**Constructing Crystal Models**

**Purpose:** To examine the six basic crystal shapes

**Materials:** scissors, 5 toothpicks, two sheets with six crystal systems (card stock works best), tape, color pencils/crayons

**Procedure:**
1. Color each crystal face the following colors (this will help you examine the axes when finished)
   □ blue   △ yellow   ○ red  *green

2. Using a toothpick, poke holes in the black dots in the centers of each of the four shapes ( □, △, *, ○). This will make the toothpick insertion (looking at angles) much easier after the paper crystals are assembled.

3. Cut out the six paper crystal shapes along the solid lines

4. Bend the shapes along the dashed ( - - - ) lines. The dashed lines indicate the edges of the crystal. The rounded tabs will be “tucked” under and taped.

**Below are the six major crystal systems in minerals.**

- **Cubic crystal**
  - Examples:
    - Galena - Missouri state mineral
    - Pyrite: “Fool’s Gold”

- **Tetragonal**
  - Examples:
    - Wulfenite:
    - Zircon:

- **Orthorhombic**
  - Examples:
    - Topaz:
    - Stibnite:

- **Monoclinic**
  - Examples:
    - Orthoclase; a type of feldspar
    - Gypsum:
5. Once the three-dimensional crystals forms are taped together, find the ORTHORHOMIC crystal. Insert one toothpick into the **LONGEST axis** of this ORTHORHOMIC crystal. Notice that the symbol on this longest axis is a $\Box$ symbol. Also, notice that the axis’ poles are on opposite sides of the crystal.

6. Hold the toothpick VERTICALLY so you are looking at the other faces (sides) of the crystal (the $\Box$ and the $\nabla$ sides – see diagram below)

7. Slowly rotate the crystal on its toothpick axis and look at each face (side).

8. In the chart draw each face of the crystal as you rotate it on its toothpick axis. In this example the sides will look like this: The example has been completed for you.

9. Take another toothpick and insert it in the (yellow) $\nabla$ faces. This is another axis of a crystal.

10. Take a third toothpick and insert it in the blue $\Box$ faces. This is a third axis.

11. Look carefully at the three axes. Are there any more axes? **Write the total number of axes each crystal has on the data sheet** (total number of toothpicks that could possibly be inserted into the crystal)

12. Look carefully at the axes again. Do they ALL meet at right angles INSIDE the crystal? **Answer YES** if ALL meet at right angles. **Answer NO even if one does NOT make a 90 angle** in the column on the worksheet.

13. Draw the crystal AND the axes in the right-hand column. Measure and write the angles’ degrees
**Crystal type**  | **Total # of Crystal Faces** | **Draw each crystal face shape along its LONGEST axis**  | **Total # of axes**  | **Do ALL the axes meet at 90° angles INSIDE the crystal?** | **Draw your paper crystal. Using toothpicks and protractor draw in all axes. Write the angle Degrees**
---|---|---|---|---|---
Orthorhombic (example) | 6 | Draw each crystal face shape along its LONGEST axis. Be sure to hold the “axis” (toothpick) vertically when you draw the faces. PLEASE **carefully** draw the face shapes. | 3 | yes | ![Orthorhombic Crystal](image)
Cubic (also called isometric) |  |  |  |  | ![Cubic Crystal](image)
Tetragonal |  |  |  |  | ![Tetragonal Crystal](image)
Hexagonal |  |  |  |  | ![Hexagonal Crystal](image)
Monoclinic |  |  |  |  | ![Monoclinic Crystal](image)
Triclinic |  |  |  |  | ![Triclinic Crystal](image)