

Building a Lego® Polarimetry

Objectives

- To build a Lego® polarimeter

Construction

Health & Safety

Voltages used in polarimeter are low such that it is very unlikely to cause harm. Avoid shining LED torches in eyes. The LED detector used will not overheat. The multimeter should only be used in completing the circuit instructed.

Equipment Provided

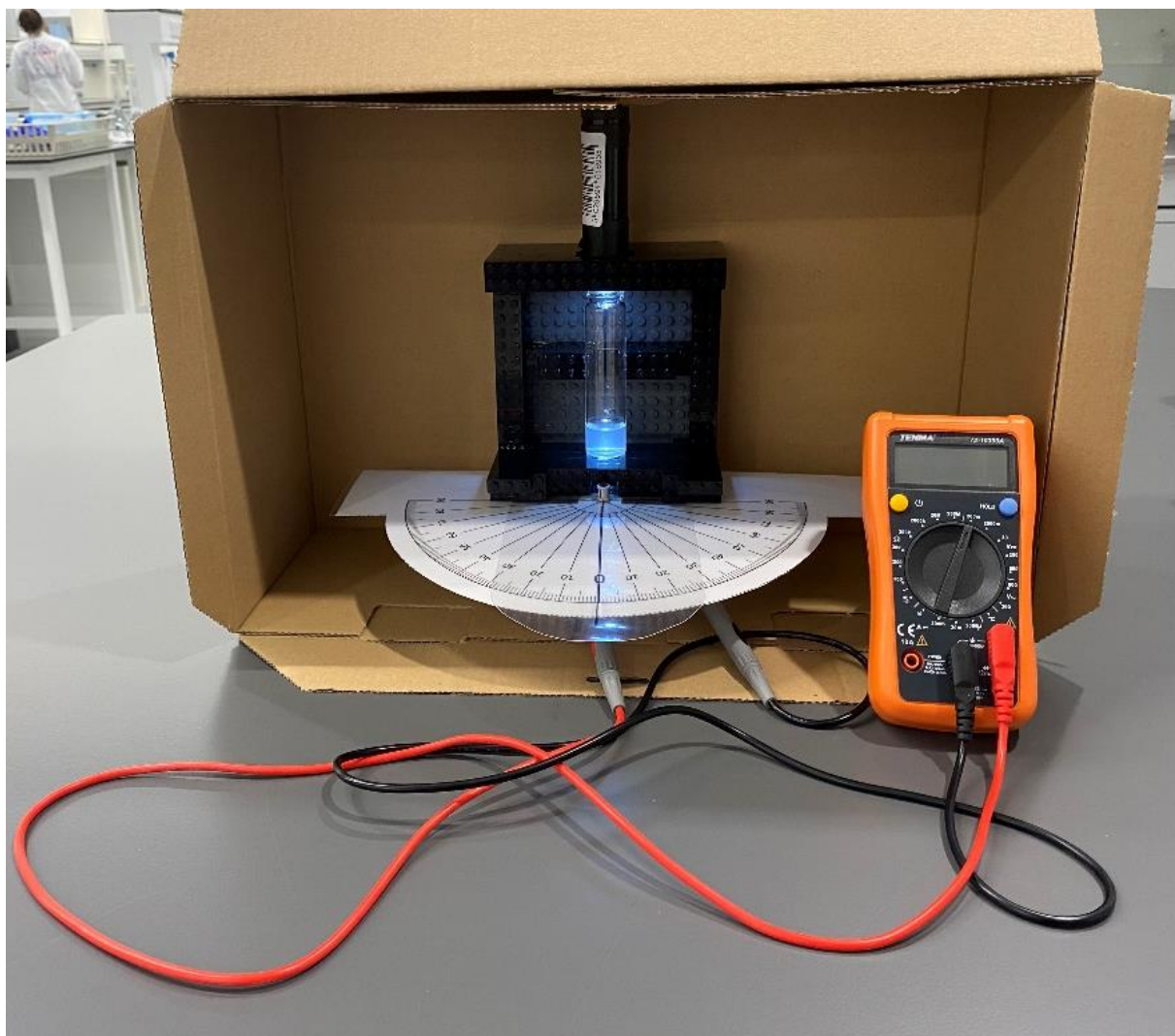
- Multimeter XL830L
- Black Electrical Lead
- Red Electrical Lead
- Red Crocodile Clip
- Black Crocodile Clip
- 9 LED Torch
- 2 Red LED 5 mm (one backup)
- Laminated Protractor
- Plastic dial/ dial polarising film (attached)
- Fixed Polarizing Film
- 2 Specimen Tubes
- Permanent Marker
- Lego® Set

Constructing the Lego® Polarimeter

Before beginning your build, you must test your LED light detector.

1. Locate your multimeter. Attach the red wire to the red crocodile clip and the longer LED leg. This is the anode. Attach the black wire and to the black crocodile clip and the short LED leg. This is the cathode. Note: You should separate the legs of the LED detector to prevent a short circuit!
2. Attach the red wire to the 'V Ω mA' port and the black wire to the 'COM' port.
3. Turn the dial anticlockwise to 200 m (200 mV). You should observe a voltage with a nonzero value on the multimeter. If you do not, your LED sensor may be faulty, and you should test the replacement before proceeding.

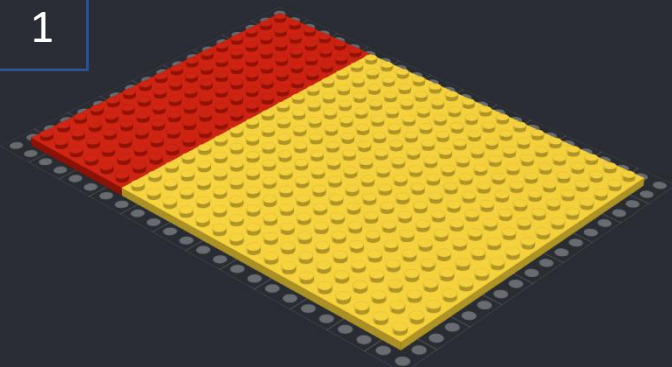
Construct polarimeter following the attached instructions. See tips before building!



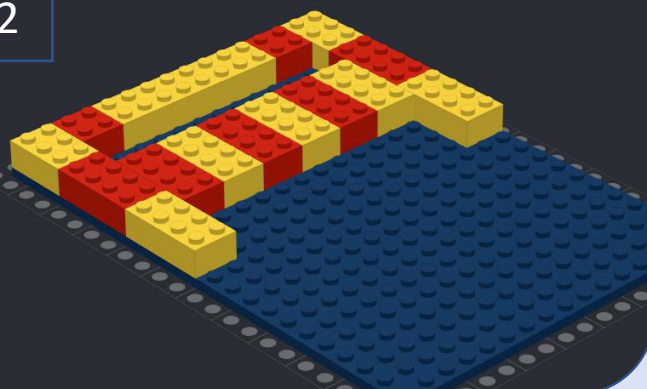
Tip: Construction of Lego® Polarimeter

- The LED light may not fully fit into fit into the technic brick. Simply insert the detector as far as possible but note too much pressure may cause the LED to break!
- Ensure the black and red wires are fully inserted into the multimeter in order to measure an accurate voltage.
- Refer to the picture of the final product above for the correct orientation of the polarimeter.

