

a WOW Lab

BLUEPRINT

Light-Bending JELL-O

Prep Instructions

Part I – Making the JELL-O

The JELL-O should be made at least one day before performing the activity.

The following items will be required for the prep of this part of the activity:

- 600 mL beaker
- water
- JELL-O powder (not sugarless)
- styrofoam plates
- metal cookie cutters (optional)
- kettle

Step 1

In a 600 mL beaker, mix 500 mL of boiling water with two JELL-O packages of the same colours. Do not follow the recipe on the package because the JELL-O needs to be twice as concentrated for this activity. Mix until the powder is completely dissolved.

Step 2

Place a Styrofoam plate on a flat surface in the refrigerator. Pour the JELL-O into the plate until it reaches the rim. Do not attempt to pour the JELL-O into the plate on a countertop and then transfer to a fridge, as the plate will collapse.

Step 3 (optional)

Metal cookie cutters can be used as moulds for the JELL-O to ensure that precise shapes are made. Tape a cookie cutter face up to a Styrofoam plate. Pour the JELL-O into the cookie cutter before it has set. If JELL-O is leaking from the cookie cutter, pour some water into the plate around the cookie cutter. Trying to cut the JELL-O after it has set with a cookie cutter often leaves a convex edge and should be avoided.

Step 4

Repeat Steps 1, 2 and 3 with the remaining packages of JELL-O. Leave overnight in the fridge to set.

Part II - Cutting the JELL-O

Cutting the JELL-O into various shapes (**Figure 1**) is the trickiest part of this activity. It is crucial to make straight and smooth cuts to avoid creating aberrations when the light passes through the interface. Cutting tools will work best when warmed, so always dip them into hot water before cutting. A list of shapes that work well is provided in **figure 4** on page 3. The following steps outline some suggested cutting techniques.



Figure 1

The following items will be required for the prep of this part of the activity:

- JELL-O
- cutting board
- craft knife
- pastry cutter

Step 1

Once the JELL-O is set, place the styrofoam plate on the cutting board. Using the craft knife, cut the rim off of the plate (**Figure 2**). It works best if the knife is kept stationary while turning the plate.

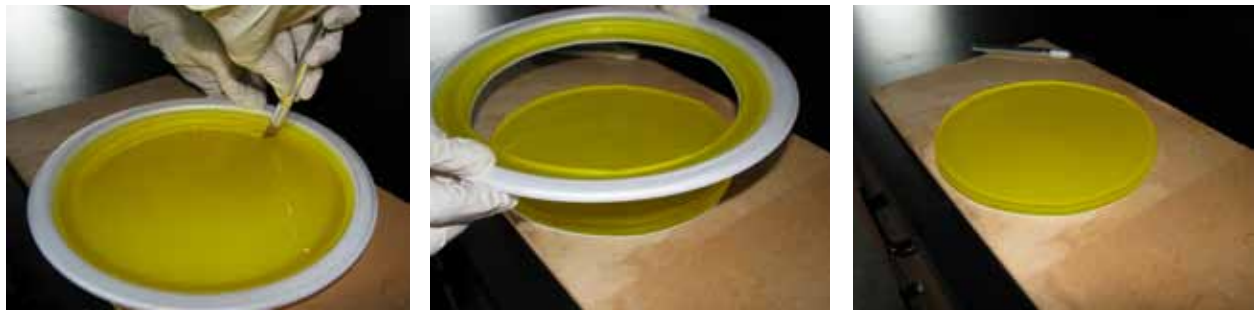


Figure 2

Step 2

Use the pastry cutter to make straight-edge cuts. Dip the pastry cutter into hot water then push it slowly through the JELL-O, keeping the blade as perpendicular to the surface of the plate as possible. If the pastry cutter does not easily cut through the Styrofoam, draw the craft knife along the outer side of the pastry cutter (**Figure 3**). If the *International Spy Academy* activity will be done with the class then refer to **figure 4** for suggestions of shapes. Feel free to experiment.



