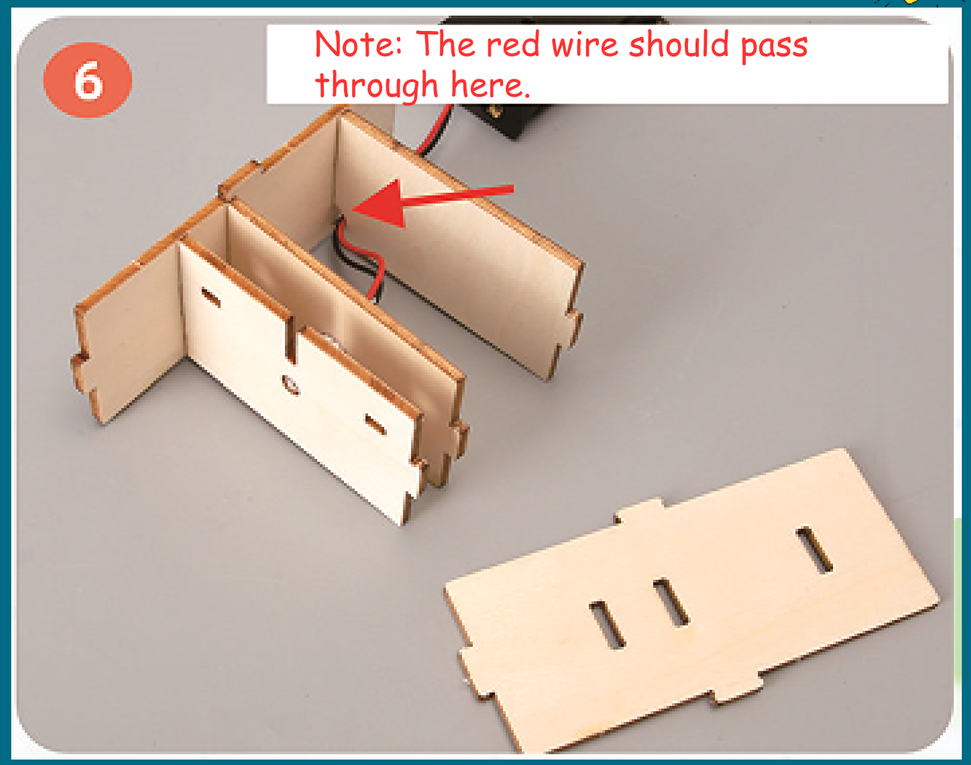
Insert the LED bulb into the terminal according to the markings.



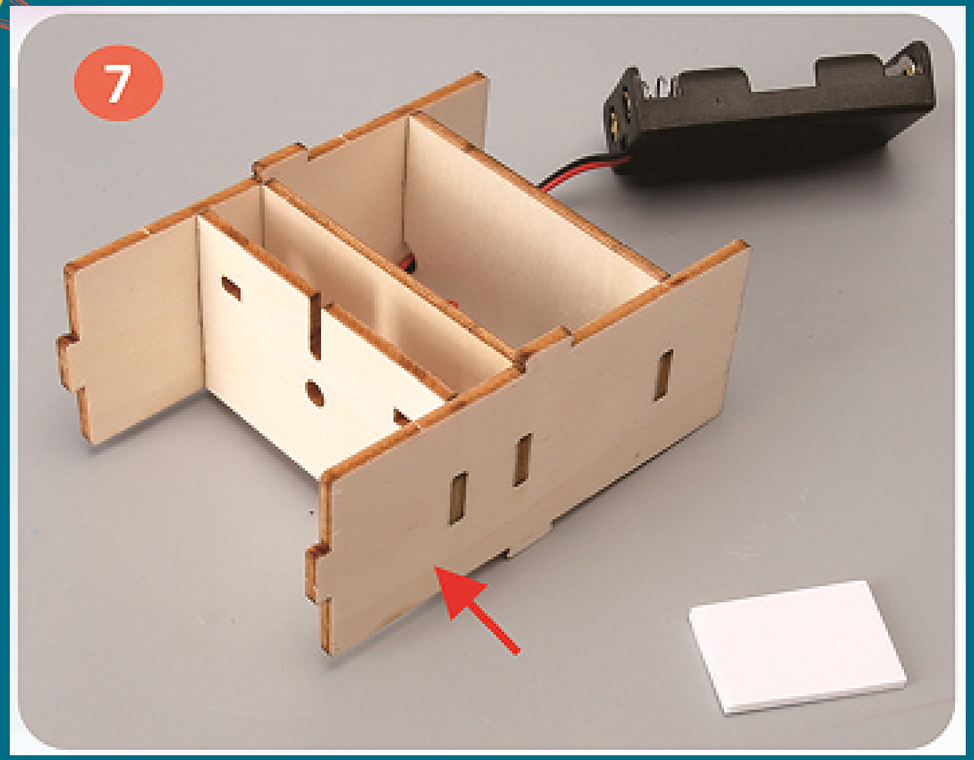
Insert the assembled part into the side panel as shown and prepare the next parts.