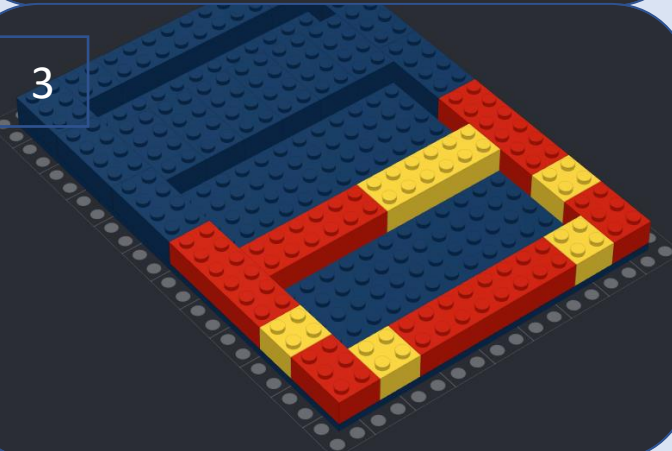
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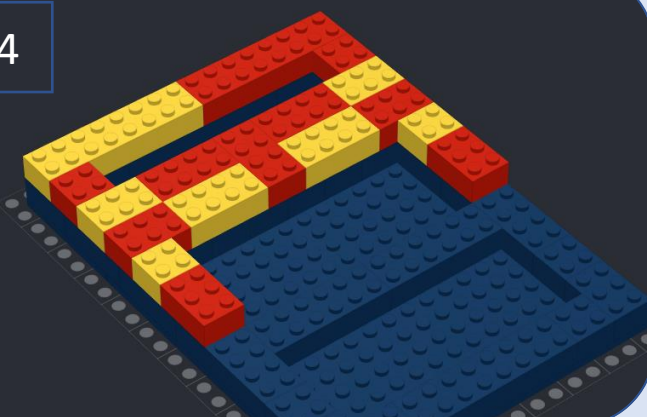
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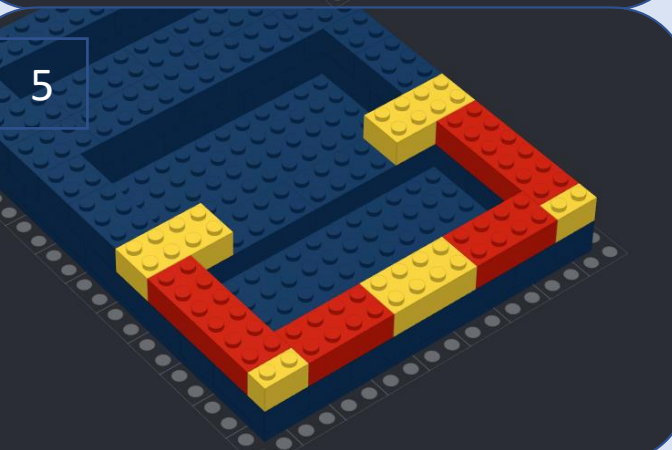
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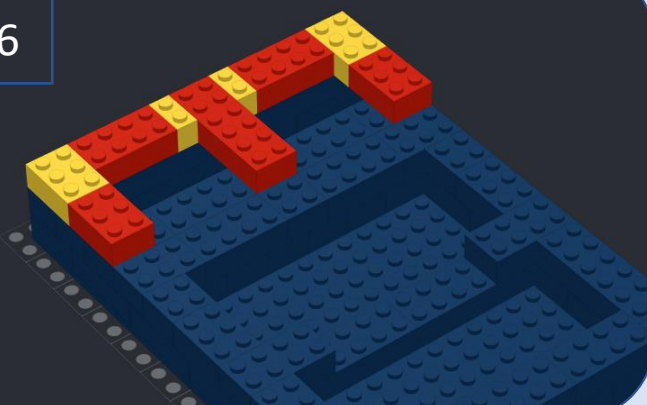
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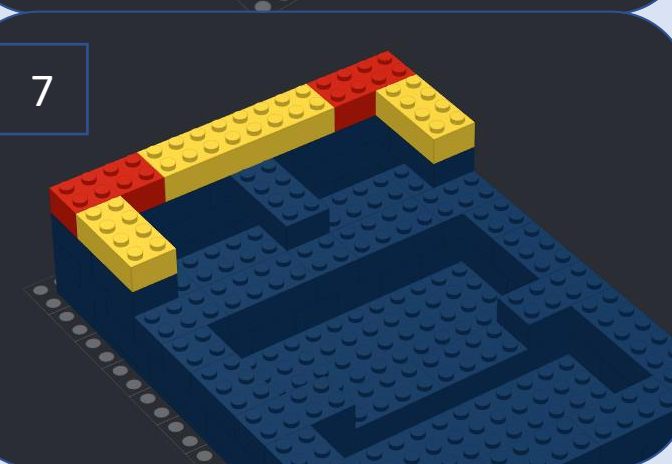
