PLASMA BALL

INSTRUCTION MANUAL

Good to know!
If you are missing any parts, please contact Thames & Kosmos technical support.

Checklist:

✓	No.	Description	Qty.
○	1	Plasma ball	1
○	2	USB-C cable	1

YOU WILL ALSO NEED:
USB-C power adapter, 4 AAA batteries (1.5 volt, type LR03), small Phillips-head screwdriver

SAFETY INFORMATION

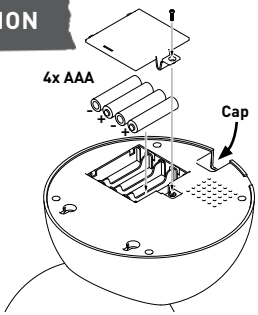
⚠ WARNING! – This is not a toy.
Not suitable for children under 14 years. Risk of electrical shock exists.
Cover the USB port with the included cap when operating the plasma ball using battery power.
This product may interfere with electrical devices such as pacemakers. Do not use if you suffer from epilepsy, a heart condition, or any similar or related illness. Do not use if you are pregnant.
Contains glass, which may be hazardous if broken. Keep out of reach of small children and pets.
Do not place the plasma ball on metal surfaces.
Do not use near water. For indoor use only. Use only as directed.
If damage is suspected, discontinue use immediately.
Do not open or dismantle product. There are no user-serviceable parts inside.
Do not attempt to remove glass.
Do not touch glass with metallic objects.
Clean with a soft, dry rag only.
Do not use liquid cleaners.
Prolonged skin contact with glass may cause a tingling or burning sensation.
Keep the packaging and instructions as they contain important information.

NOTES ON DISPOSAL OF ELECTRICAL AND ELECTRONIC COMPONENTS
The electronic components of this product are recyclable. For the sake of the environment, do not throw them into the household trash at the end of their lifespan. They must be delivered to a collection location for electronic waste, as indicated by the following symbol:
Please contact your local authorities for the appropriate disposal location.

BATTERY INFORMATION

Install the batteries with the correct polarity as shown. Secure the cover with the screw. Cover the USB port with the included cap.

Alternatively, you can plug the plasma ball into a USB-C power adapter.



SAFETY FOR EXPERIMENTS WITH BATTERIES
- The wires are not to be inserted into socket-outlets. Never perform experiments using household current! The high voltage can be extremely dangerous or fatal!
- To operate the models, you will need four AAA batteries (1.5-volt, type LR03), which could not be included in the kit due to their limited shelf life.
- The supply terminals are not to be short-circuited. A short circuit can cause the wires to overheat and the batteries to explode.
- Different types of batteries or new and used batteries are not to be mixed.
- Do not mix old and new batteries.
- Do not mix alkaline, standard (carbon-zinc), or rechargeable (nickel-cadmium) batteries.
- Batteries are to be inserted with the correct polarity (+ and -). Press them gently into the battery compartment. See above. The image shows how the batteries are inserted, removed, and changed.
- Always close battery compartments with the lid.
- Non-rechargeable batteries are not to be recharged. They could explode!
- Rechargeable batteries are to be removed from the device before being charged.
- Exhausted batteries are to be removed from the device.
- Dispose of used batteries in accordance with environmental provisions, not in the household trash.
- Avoid deforming the batteries.
- The device is not to be connected to more than the recommended number of power supplies.
- As all of the experiments use batteries, have an adult check the experiments or models before use to make sure they are assembled properly. Always operate the motorized models under adult supervision. After you are done experimenting, remove the batteries from the device compartments.

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INTRODUCTION


Nicola Tesla

The first plasma ball (patented as an 'Inert Gas Discharge Tube') was invented by Nicola Tesla in 1894. It wasn't commercially produced until the 1970s, when it was renamed by scientist and inventor James Falk.

Your plasma ball is a glass sphere containing a special gas: **neon (Ne),** which is one of the six noble — or inert — gases on the periodic table. At the center of the plasma ball is a high voltage **electrode.** When you switch your plasma ball on, the electricity flowing into the electrode heats up and energizes the gas, which causes **electrons** to break free from their neon atoms. This creates positively charged neon ions (+) that fly around along with the negatively charged electrons (–) in a soup of plasma.

So what is plasma anyway? Plasma is a highly-energized gas. Plasma is actually the **fourth state of matter** — in addition to solid, liquid, and gas — and it is the most abundant state of matter in the universe.

EXPERIMENT 1

You are the conductor

Slide the plasma ball switch to the middle position, and then touch it with your fingers. Observe the plasma ball.

What's happening? When you touch the plasma ball, you create an **electric glow discharge,** a path for the electrons to travel to Earth through your body. Similar to a bolt of lightning, the electrons want to move toward Earth because it has a lower voltage. As the ionized gas **conducts electricity** from the electrode to your hand, you see a bright, colorful path of light. Your hand does not get shocked because the glass is an insulator.

EXPERIMENT 2

Sound machine

Slide the plasma ball switch to the left-most position. Clap, speak loudly, or play music near the plasma ball. Observe the plasma ball.

What's happening? Your plasma ball has a tiny microphone inside it. The microphone picks up sound waves in the immediate area and converts them into electric signals. When there is no sound, the circuit is open, so you don't see any light. When the microphone registers a sound wave, the circuit closes, and the plasma ball turns on.

EXPERIMENT 3

Plasma buoyancy

Slide the plasma ball switch to the middle position. Hold your hand on the side of the plasma ball. You will notice the plasma threads form and re-form. In other words, the threads are a bit jumpy. Now, hold your hand on the very top of the plasma ball. You will notice the thread is steady. Remove your hand after a few seconds because the glass will heat up.

What's happening? Plasma threads are very hot, and they will rise due to their **buoyancy** in the other gas inside the ball. A horizontal thread wants to rise, while a vertical thread is stabilized by the buoyancy.

EXPERIMENTS 4 AND 5

Let there be light

You will also need:
Fluorescent light bulb or tube

Slide the plasma ball switch to the middle position. Hold a fluorescent light bulb very near — but not touching —the plasma ball. What do you notice? You can also try touching the bulb to the plasma ball.

Now, rest the fluorescent bulb on a book or other object (so that you're no longer holding it), so it is very near (but not touching) the plasma ball. What happens when you touch the bulb with your finger?

What's happening? The movement of charged particles inside the plasma ball creates an **electric field,** which in turn creates a **magnetic field** around the ball. This field causes the electrons inside the fluorescent bulb to move around, which creates an electric current inside the bulb. The bulb lights up even without making direct contact with the plasma ball! When you touch the bulb, your body creates a pathway for the electrons to flow to Earth, just like you saw in experiment 1.

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