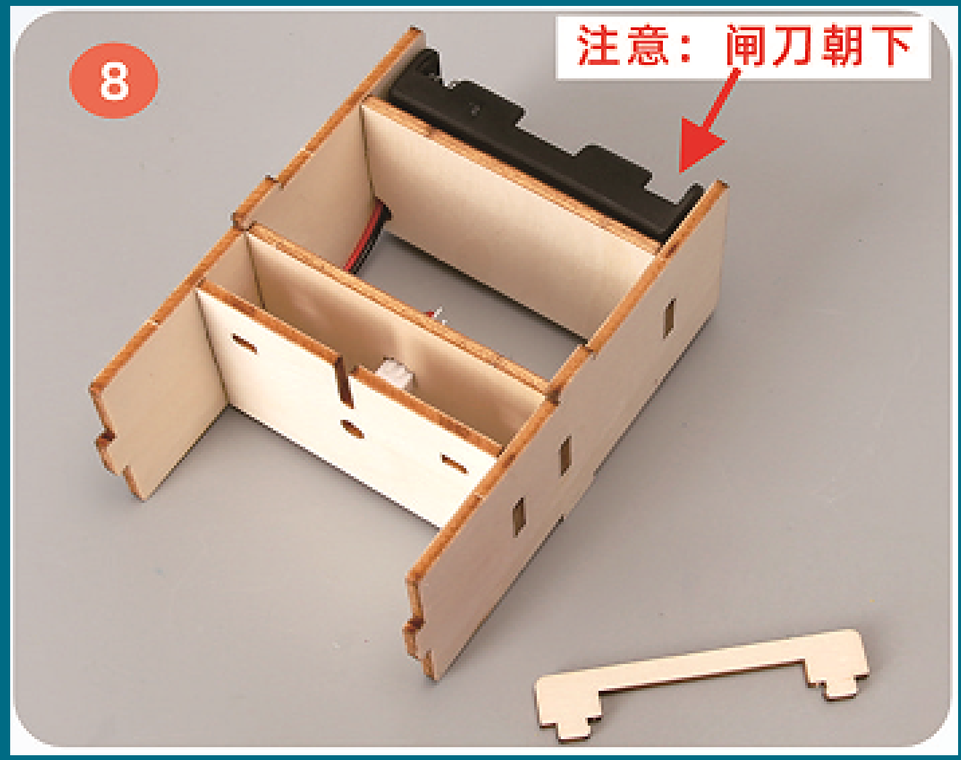
Align the round hole with the LED bulb as shown, then insert the side panel and prepare the parts for the next step.



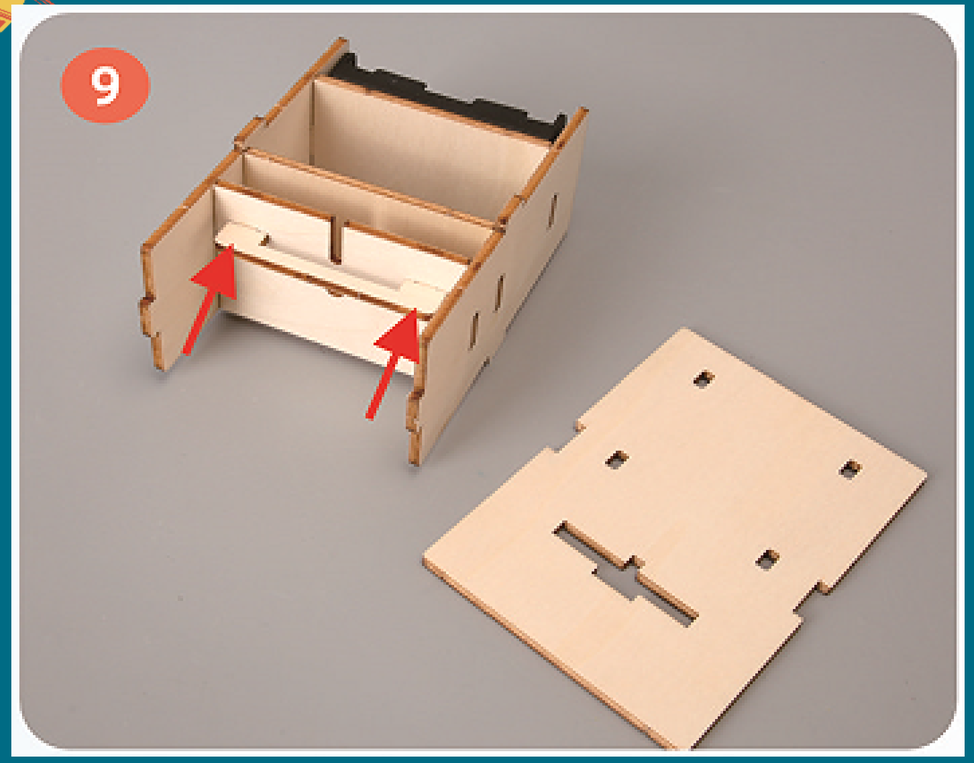
Place the wires into the groove first as shown, then insert the side panel and prepare the parts for the next step.



