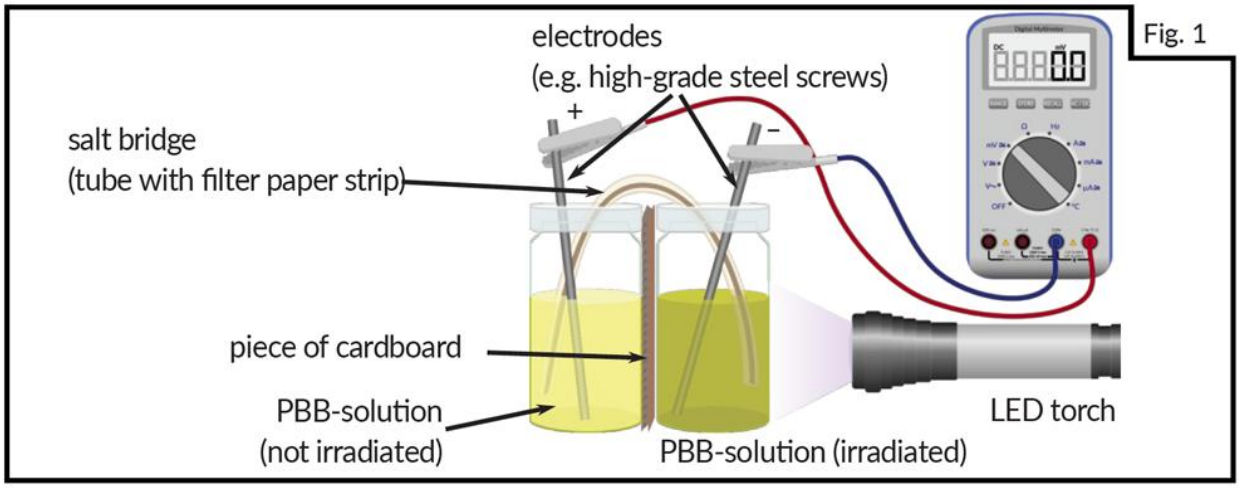
Name: _____ Date: _____

Photo-Blue-Bottle (Sek. II/upper secondary level)

A model experiment for energy conversion and energy storage in a light-driven concentration cell

PBB – Energy conversion and energy storage



E1 Photoelectrochemical concentration cell

Following fig. 1, set up the experiment and switch on the LED torch. Observe voltage and colour for three minutes. Switch off the light and observe another three minutes. Name all forms of energy which are involved in the experiment.

E2 The following reduction is responsible for the build-up of voltage: $EV^{2+} + e^- \xrightleftharpoons{light} EV^+$ However, the ratio $\frac{c(EV^{2+})}{c(EV^+)}$ plays a decisive role. By using chemical equations, explain the chemical processes which take place at the two electrodes.

E3 The concentration cell shows a voltage of 200 mV. Calculate the ratio $\frac{c(EV^{2+})}{c(EV^+)}$ in the irradiated half-cell (E^0 (EV^{2+}/EV^+) = -0,45 V). Assume that the ratio in the other, not irradiated half-cell is $\frac{c(EV^{2+})}{c(EV^+)} = 10^{10}$. Afterwards, compare the ratio $\frac{c(Ox)}{c(Red)}$ in the two half-cells and give reasons for the differences.

E4 Experiment E1 works with sunlight, too. Assess the suggested name ‘solar accumulator’ for the concentration cell. Then discuss why the production and storage of electrical energy from sun light is of utmost importance for our society.

An additional assignment for Biology courses:

E5 Point out the limits to the model experiment.