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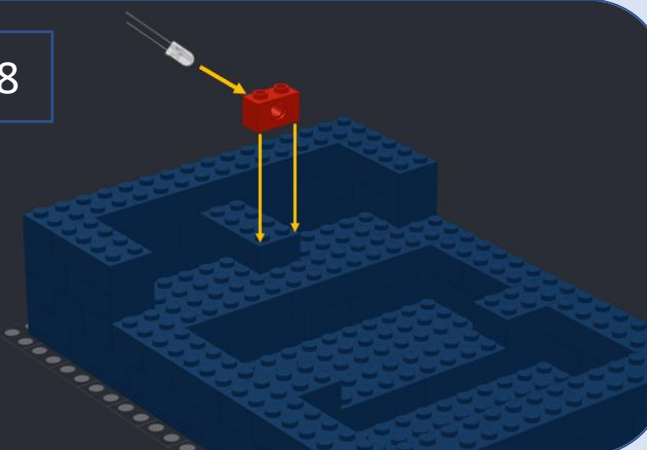
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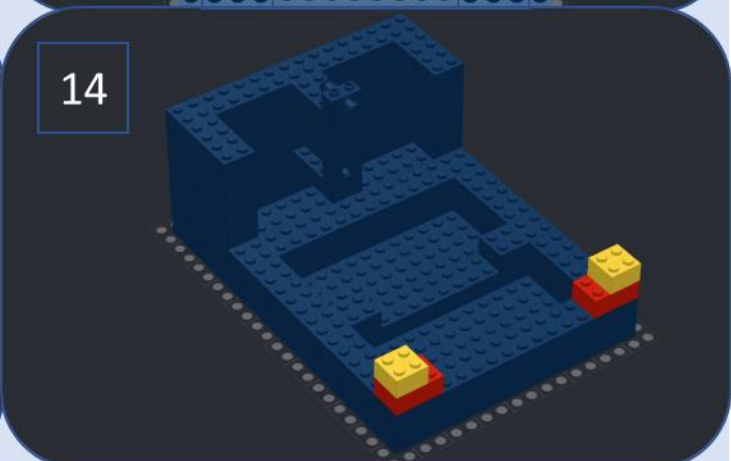
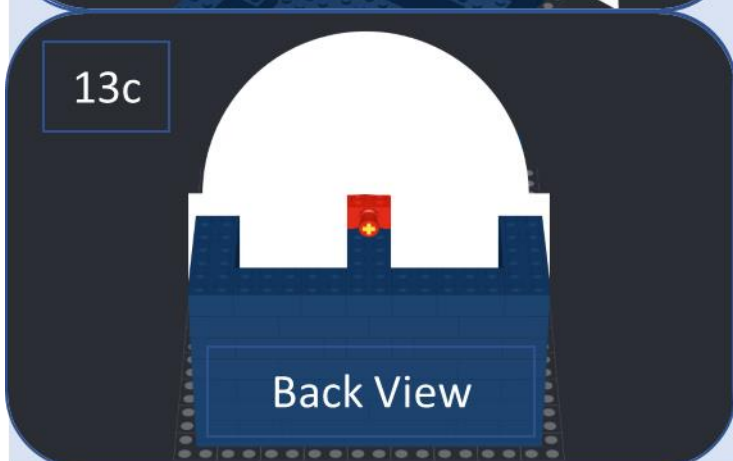
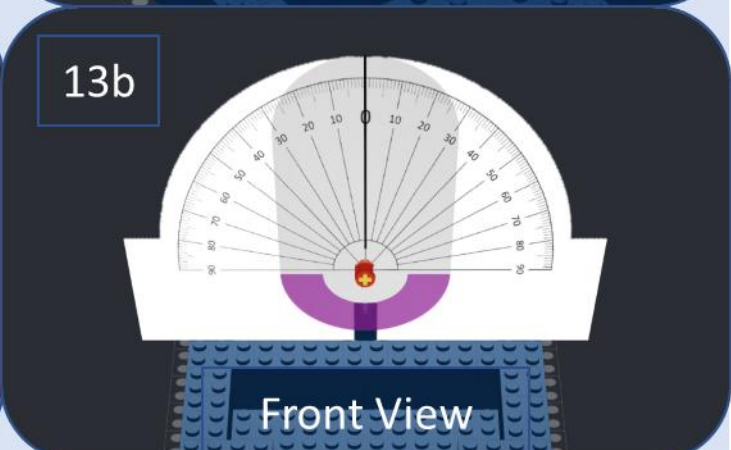
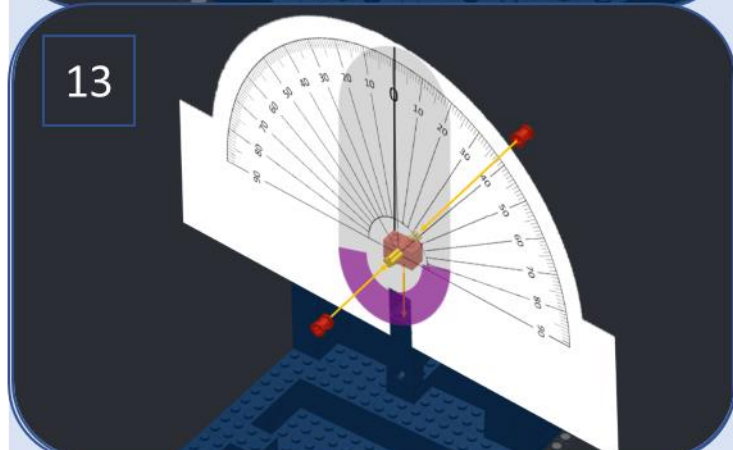
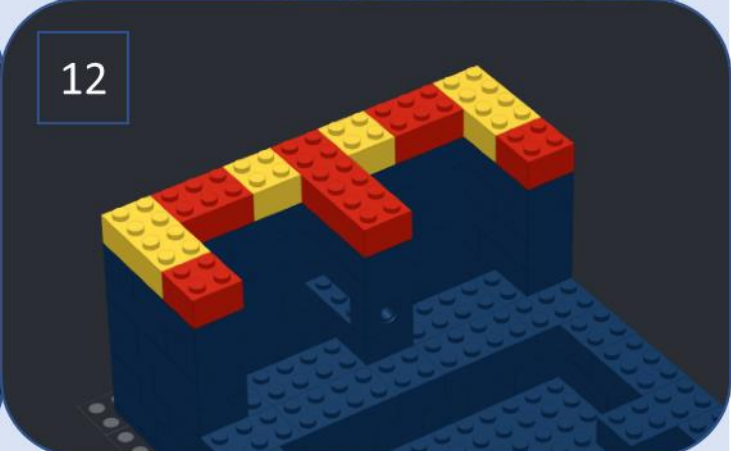
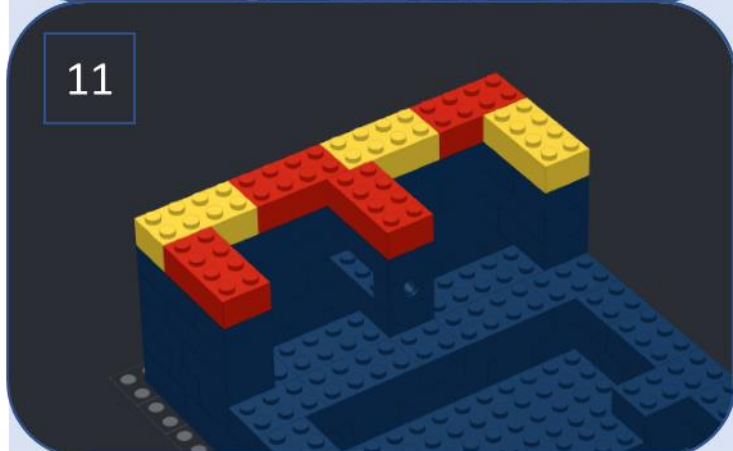
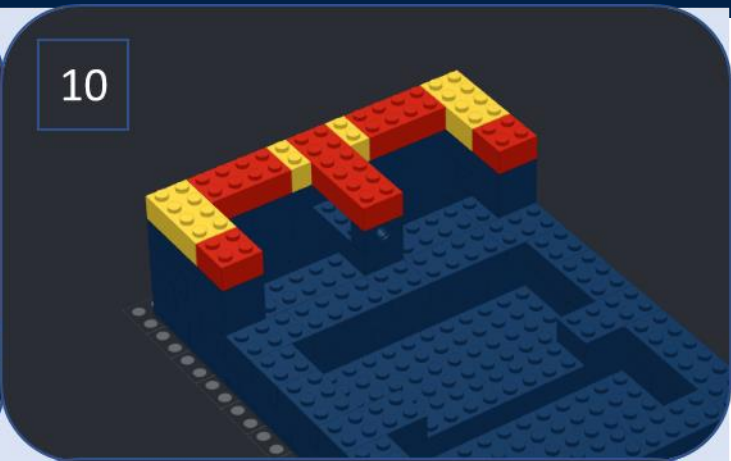
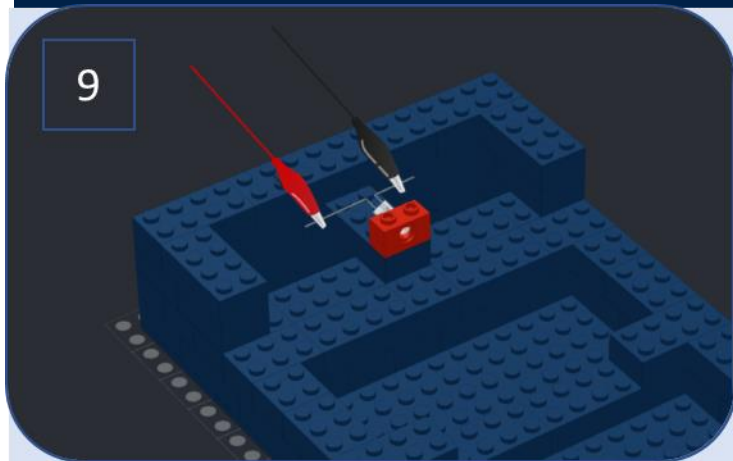