Install the second side panel and prepare the foam adhesive.



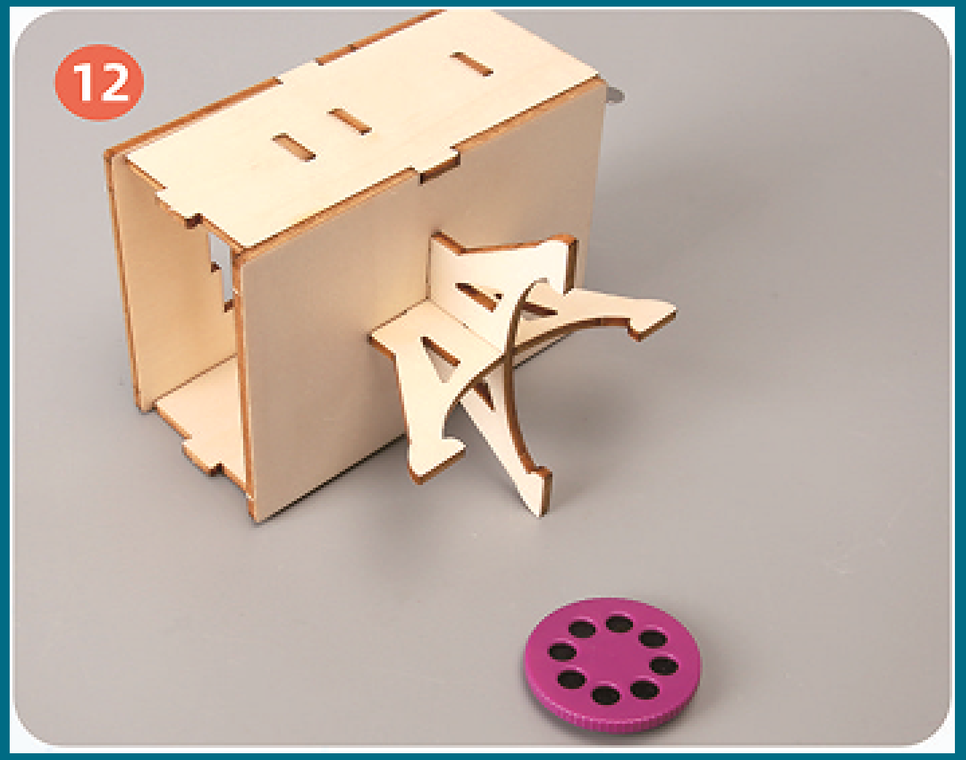
Use the foam adhesive to fix the battery box in place.



