

required
knowledgeoxidation and reduction
(gain and loss of oxygen)

composition of air

chemical equations

photosynthesis (biology, elementary level)

The Photo-Blue-Bottle-Experiment

E1 Find different ways to set off a chemical reaction in the closed screw-top vial based on the material at hand (hot plate, torch with different light colours, UV torch). Once you can observe the formation of a blue substance in the yellow solution, you have been successful.

Jot down your findings in a chart like the one on the right.

Hint: Colours within the visible light spectrum



energy form	colour; temp.; etc.	observation

Photo-Blue-Bottle: Y → B

Photo-Blue-Bottle: B → Y

E2 Read the following statements and decide whether they are true or false (in case you are undecided, write down a question mark (?)). Based on your findings in **E1**, give reasons for your choice. Plan experiments to clarify the statements which you marked with a question mark.

The chemical reaction Y(ellow Solution) → B(lue Solution) ...

- ☐ ... requires energy supply.
- ☐ ... does not work with any given colour from the visible light spectrum.
- ☐ ... does not take place if there is no air above the solution.
- ☐ ... only takes place at temperatures above 5 °C.
- ☐ ... releases energy.
- ☐ ... does not require any air.

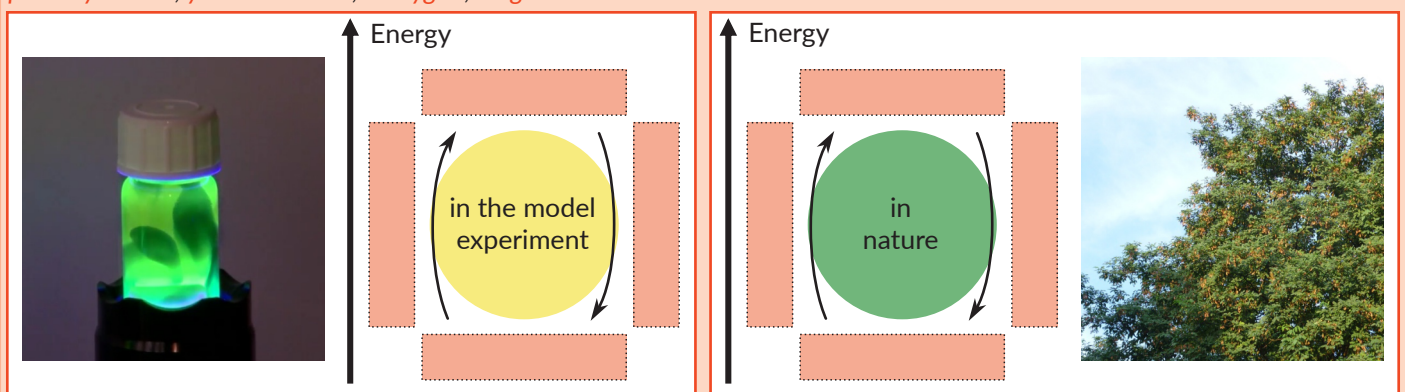
The chemical reaction B(lue Solution) → Y(ellow Solution) ...

- ☐ ... occurs if you shake the solution.
- ☐ ... takes place even though there is no air above the solution.
- ☐ ... does **not** take place if energy is supplied in the form of light.
- ☐ ... requires air.
- ☐ ... releases energy.
- ☐ ... requires only oxygen from the air.

Analysis: From Photo-Blue-Bottle to photosynthesis

A1 The reaction cycles Yellow → Blue → Yellow are a model for the natural cycle of photosynthesis and respiration.

Fill in the boxes with these words: *blue solution*, *cellular respiration*, *high-energy substances*, *low-energy substances*, *photosynthesis*, *yellow solution*, + *oxygen*, + *light*



A2 Match the terms *oxidation* and *reduction* to the arrows and give reasons for your choice.

A3 In a Venn diagram, collect similarities and differences between the two processes (model experiment vs photosynthesis/cellular respiration).

A4 By creating a list of the model experiment's advantages and disadvantages, assess it.

Finished? An assignment for the quick ones:

A5 In a chart or in a mind map, collect all forms of energy you have already come across in your science classes. Add an application example ("In which process is this form of energy being used?"). Specify the function of the respective energy form. Add a title to your diagram.

Hint: When working with a mind map, use different colours for energy form, application, and function. Create a legend.