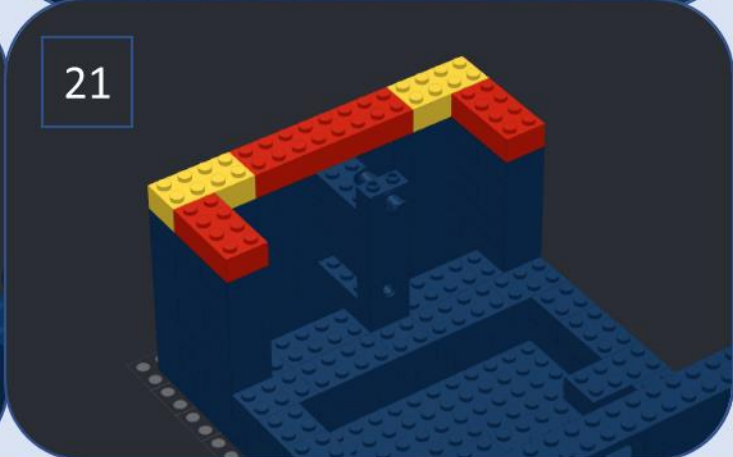
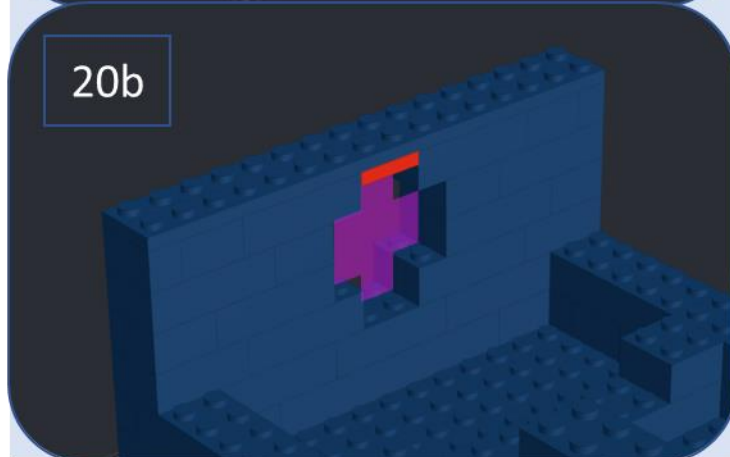
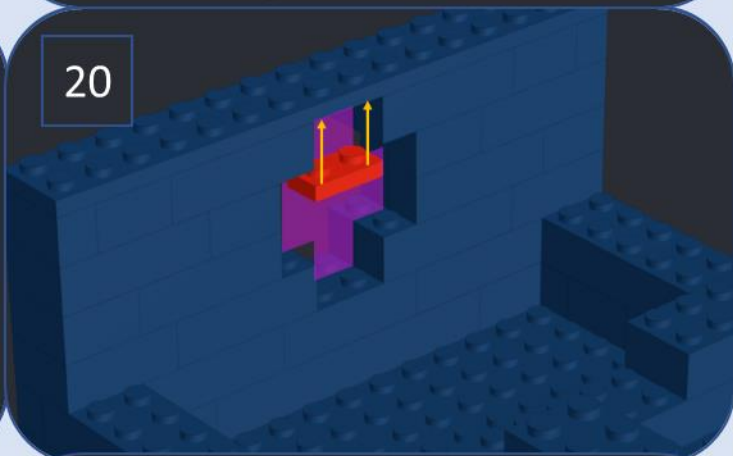
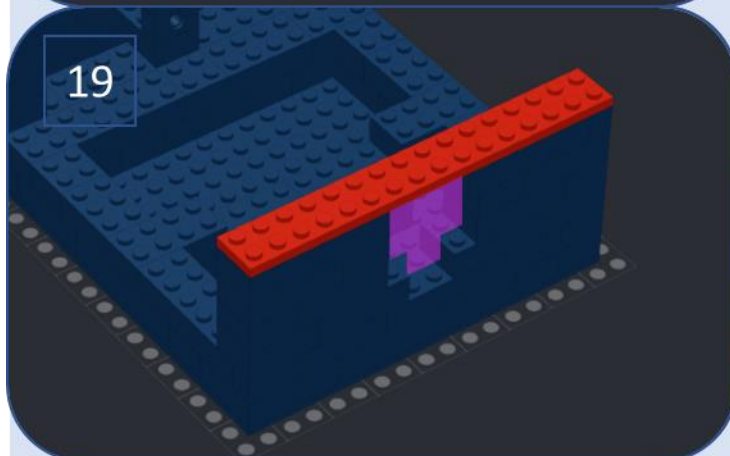
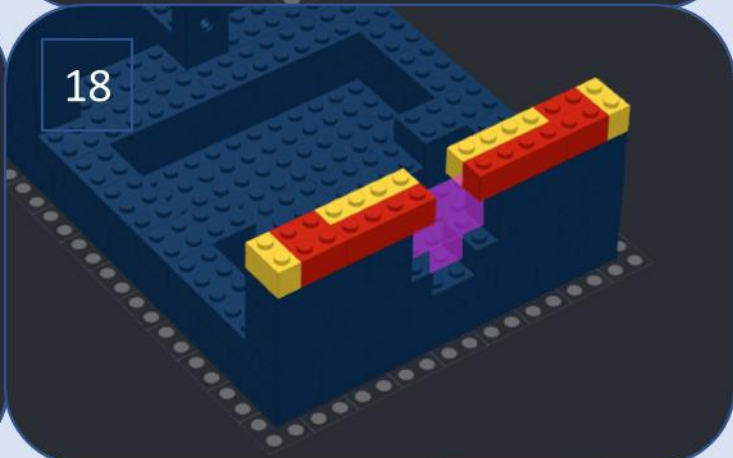
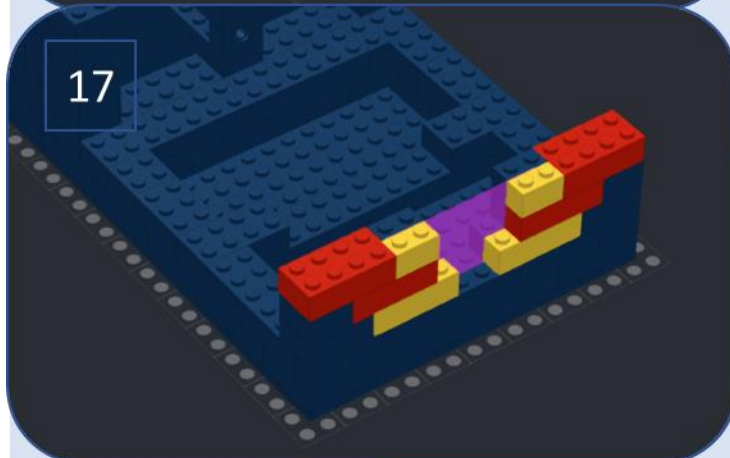
