**ACTIVITY: Make a printed circuit board**

**Activity idea**

In this activity, students make a printed circuit board photographically by shining UVA light through a negative artwork mask to cure and harden a thin coating of UV-sensitive material that covers the copper.

By the end of this activity, students should be able to:

* demonstrate the use of UVA light to cure a photosensitive chemical in the process of making a circuit

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**Introduction/background**

This activity is to show students an application of UV light. For those interested in electronics, it’s a chance to make a circuit board of their choice. In the process of producing their boards, students will apply UVA light to cure a thin coating of UV-sensitive material that covers the copper.

***Safety***

Note that both ferric chloride solution and sodium hydroxide solution can be harmful. Care should be taken when handling them. Rubber gloves should be worn.

**What you need**

* Pre-coated copper printed circuit board (PCB) (you can purchase this from suppliers such as Jaycar Electronics or Surplustronics – both companies sell a Riston brand PCB, 152 x 152 mm in size) that has a thin film of photo-resist applied to the copper surface – the photo-resist is very sensitive to UVA and needs to be kept away from sunlight or any other UV source
* Craft knife
* Negative artwork of the circuit layout (mask)
* Sheet of glass
* Source of UVA (such as a black light or aquarium fluorescent tube)
* Plastic container
* Developing liquid (you can purchase this from suppliers such as Jaycar Electronics or Surplustronics)
* Soft paintbrush
* Etch-resist felt-tip pen or fingernail polish and a fine paintbrush
* Ferric chloride solution
* Sodium hydroxide solution
* Solder and soldering iron
* Circuit board components
* PCB drill
* Copies of the student handout [Make a circuit board](#make)

**What to do**

1. Hand out copies of the student handout [Make a circuit board](#make) and assist students to gather the materials they need, working in small groups. Discuss the results.

**Student handout: Make a circuit board**

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| 1. Cut the PCB to size and place the negative artwork of the circuit layout (the mask) on the coated PCB. |  |
| 1. Cover with a sheet of glass to keep the mask flat on the PCB. 2. Expose the mask and board for approximately 3 minutes to a steady source of UVA (such as a black light or aquarium fluorescent tube) or broad daylight. The parts of the photo-resist that have been exposed to UV through the mask will cure and harden. | UV_TEA-ACT_04_Make_a_Printed_Circuit_Board_im1 |
| 1. Use a developing liquid and a soft paintbrush to dissolve the uncured sections. | UV_TEA-ACT_04_Make_a_Printed_Circuit_Board_im2 |
| 1. Touch up any imperfections in the photo-resist using a commercial etch-resist felt-tip pen or a small amount of fingernail polish and a fine paintbrush. | UV_TEA-ACT_04_Make_a_Printed_Circuit_Board_im3 |
| 1. Use a strong ferric chloride solution to etch away the exposed copper on the PCB. | UV_TEA-ACT_04_Make_a_Printed_Circuit_Board_im4 |
| 1. When fully etched, wash the PCB in warm water and dry. | UV_TEA-ACT_04_Make_a_Printed_Circuit_Board_im5 |
| 1. Use a medium strength sodium hydroxide solution to strip off any photo-resist that remains. 2. Trim the PCB and drill the holes. Now you’ve made the circuit board, insert the components and solder them in place. | UV_TEA-ACT_04_Make_a_Printed_Circuit_Board_im6 |