# Model 1 – Functional model / Solar energy

## Construction task model 1

Build model 1 according to the building instructions. Observe the following points:

* You can use an artificial light source with sufficient strength (such as an incandescent bulb or halogen bulb over 60 watts) for your experiments, as a replacement for sunlight.
* Always keep a safe minimum distance away from the light source (at least 30 cm, depending on the strength of the light source), since the solar modules can become very hot.

**Solar cell basic principles**

The sun is an inexhaustible source of energy. Therefore, solar energy is considered renewable energy. Solar energy is the energy generated by the sun through nuclear fusion; some of this energy reaches the earth as electromagnetic radiation (radiant energy)

Solar cells are usually made of silicon. Silicon is contained in sand. Solar cells convert light energy into electric energy using a trick. When the light particles (called photons) hit the solar cells, electrons are released from nuclei in the lower layer and moved to the upper layer. From there, they cannot move back. The electrons must flow through the line to return to their original place. Electricity flows.

The more light (energy) hits the cell, the more the electrons move. Therefore, solar cells convert light energy into electrical energy (electricity).

## Topic task

1. When light hits an object, part of it is reflected and part of it is stored in the form of heat. Why are solar modules dark (black) and not white?
2. Solar technology can be employed to use solar energy in a variety of ways. What uses are you already familiar with?

In general, we can differentiate between direct and indirect sunlight. Direct sunlight hits the solar module directly, and is the strongest. Indirect or diffuse sunlight is when the clouds cover the sun, or the light is reflected.

The angle of incidence between the sunlight and solar module changes, depending on the time of day or the season.

## Experimental tasks

What determines how much electricity a solar system can deliver?

1. Experimental setup with model 1
* Adjust the angle of the solar module so that it is flush with the green panel. (Image 1 - on the side with the 60 degree corner block)
* Point a light source towards the solar module until the indicator starts to turn.

Now, we will change the tilt of the solar module to the light step by step.

* To do so, change the angle of the solar module to the light source by aligning the solar module to the green panel with the 30 degree angle (image 2).
* Then, in a third step, align the solar module until it is flat (image 3)

At what angle of incidence of the light on the solar module does the most current flow, causing the indicator to turn the fastest?

Test your model outdoors in the sunshine as well.

1. The solar module cannot generate power overnight. But what happens if the sky is cloudy during the day? You can reconstruct this situation by slowly moving your model farther and farther away from the light source. What does the rotational indicator do as the radiant intensity of the light decrease, and what can you conclude from this?
2. Move your model back towards the light source and observe the direction that the indicator turns. Then exchange the red plug (plus pole) and green plug (minus pole) of the solar motor. How does the indicator turn now, and what is the explanation for this? Compare your observation with plugs and outlets on household appliances.