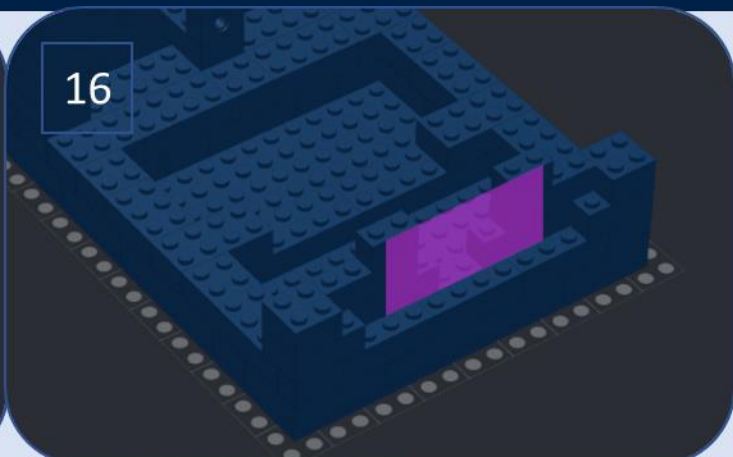
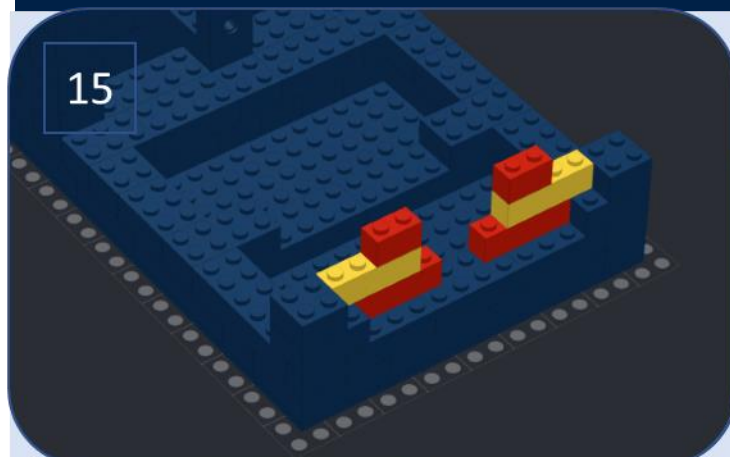
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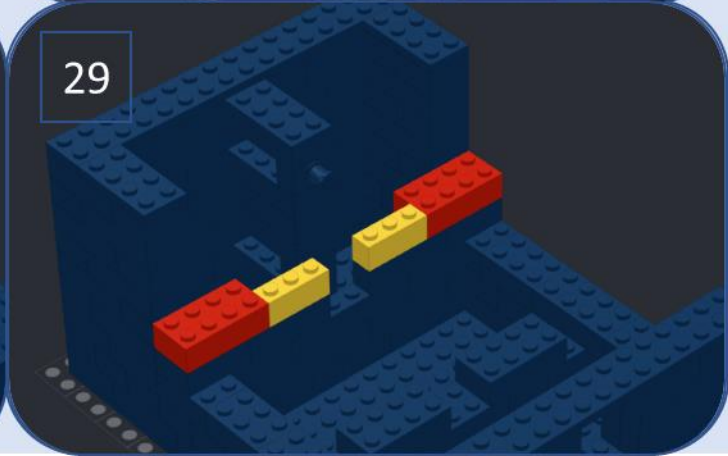
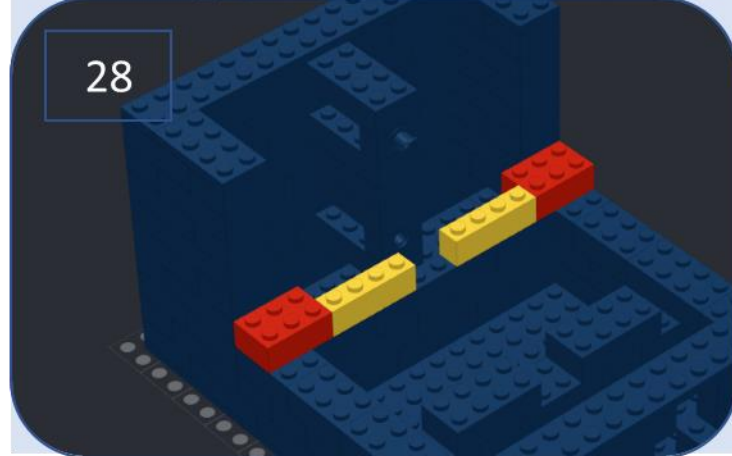