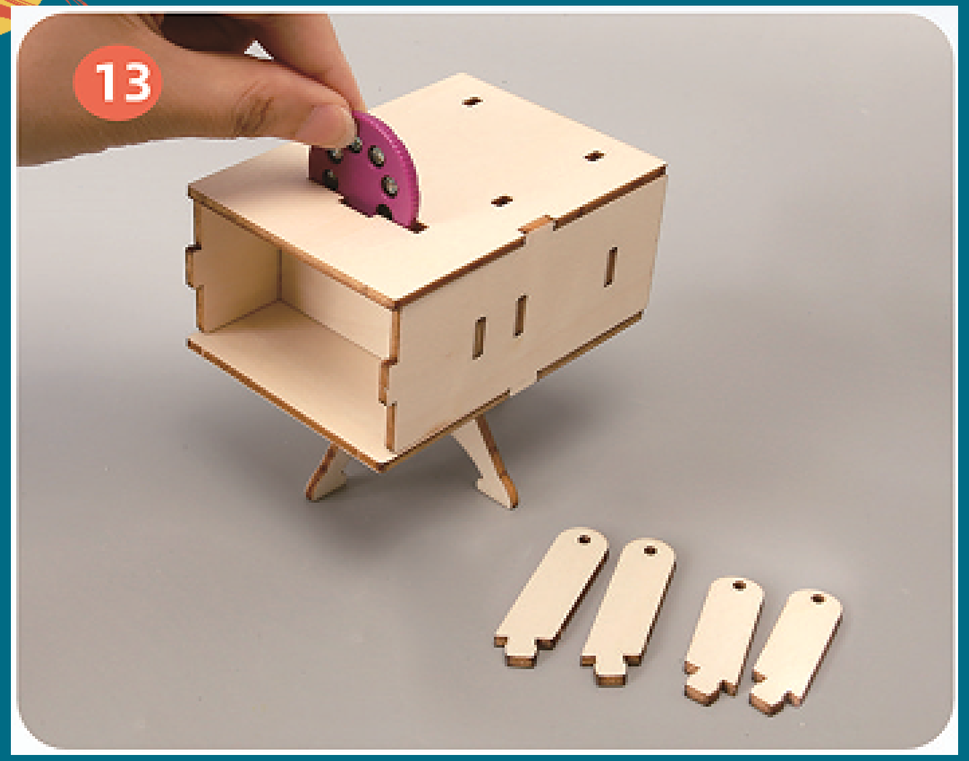
Insert the small board into the square hole as shown.
Prepare wooden panel.

Cover the top panel
Prepare wooden panel in the red circle.

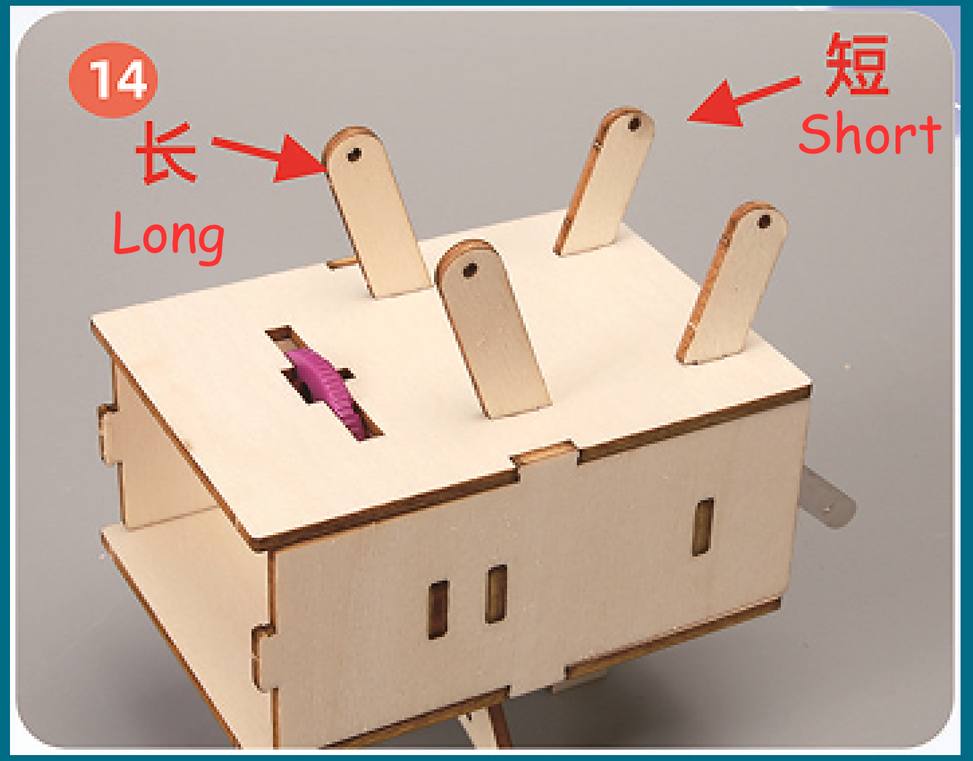
Cross the two support boards and insert them into the base.



