

## CAN THE CONTAINER HOLD MORE?

**A. Question:** *How much can a container really hold?*

**B. Materials Needed:**

1. A transparent container (glass or plastic).
2. Marbles, sand water and a graduated beaker.

**C: Procedure:**

1. Fill the transparent container up to the brim with marbles.
2. Show the students that you still have sand and water; ask them: “Can I add any other material to this container?”
3. Add sand to the container (shake to settle the sand in between the marbles); ask the same question again.
4. Now add water to the mixture of water and sand.
5. Measure off the amount of sand and water added to the marbles (do this by measuring how much is left over in a graduated beaker).
6. Do not neglect to tell students that the marbles, sand, and water particles are only illustrating how molecules of matter are behaving and that they are not molecules themselves! It is only a model!

**D: Anticipated Results:**

Students should be able to observe the sand and water take up space in between the marbles.

**E: Thought Questions for Class Discussion:**

1. Why could the container that was already filled with marbles still hold more sand and water?
2. Could we have started with water, then sand and marbles?
3. What would you infer that the sizes of molecules of different materials or substances would be?
4. What other material could be used to do this experiment?

**F: Explanation:**

The marbles, sand and water particles are used only as an analogy of how molecules of different sizes would behave. The smaller sized molecules can slip in between the larger ones. Thus it is possible to slip the sand or the water in between the marbles, but not the other way around. It is especially important to point out to students, that the marbles or sand grains are not molecules, but that molecules are so small that we cannot see them, not even with a microscope.