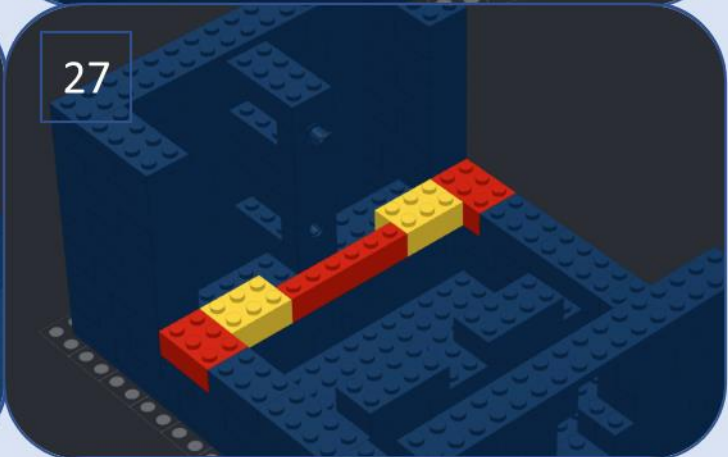
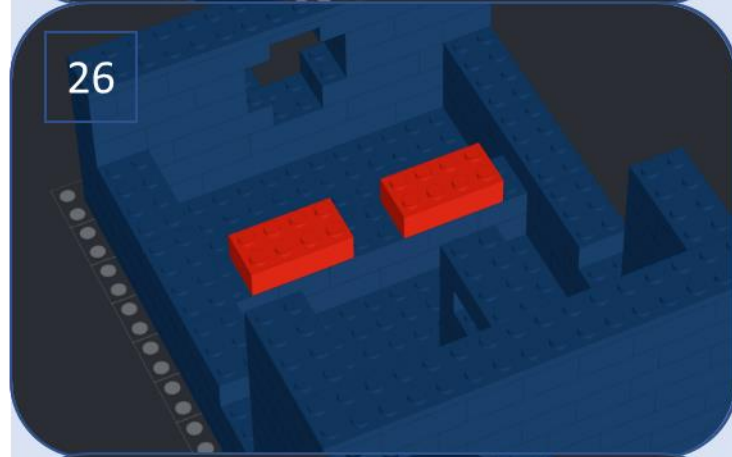
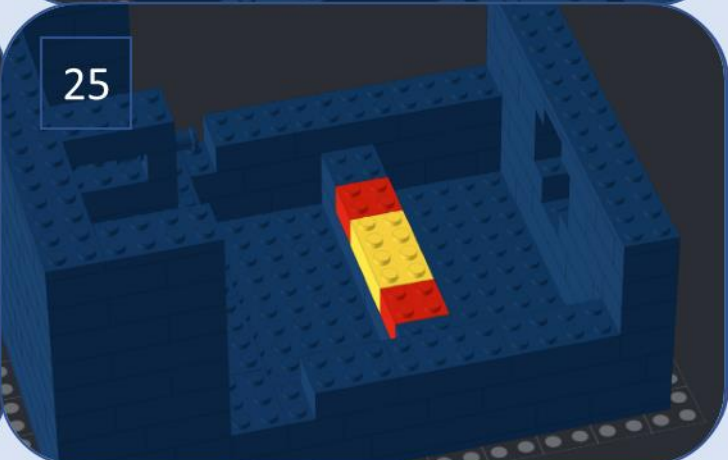
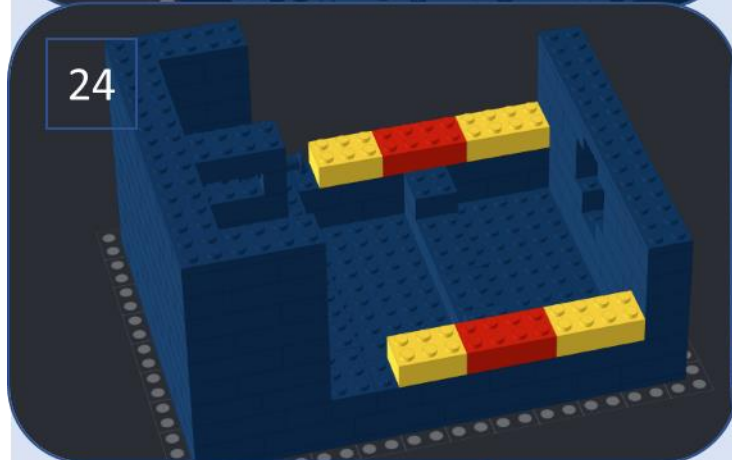
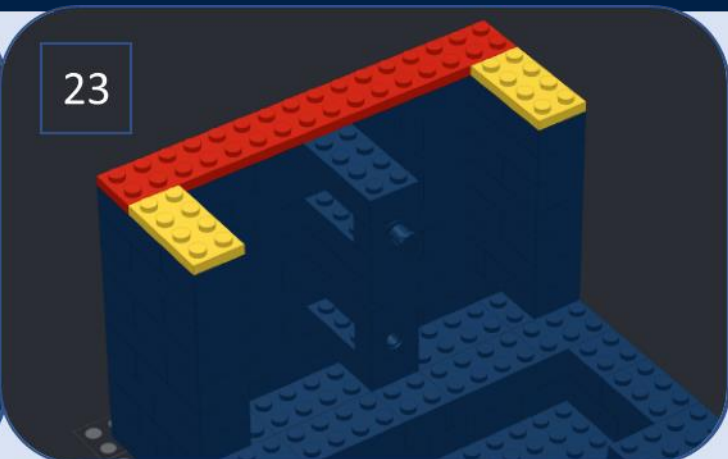
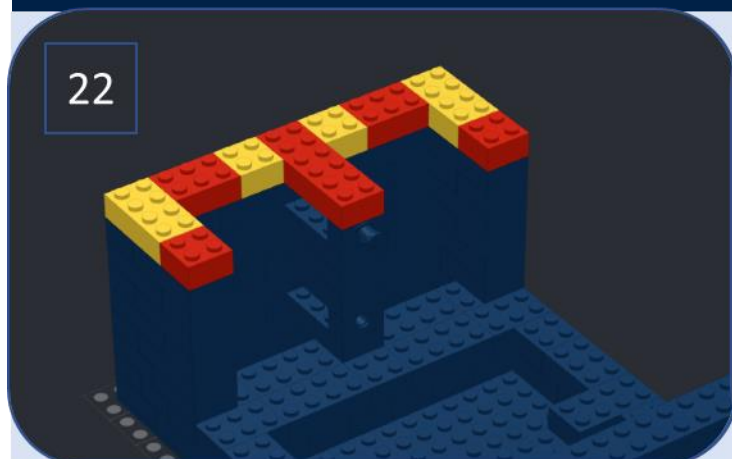