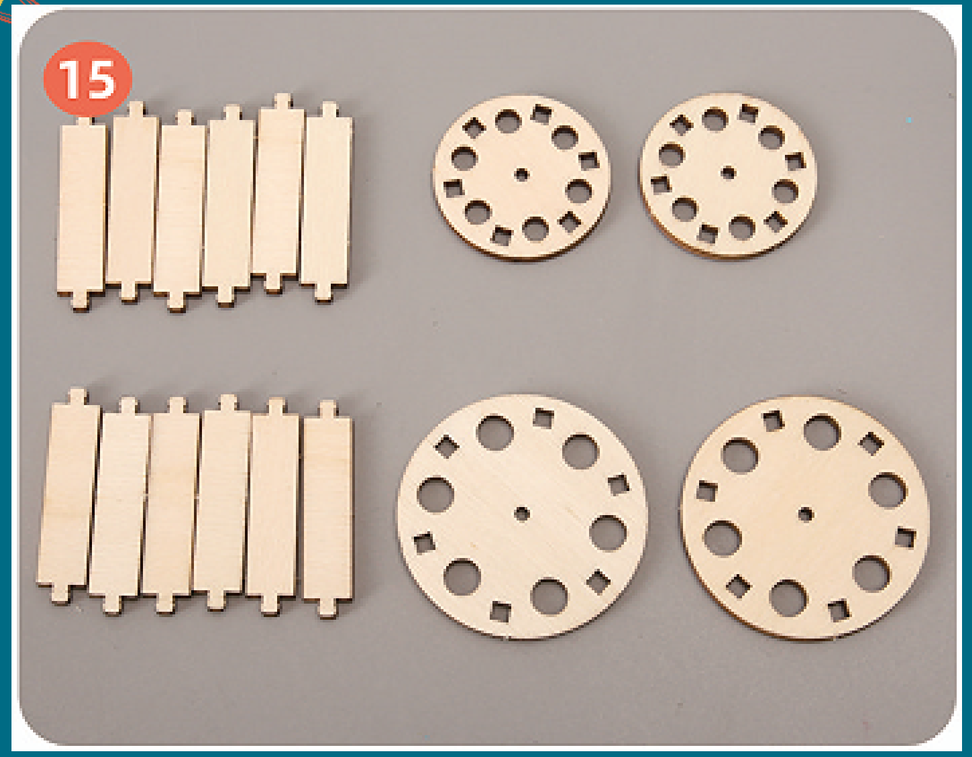
Install the bottom part and prepare the slide film.



Insert the slide film into the slot as shown.



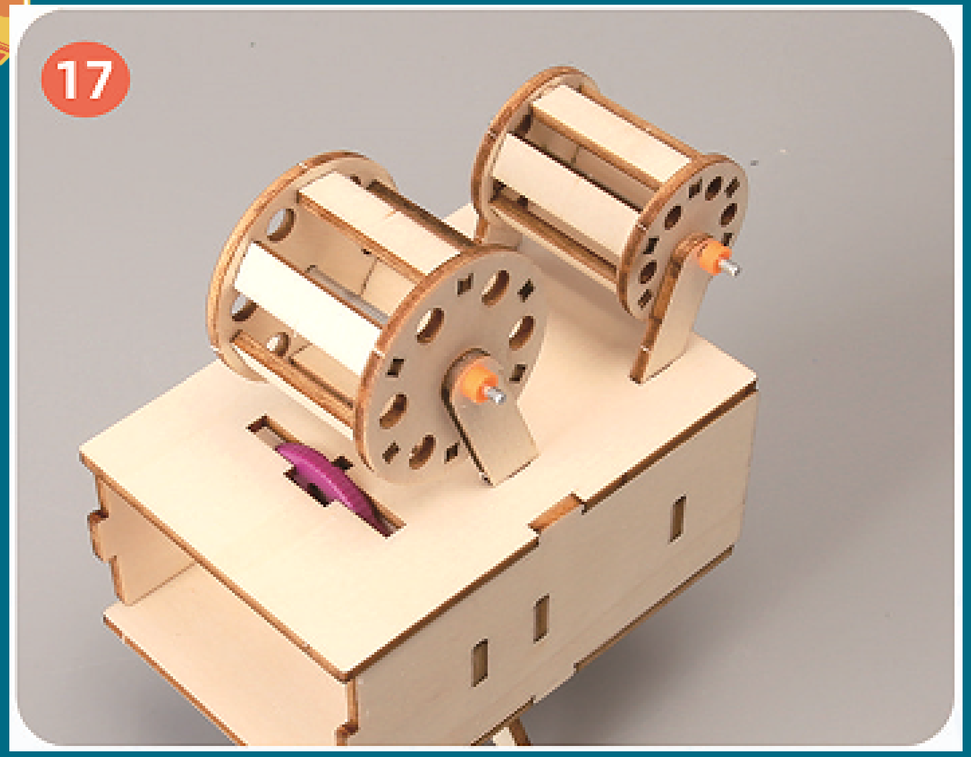
Insert the long and short wooden pieces into the square holes.



