

# PHOTOSYNTHESIS SET 050

## USER GUIDE



[cma-science.nl](http://cma-science.nl)

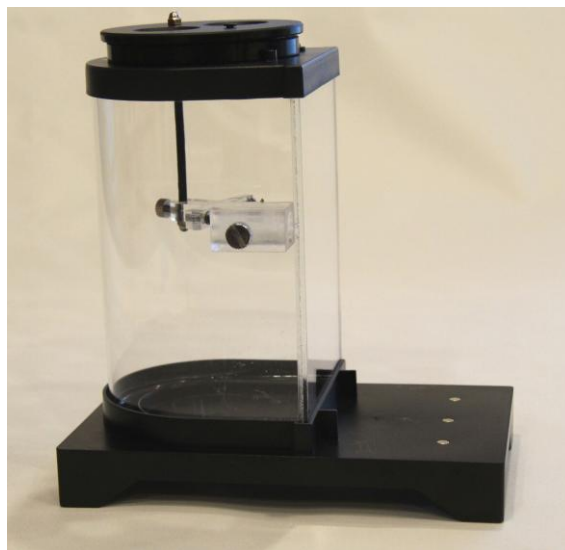
## Short description

The CMA Photosynthesis Set 050 allows monitoring photosynthesis and respiration in a closed system. It consists of:

- a plastic base with a transparent plastic chamber
- a cover with holes and holder
- two large rubber stoppers, and a smaller one for the smaller hole
- an LED lamp (colour mix) module

## Photosynthesis chamber

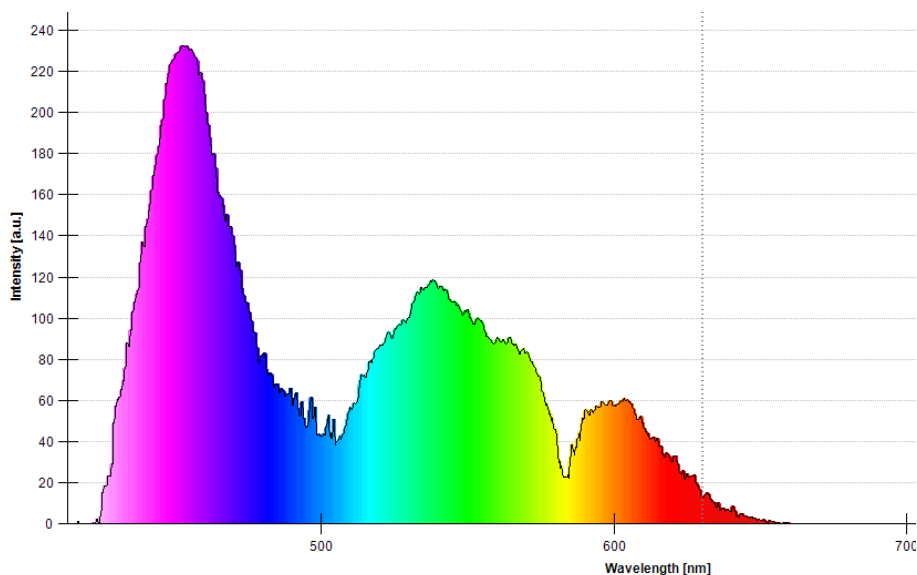
The chamber has a large opening for easy access and is closed with a round top cover with two holes. A small holder attached to the cover allows fixing small materials such as leaves. The holes in the cover can be used to insert the CO<sub>2</sub> and/or O<sub>2</sub> sensors to monitor gaseous carbon dioxide and oxygen levels in the chamber. When not in use a hole can be closed with a rubber stopper or another sensor e.g. the temperature sensor can be inserted in the hole of the stopper to monitor the temperature change in the chamber. Note that while the stoppers fit well, it is not guaranteed to be a watertight seal. The holder located outside of the chamber allows mounting a light sensor and monitoring light changes of the surrounding.