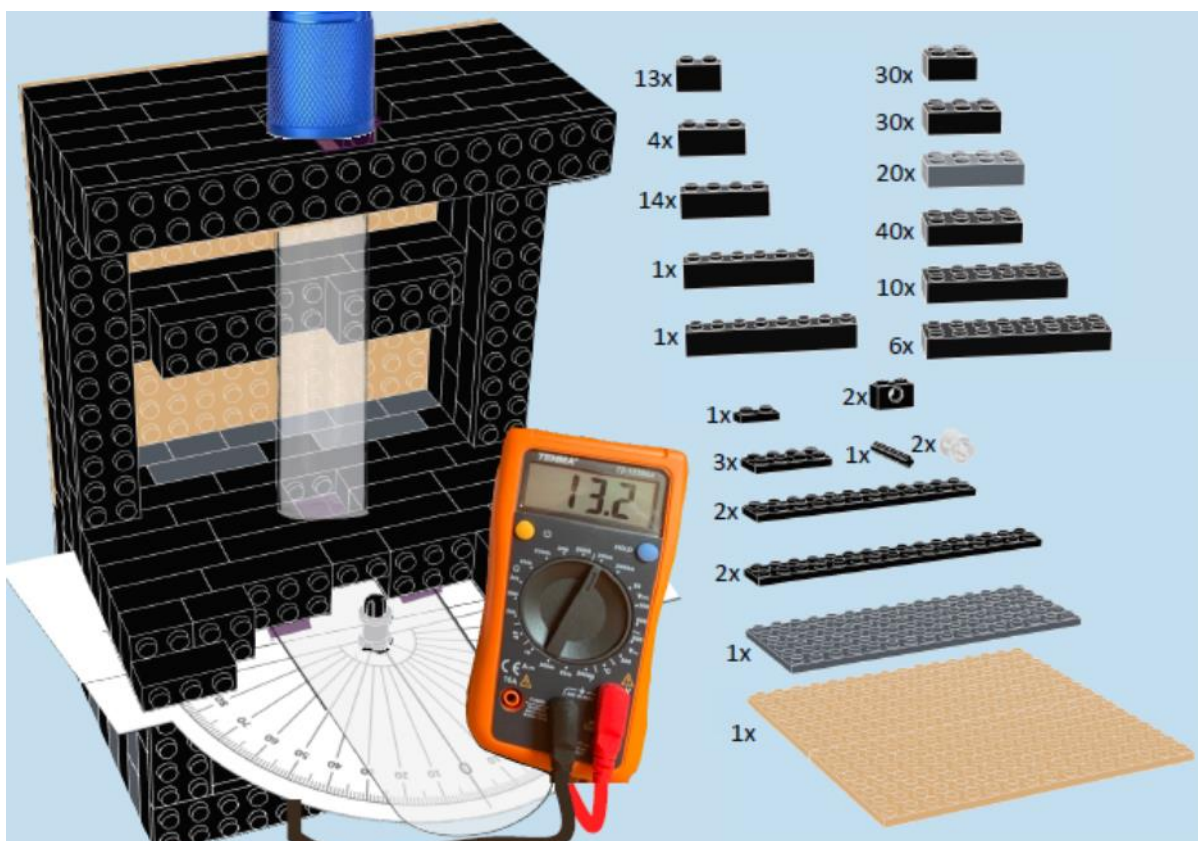
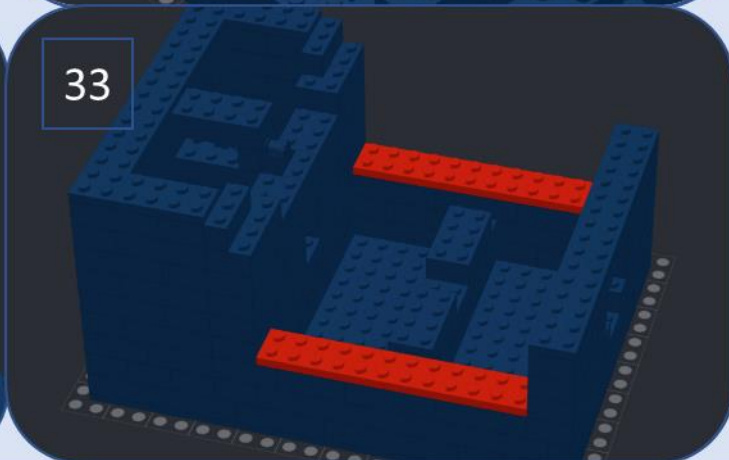
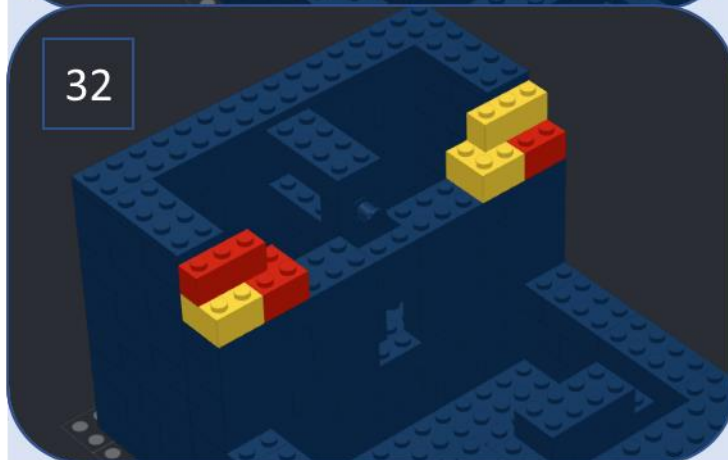
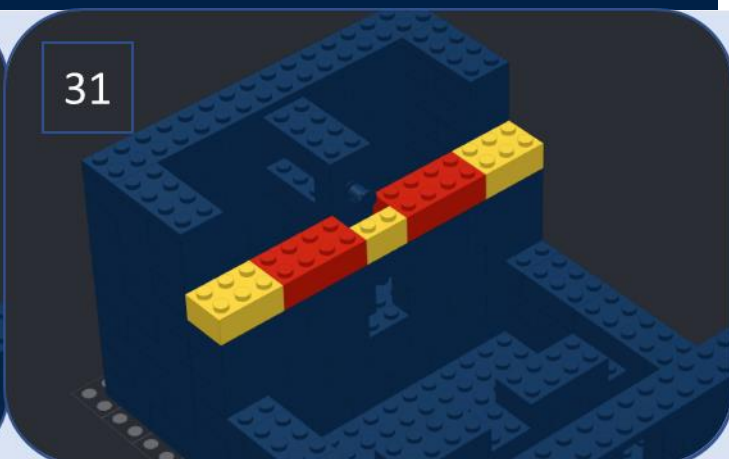
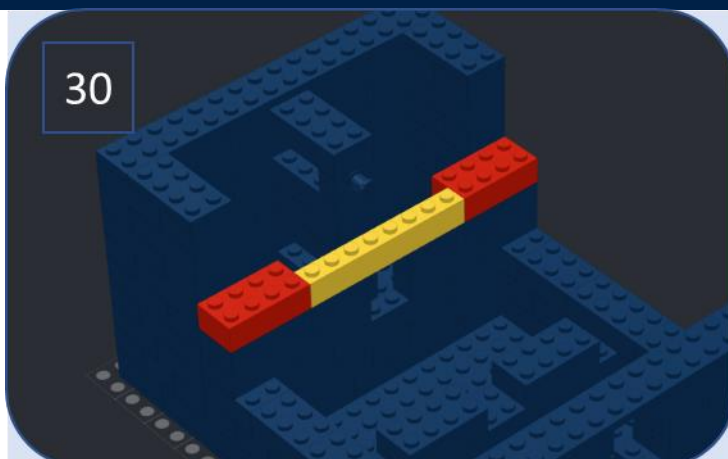
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References consulted:

L. Kvittingen and B. J. Sjørnes, *J. Chem Edu.* **2020**, *97*, 2196–2202.

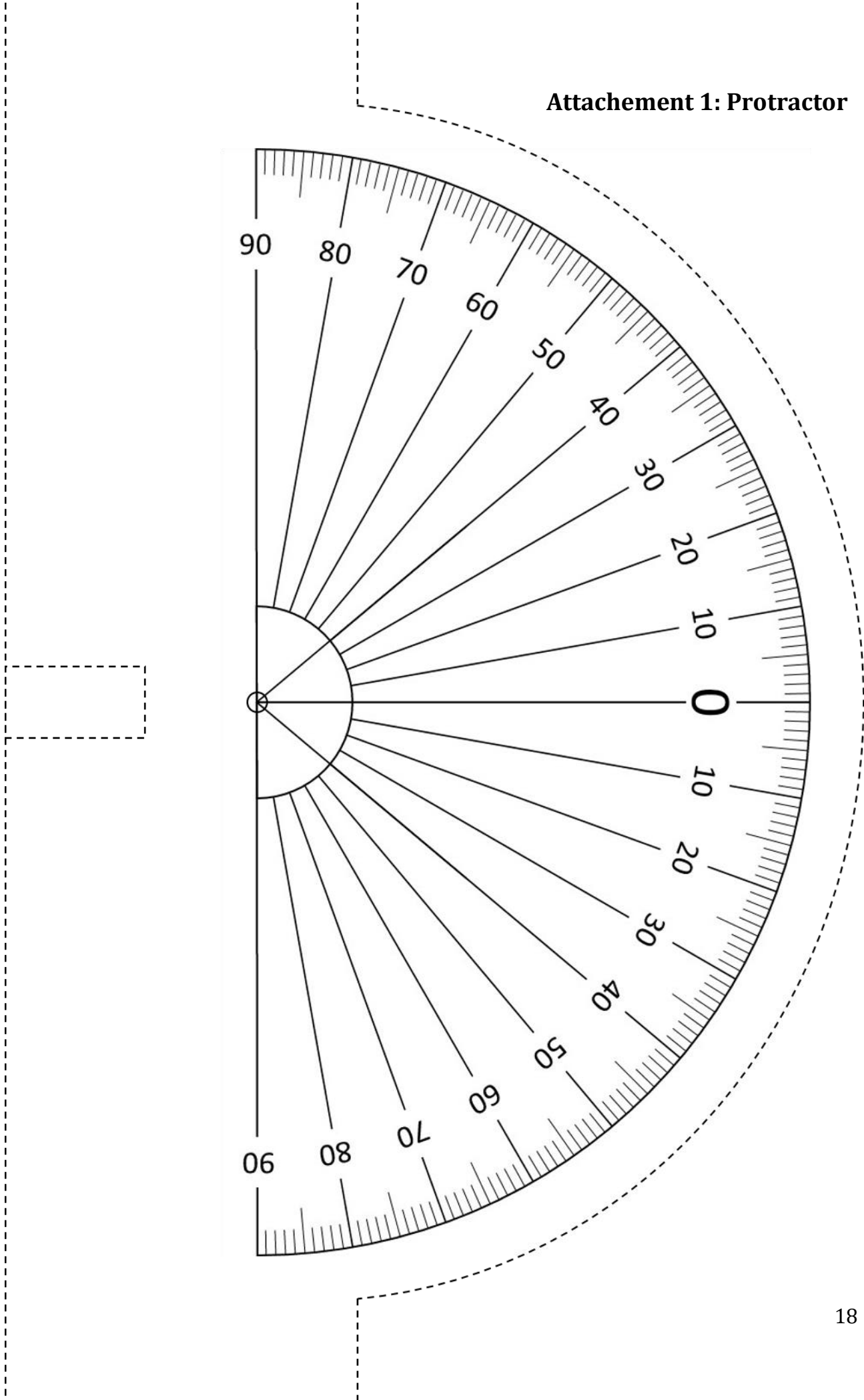
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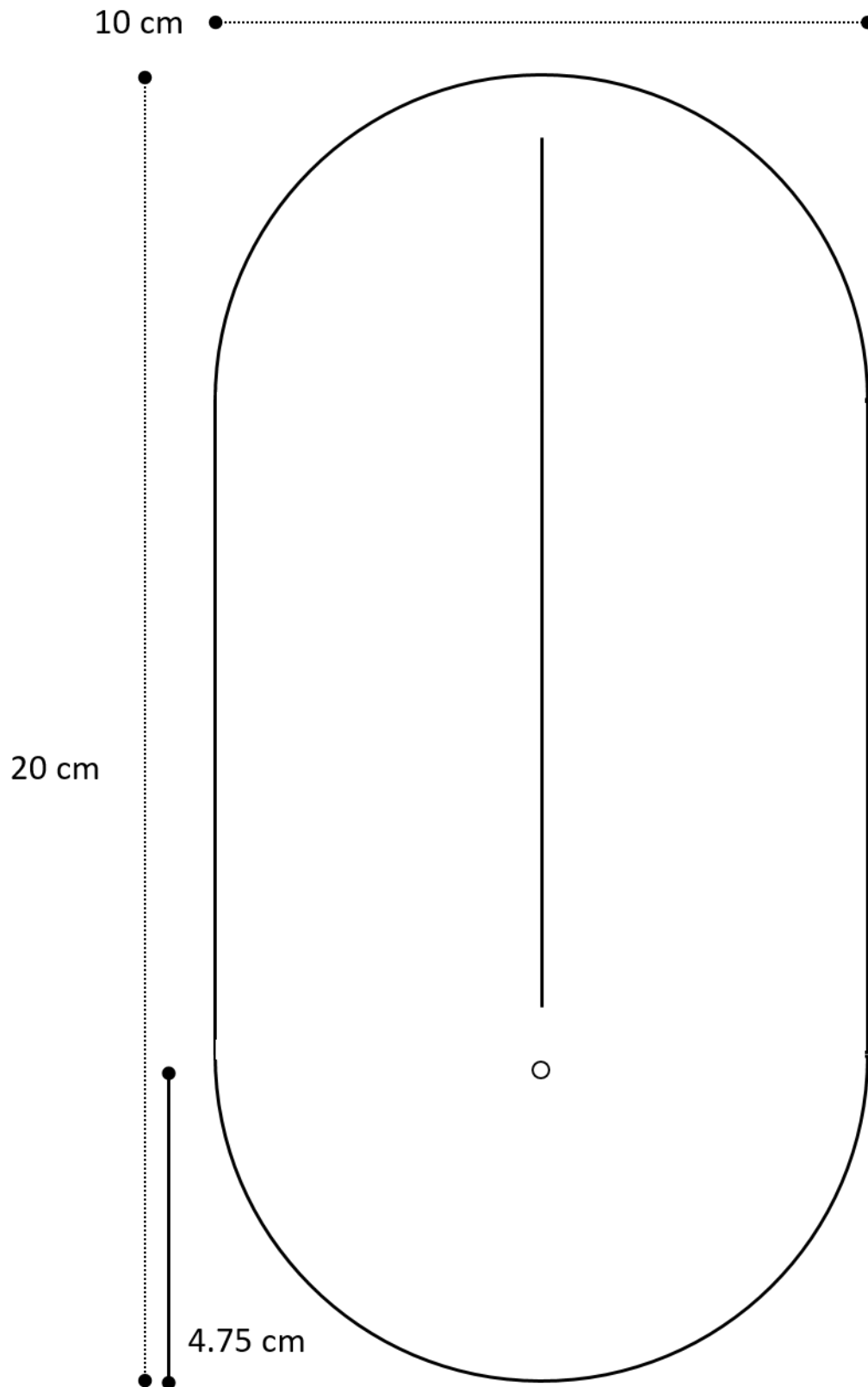
The templates of the protractor, dial and film (below) are courtesy of L.Kvittingen and B.J.Sjørnes.

This resource has been authored by members of the Department of Chemistry at the University of Oxford.

Attachement 1: Protractor



Attachment 2: Pattern for the plastic dial



Attachment 3: Patterns for the rotating and fixed polarizing films