Prepare the parts as shown.

Assemble the large and small wheels, and prepare the shafts and sleeves.

17

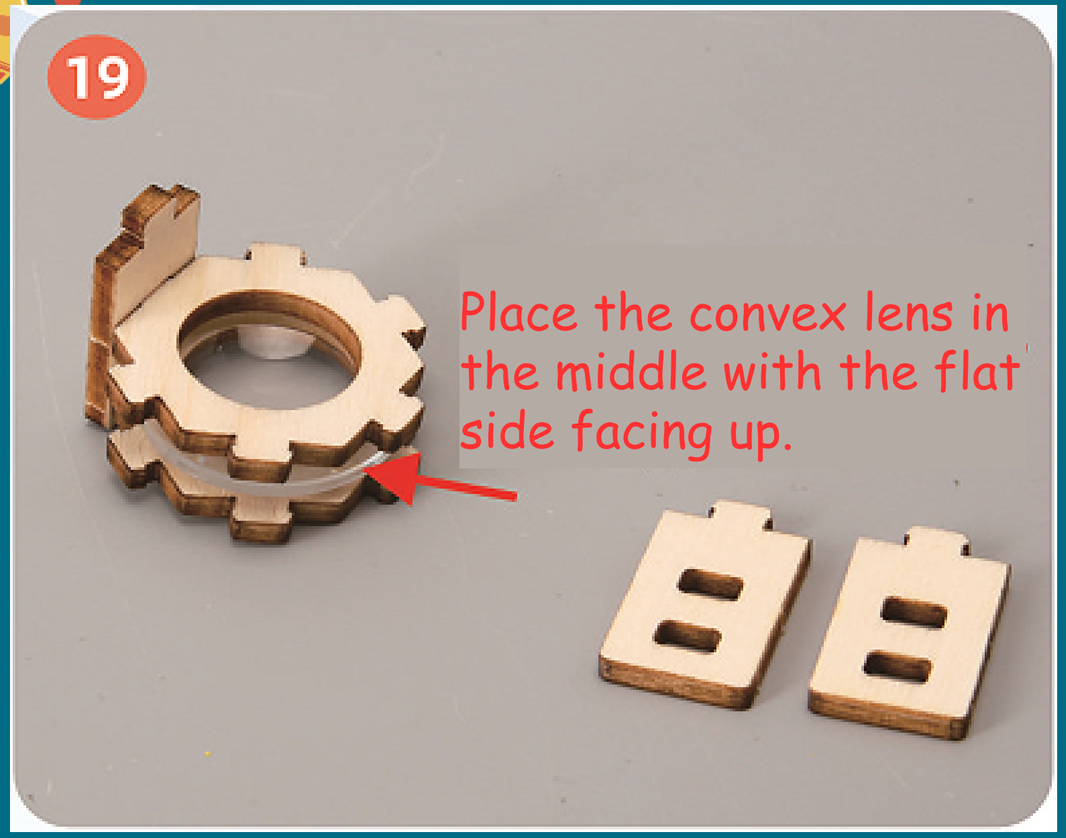


Use the shafts and sleeves to attach the large and small wheels — the large wheel goes in front, the small wheel at the back.

