

CHAPTER 2	Investigation 2.B: Soap Bubble Molecules	BLM 2.1.10
HANDOUT		

Using molecular modelling kits helped you visualize the bonds between atoms and clearly identify which atoms are bonded. However, you do not get a good sense of the more realistic shape that is shown by space-filling molecules. Soap bubbles produce good models of molecular shapes. In this investigation, you will model some three-dimensional features of simple molecules.

### Materials

- soap solution (mixture of 80 mL distilled water, 15 mL dish soap, and 5 mL glycerin)
- 100 mL beaker
- hard, flat surface
- straw
- 2 transparent 15 cm rulers
- protractor
- paper towels

### Safety Precautions

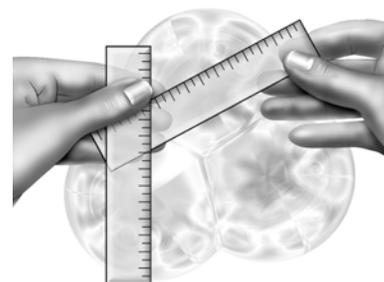


- Ensure that each person uses a clean straw.
- Do not get any of the detergent solution in your mouth.
- Clean up all spills immediately.

### Procedure

1. Obtain approximately 25 mL of the prepared soap solution in a 100 mL beaker.
2. Use the soap solution to wet an area of about 10 cm x 10 cm on a hard, flat surface.
3. Dip a straw into the soap solution in the beaker and blow a bubble on the wet surface. Then blow a second bubble of the same size so that it touches the first bubble. Record the shape of this simulated molecule and measure the bond length between the centres of the two bubbles where the nuclei of the atoms would be located. You could stand above the bubbles and hold a transparent ruler over but not touching them to roughly measure the distance from the centre of one atom to the centre of the other atom.

Shape of molecule:



4. Repeat Procedure Step 3 with three bubbles of the same size, to simulate three bonding pairs. Record the shape and the bond angles (the angles of the planes of contact of the soap bubbles). To measure angles, hold two rulers over the bubbles. Hold the ends of the rulers together with one hand, as shown, and adjust the angle in the bubbles. Then measure the angle between the rulers.

Shape of molecule:

Bond angles:

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5. On top of the group of three equal-sized bubbles, blow a fourth bubble of the same size that touches the centre. Estimate the angle that is formed where bubbles meet.

Shape of molecule:

Bond angle:

6. Repeat Procedure Step 3, but this time, to simulate a lone pair, make one bubble slightly larger than the other two.
7. To simulate two lone pairs, make a fourth bubble that is the same size as the large bubble and rest it on top of the three bubbles you made in Procedure Step 6. Record the resulting bond angles. Record any changes in the original bond angles when the fourth bubble was added.

Bond angles:

Change in bond angles with fourth bubble?

8. Clean your work area using dry paper towels first. Then wipe the area with wet paper towels.

### Analysis

1. What shapes and bond angles were associated with two, three, and four same-sized bubbles? Give an example of a molecule that matches each of these shapes.

2. Give an example of a molecule that matches each of the shapes in Procedure Steps 6 and 7.

### Conclusion

3. What property of soap bubbles causes them to assume shapes similar to atoms in a molecule?