

WATER BEADS

Super absorbent polymers in bead form!

Curriculum topics

- Atomic Structure
- Chemistry
- Investigations
- Molecules
- Polymers

Subjects

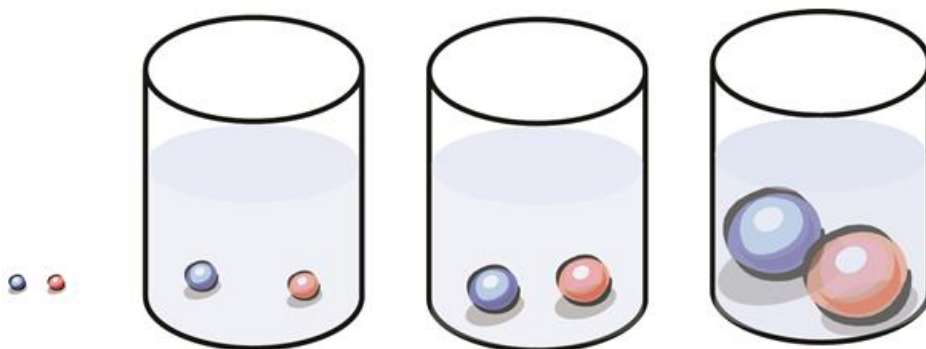
- Physical Science

Grade range: 3 – 8

Who we are: Resource Area for Teaching (RAFT) helps transform the learning experience by inspiring joy through hands-on learning.



These tiny beads can soak up and hold over 100 times their weight in water! Each bead maintains its spherical shape and color. Explore their amazing properties by observing how they absorb water over time by changing different variables such as salinity, pH, temperature, and more. Create fun illusions by using the optical properties of the beads. These beads are sure to yield plenty of curiosity and fun!



Share Your feedback!
<http://bit.ly/RAFTkitsurvey>

Materials

Use the following items for investigations:

- Water Beads, multi-colored and clear
- Containers, water-tight, clear (2)
- Marble (1)
- Plastic tube, water-tight with cap (1)
- Water (cold, room temp, and/or warm)
- **Not included** (optional): Salt, vinegar, metric ruler, timer/stopwatch

WARNING-CHOKING HAZARD: Hydrated water beads pose choking hazard. Do not use with children under 6 yrs. Water bead are non-toxic, but adult supervision required.

To Do and Notice

- 1 Measurement Activity:** Label two containers as “hot water” and “cold water”. Put hot water and cold water in the respective containers. Optional: Measure and record each starting water temperature
- 2** Measure and record the diameter of the water beads in both containers at defined time intervals (see examples in data table below). Note any difference in the growth rates for hot versus cold water. What affect does water temperature have on the size of the beads as they absorb over time?
- 3** Observe the water beads over the next few days or weeks, adding more water as needed. Set some water beads out to dry and record your observations.
- 4 Additional Investigations:** Change the composition of the water added to the beads by dissolving salt or baking soda in it or by stirring in vinegar. Repeat the measurement activity for beads in these different water treatments at the same temperature (cold, room temp, or warm) or compare the effects of both water treatment and temperature on the growth of the water beads.
- 5** Drop a fully hydrated water bead on a hard surface and record your observations. Compare these results with a dry water bead.
- 6** Place water beads of different colors together in one container of water. Do the colors diffuse (move) between the beads? Are some colors easier to see than others? Explain your observations.
- 7 Optical Illusions:** 1) Place several fully hydrated *clear* water beads in a clear watertight tube with a tight-fitting cap. Place a marble or hydrated colored water bead on top of the clear water bead. Fill the tube with water up to the bottom of the colored water bead/marble. What do you see? 2) Hold a hydrated clear water bead and look through it over printed text. What do you notice?
- 8** **Share** student learning with RAFT! Submit photos/video via email at education@raft.net or on social media ([Facebook](#), [Twitter](#), [Instagram](#)).

Sample Data Table

Elapsed Time (min)	Diameter, warm water (mm)	Diameter, cold water (mm)
0		
5		
10		
15		
20		

Core Content Skills:

Science & Engineering (NGSS)

Planning and Conducting Investigations, Chemical Reactions, Structure and Properties of Matter

Social Emotional Learning

- Self-awareness
- Self-management
- Responsible decision-making

The Content Behind the Activity

Water beads are made of a **superabsorbent** (water-retaining) **polymer**. Whether the polymer is an **alginate** (a gum extracted from seaweed or brown algae) or contains **sodium acrylate**, it can absorb more than 100 times its weight in pure water, depending on the degree of “cross-linking” within the molecules. During the absorption process, water molecules are drawn into the network of polymers. The polymer chains cannot expand, due to the cross-linking, so the particles expand as water moves into the network. As the beads dry, the water leaches out into whatever medium the beads are in, whether it is air or soil. Clear water beads that have been hydrated have an index of refraction identical to the index of the water in which they are immersed, making them appear invisible in clear water.

These and other similar polymers can be found in baby diapers, feminine hygiene products, “cooling” products such as bandanas, and are also very useful for keeping plants hydrated. The water bead polymer can be dried out and then rehydrated several times, making it ideal for hydroponic activities and much more. Consider adding hydrated water beads to planters or flowerbeds as a way to keep indoor or outdoor plants watered during dry periods.

Reuse

This kit uses 100% reusable materials designed for other uses. To continue making a positive impact in reducing waste, reuse these materials in other projects. Additionally, any unused materials can be collected and delivered back to RAFT.

Feedback

Please comment on this kit by taking this short survey: <http://bit.ly/RAFTkitsurvey>. Let us know of any material concerns (missing, broken, or poorly fitting parts) as well as any suggestions for improvement.

Visit <https://raft.net> to view related activities!

Elemental Crazy Eights
Overnight Crystals
Is It Really Full?
Match 3 for Chemistry
Shake Your Butter

Resources

- Absorbent polymer history – <https://bit.ly/2XzPkO9>
- Superabsorbent polymer demo – <https://bit.ly/34GhoAE>