18

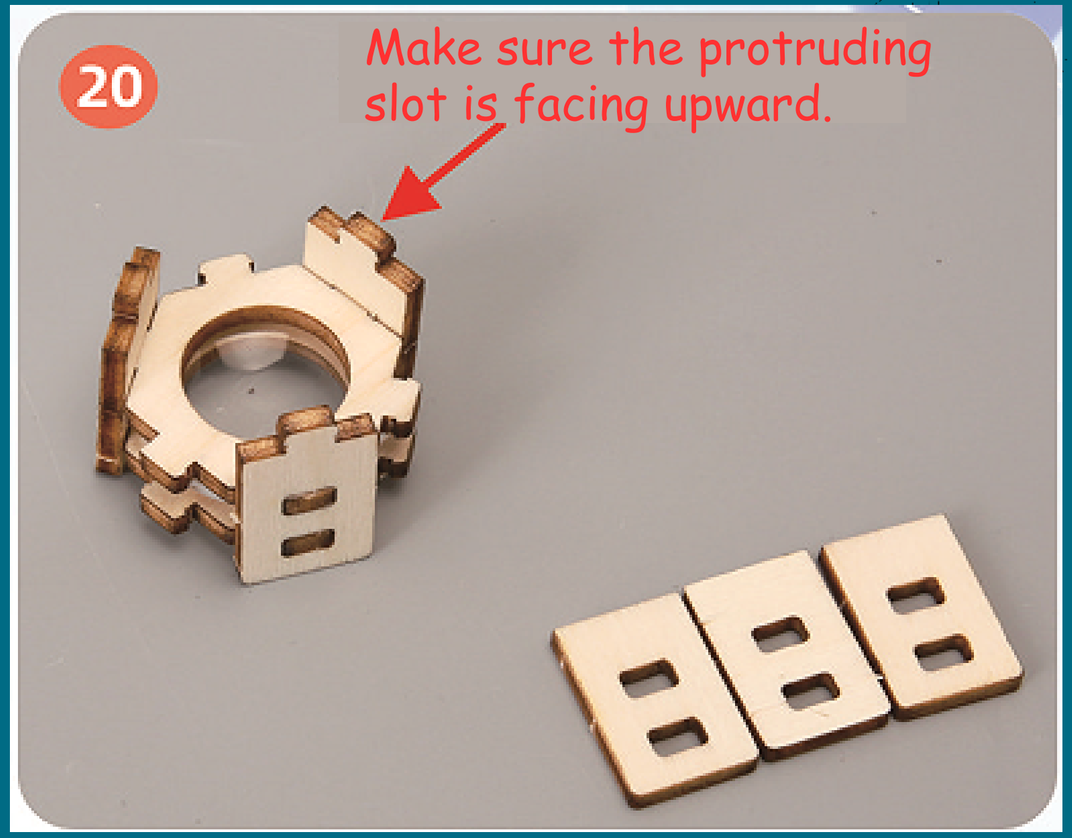
Prepare the following parts as shown.

19



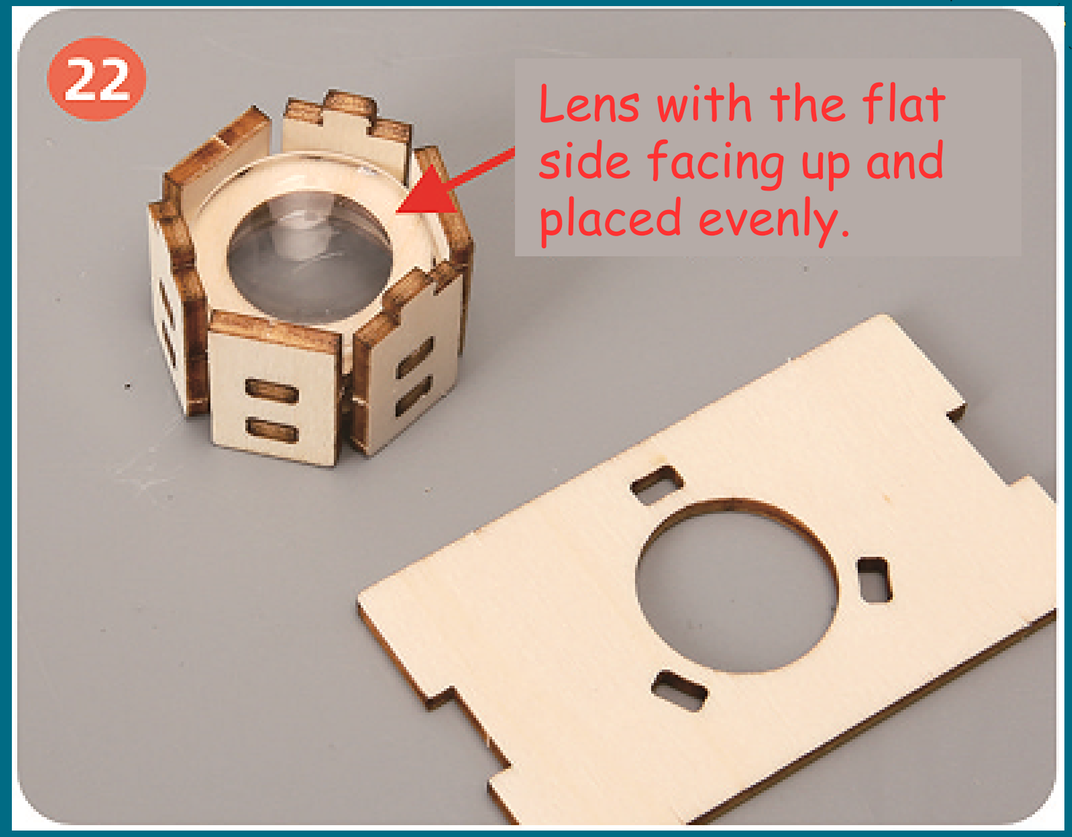
Assemble as shown and prepare the next parts.