Figure 3

Step 3

For circular shapes, try to use the curvature of the JELL-O that resulted from cutting off the rim of the plate. For shapes where this is impossible, it is best to use moulds such as metal cookie cutters (see Part I Step 3).

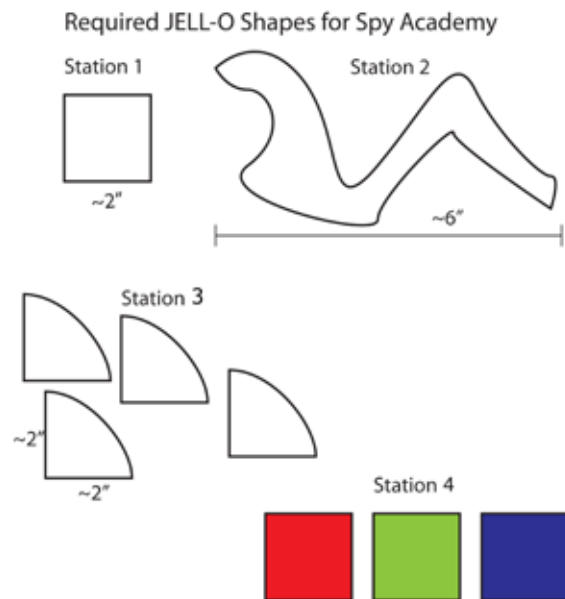


Figure 4

Part III - Setting up the International WOW Spy Academy

Stations 1 and 2 work just as well using either a red laser and red JELL-O or a green laser and green JELL-O.

Station 1 - Calculate the Speed of Light inside JELL-O

Materials

- red laser
- piece of red JELL-O with a straight edge
- cue card print-outs from the *Activity Instructions*
- ruler
- translucent protractor
- scientific calculator

Station 2 - Calculate the Critical Angle of JELL-O

Materials

- red laser
- cue card print-outs from the *Activity Instructions*
- piece of red JELL-O
- scientific calculator

Station 3 - Determine the Colour Absorbance of JELL-O

Materials

- one green laser
- one red laser
- one piece each of green and red JELL-O
- optional: one piece each of orange and blue JELL-O
- cue card print-outs from the *Activity Instructions*

Station 4 - Complete the Optical Course

Required Materials

- green laser
- one or two pieces of JELL-O
- cue card print-outs from the *Activity Instructions*
- shoebox lid
- cardboard

Construct optical courses using the cardboard pieces to make the barriers. Some examples are shown in **figure 5**. They are most easily built with a shoebox lid, rectangular sections of cardboard and a hot glue gun. Feel free to experiment with designs. Avoid obstacles that require more than two reflections and more than two pieces of JELL-O. Before starting the Optics Training Course as described in the *Activity Instructions*, please read the information on optics in the *Additional Information*.

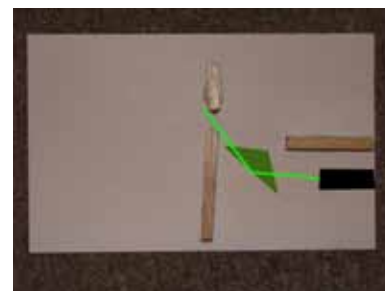
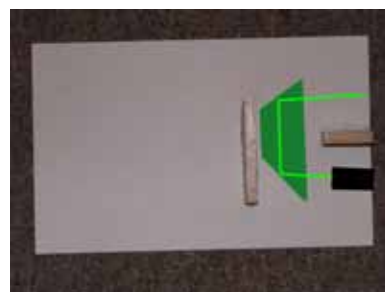
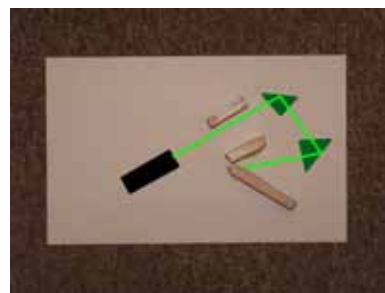


Figure 5