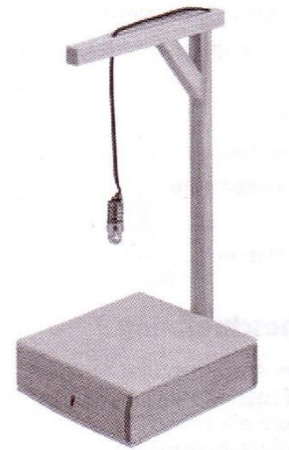


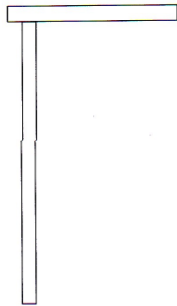
## Magical physics: The „light-gallow“

- Material:
- 4 wooden plates (9,5 cm x 3 cm)
  - 2 wooden plates (10 cm x 10 cm)
  - 1 wooden brace (1cm x 1 cm x 11,5 cm)
  - 1 wooden brace (1cm x 1 cm x 19,5 cm)
  - 1 wooden brace (1cm x 1 cm x 5 cm)
  - 1 trimmer (1 k $\Omega$ )
  - 1 LDR
  - 1 transistor
  - isolated wire
  - 1 light bulb with socket
  - 1 4.5 V battery
  - 5 thumbtacks
  - 2 unisolated paper clips
  - 4 screws
  - screwdriver
  - saw
  - wood glue
  - twist drill ( $\varnothing$  3 mm)
  - components, ..
  - soldering gun
  - tin-solder

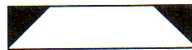


**Figure 1**

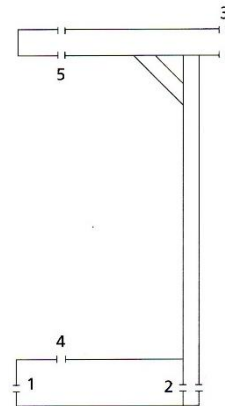
*Follow the instructions step by step!  
Make sure you work as fast as possible  
(but safely!) when soldering the  
as the components can be destroyed by  
overheating.*



**Figure 2**



**Figure 3**



**Figure 4**

### Instructions:

Glue the 4 identical wooden plates to one of the base plates (10 cm x 10 cm) to make a box. Glue the two larger braces (according to Figure 2) together to form a gallow tree. Saw off the corners of the short brace (see Figure 3). Glue the trimmed short brace onto the gallow tree and glue the gallow tree to the middle of one of the side walls of the box. Put the second base plate on the box. Drill holes into the setting at the locations indicated by the numbers 1 to 5 in Figure 4. Hole 5 must be exactly above hole 4. Remove the upper base plate.

Insert two tacks into the base plate, below the hole number 4. Onto these two tacks you solder on the Light dependent resistor (LDR). The LDR must be located directly underneath the hole in the cover plate!

Solder the outer terminals of the potentiometer to two other tacks that you previously inserted into the base plate. Place the Potentiometer so that you can adjust it with a screwdriver through hole number 1.

Solder a wire to the middle connection of the potentiometer. Solder the free end of this wire to the base of the transistor. Solder the emitter of the transistor to the tack and connect it to the right outer leg of the potentiometer. Insert the last thumbtack into the baseplate and solder the collector leg to it. Then connect the collector leg via a soldered wire to one end of the photoresistor.

Connect the other end of the photoresistor to the left outer leg of the potentiometer with a wire.

Next step is to solder wires which you can use to connect the 4.5 V battery. Attach one end of a wire to the thumbtack which is already soldered to the emitter of the transistor. Attach the other wire to the photoresistor. Solder an uninsulated paper clip onto the free end of the "emitter wire".

The other cable is thread through hole number 2 out of the box, through hole number 3 and hole number 5, so that it is guided over the gallows and points down towards the box. Solder one end of the bulb socket onto the wire. The second end of the bulb socket is soldered to another wire, which is returned into the box, passing through the holes 5, 3, and 2. Solder another uninsulated paper clip onto this wire.

Stick the two paper clips onto the two pins of the 4.5V battery. The bulb that you screwed into the socket should now light up. Cover the box with the second base plate. Check that the photo resistor is directly underneath hole 4. Cover the hole for a short time, the light bulb should go out and should not start shining when the hole is uncovered.



**Figure 5**

Illuminate hole number 4 with a the flashlight. If you remove the flashlight, the bulb will continue to shine. If the bulb turns on even without illuminating hole 4 or turns off when the flashlight is removed, use the screwdriver to change the resistance of the potentiometer. The resistance should be adjusted so that the bulb does not light up in the room lighting.

Check the function of your light gallow: If you illuminate the hole with the flashlight, the bulb should turn on. Now blow away the bulb from the hole in the base plate: the bulb should switch off.

Once your light gallow works, you can screw the corners of the second base plate to the box with the screws.

Homework: Explain how the "magic light gallow" works. Ensure you refer to the individual functions of the electronic components.

### *Solution Homework "light gallow"*

*Once the photoresistor is illuminated it is conductive. In this case, the base of the transistor is connected to the positive pole of the battery, the transistor is current-permeable. The potentiometer controls the sensitivity of the photoresistor. If one "blows out" the lamp, which continues to illuminate the photoresistor, then no light falls on the photoresistor. As a result, its resistance increases, the circuit is interrupted, the lamp switches off.*