20



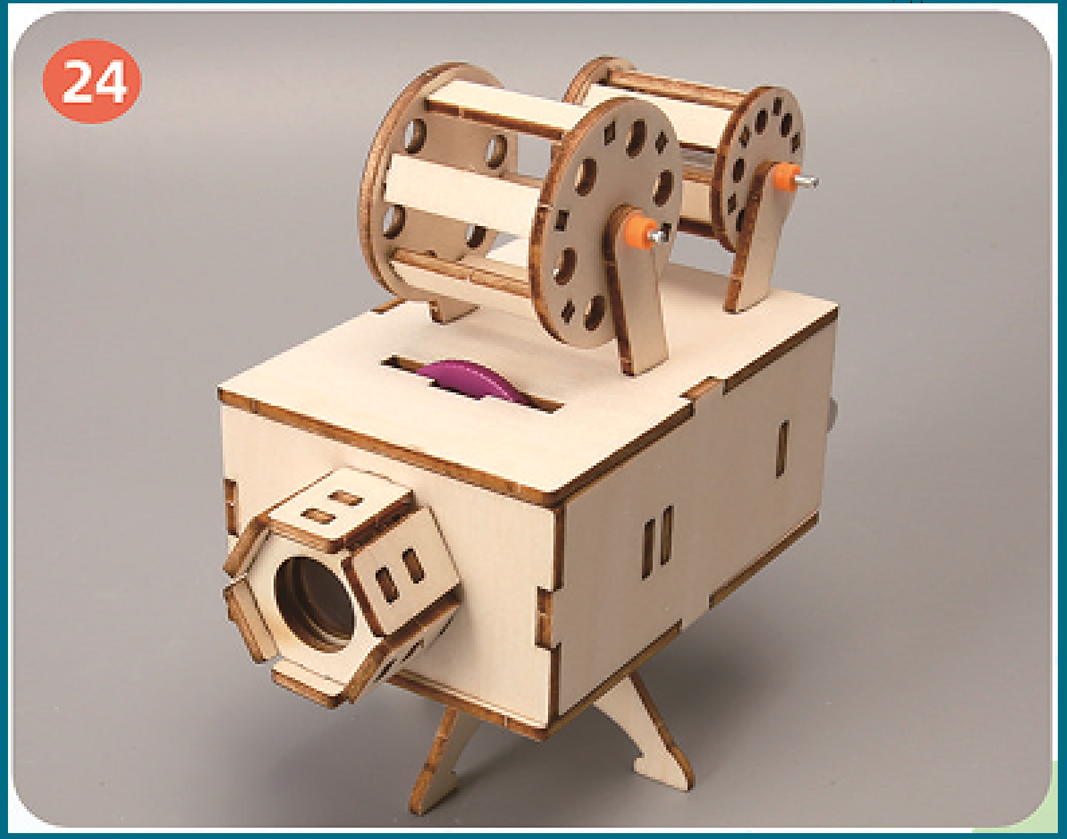
Assemble as shown and prepare the next parts.

Assemble as shown and prepare the lens.



Insert the convex lens as shown.
Prepare the parts for the next step.

As shown, align the assembly from Step 22 with the square hole and insert it.



As shown, insert the assembly from Step 23 into the front side — the projector assembly is now complete.

Experiment Principle

Scientific Principle

The projector precisely controls the distance between the film (object) and the convex lens ($1f < u < 2f$).

Using the optical rule that a convex lens forms an inverted, magnified real image, it projects the small film image onto a distant screen.

By placing the film upside down, the inverted image is corrected, resulting in a clear, upright, and enlarged picture.