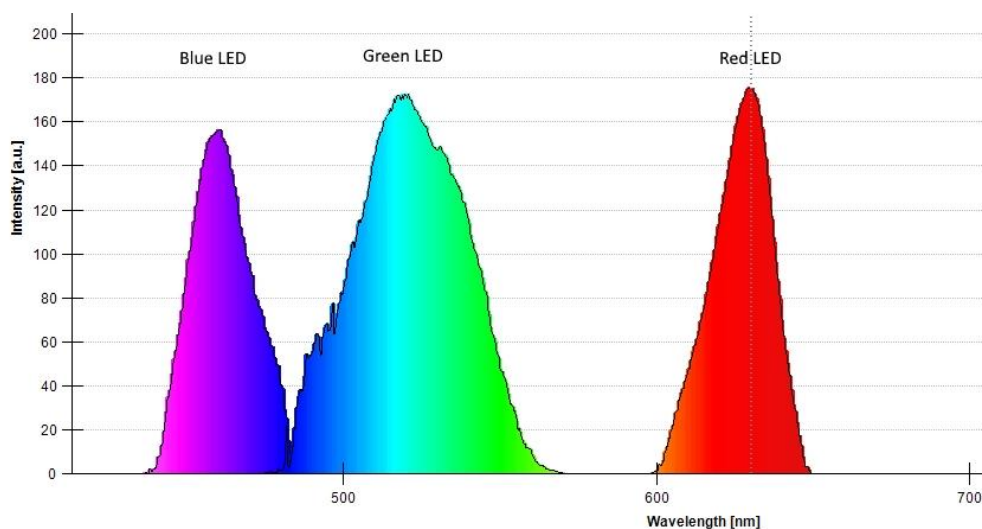
## LED lamp module

The large and strong LED lamp has 4 push buttons, which allow selecting the color of the light emitted by the lamp: red, blue, green and white. The knob, located below the push buttons, allows changing the intensity of the light. Because the lamp consists of LEDs, no heat from the lamp is transferred into the chamber. The lamp can be set to four different colors of light each produces by a separate set of LEDs. The single-color LEDs emit light in a spectrum around a specific wavelength, while the white LEDs emit light in a spectrum with peaks at three different wavelengths. The wavelengths of the emission peaks can be found in the technical specifications table and the light spectra of different LEDs are shown in the following figures.





**Figure 1:** Light emission spectrum of the white LEDs from the lamp. The absolute intensities differ strongly with the position and distance from the lamp.



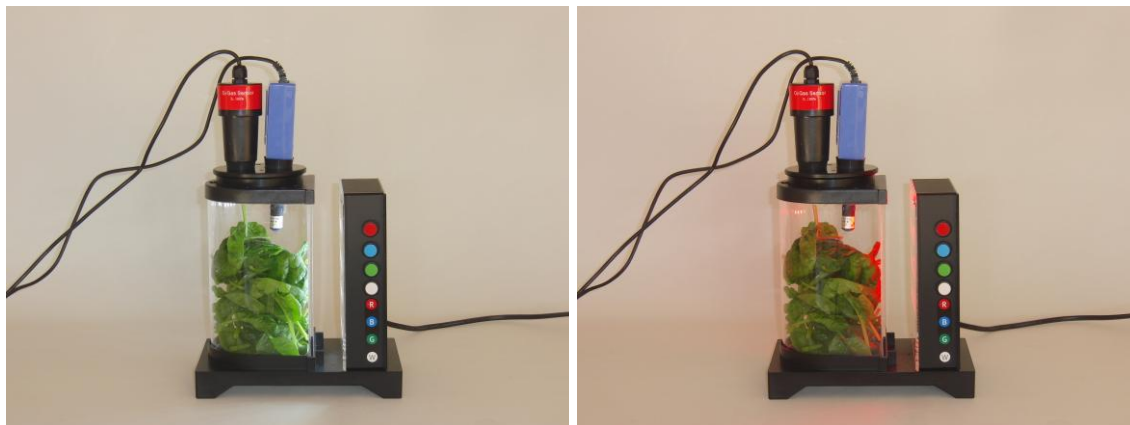
**Figure 2:** Light emission spectrum of the blue, green and red LEDs from the lamp. The absolute intensities differ strongly with the position and distance from the lamp.

### Suggested experiments

- Measuring photosynthesis and respiration rate of fresh spinach leaves at different light intensities using the CO<sub>2</sub> and O<sub>2</sub> sensors.
- Measuring photosynthesis and respiration rate of fresh spinach leaves at different light colors using the CO<sub>2</sub> and O<sub>2</sub> sensors.
- Measuring the photosynthesis and respiration during the daily cycle of a small plant using the CO<sub>2</sub> and O<sub>2</sub> sensors.
- Building and monitoring a closed miniature ecosystem with producers, consumers and decomposers.
- Exploring the growth speed and respiration of algae under different light colors and

light intensities.

- Measuring the respiration and pH during the fermentation of milk by lactic acid bacteria.
- Measuring the respiration and pH during the fermentation of sugar by yeast.



**Figure 3:** Measuring photosynthesis of fresh spinach leaves at different light colors using the CO<sub>2</sub> and O<sub>2</sub> sensors.

### Technical specifications

<i>LED lamp</i>	White (peak intensity at 446 nm, 543 nm and 603 nm). Blue (peak intensity at 460 nm) Green (peak intensity at 520 nm) Red (peak intensity at 630 nm)
<i>Hole diameters</i>	29/28 mm (sensor holes) / 5 mm (thermometer holes)
<i>Dimensions</i>	135 mm x 220 mm x 460mm (l x w x h)

### Warranty

The Photosynthesis Set 050 is warranted to be free from defects in materials and workmanship for a period of 2 years from the date of purchase provided that it has been used under normal laboratory conditions. This warranty does not apply if the sensor has been damaged by accident or misuse.

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*Note: This product is to be used for educational purposes only. It is not intended for industrial, medical, research, or commercial applications.*

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