Diaper Polymers

ESTIMATED TIME  Setup: 10 minutes  |  Procedure: 15-20 minutes

Materials
☐ Disposable diapers
☐ Distilled water or tap water
☐ Graduated cylinder or measuring cup
☐ Table salt
☐ Paper or plastic bag
☐ Spoons
☐ Paper or plastic cups
☐ Magnifying glass (optional)

Jobs (optional)
Organizer ________________________________
Runner(s) ________________________________
Scribe _________________________________
Technician(s) ___________________________

Vocabulary
Molecule  monomer  diffusion
Polymer  osmosis  fluid

OBSERVATION & RESEARCH

BACKGROUND
A molecule is the smallest particle of an element or compound that retains the chemical properties of that element or compound. It is composed of two or more atoms chemically bonded together by an exchange or sharing of electrons. At the beginning of the 20th century, chemists learned how to create special molecules by combining many smaller molecules in a regular pattern. These large molecules are called polymers. Polymers are long, chain-like molecules that are formed by connecting many repeating units (monomer units). The most common polymers are made of long chains of carbon atoms. A monomer is a single molecule capable of combining with other similar molecules.

The super-absorbent polymer found in many brands of disposable diapers is called sodium polyacrylate. This long polymer is able to absorb large amounts of water because the sodium ions attached to it attract water. These ions attract water into the polymer by diffusion or osmosis. Diffusion is the movement of particles from an area of high concentration to an area of low concentration. Osmosis is the diffusion of water across a semi-permeable membrane.
ENGAGEMENT

1. Write down the materials you observe. __________________________________________
   __________________________________________
   __________________________________________

2. Predict how these materials may be used. _______________________________________
   __________________________________________
   __________________________________________

3. Consider how crystals contained within a disposable diaper will react when water is added and why.
   Write your hypothesis. __________________________________________________________
   __________________________________________
   __________________________________________

EXPLORATION & EXPLANATION

Part One:

1. Wearing gloves, remove the fiber filling from a disposable diaper. Observe the filling.
   Describe the fiber filling of the diaper. ___________________________________________
   __________________________________________
   __________________________________________

   Why do you think there are crystals in the diaper? __________________________________
   __________________________________________

2. Carefully shred the fiber filling into smaller pieces, and place the filling in a plastic bag.

3. Shake the bag vigorously for a minute. The crystals will dislodge and collect in the bottom of the bag.

4. Remove the fibers from the bag and dispose of them. Make sure the crystals remain in the bottom of the bag.

Part Two:

1. Place the crystals in the bottom of a paper cup.
What do you think will happen if you add water to the crystals?


2. Slowly pour approximately 200 mL of distilled water into the cup, stir, and observe.
Describe the polymer after the water is added.

3. Sprinkle table salt on the mass and stir. Keep adding salt until the properties of the mass change.

EVALUATION

1. What happens when you add salt to the water-soaked polymer?

2. Is your hypothesis valid? Why or why not? If not, what would be your next steps?

ELABORATION/EXTENSION

1. What are some other polymers you can think of that are similar to the water soaked polymer you made today?

2. What are other ways that super-absorbent polymers may be used?
Power of Discovery

STEM Is EVERYWHERE!

Thursday, October 29
3:30-4:45

Michael Funk, Director, After School Division
Yvonne Evans, Consultant, After School Division
Anissa Sonnenburg, Consultant, After School Division
CynDee Zandes, After School Division STEM Fellow
WELCOME!!!

Who’s in the room?
Capturing Your Thoughts
STEM IN ACTION ACROSS CALIFORNIA’S AFTER SCHOOL PROGRAMS
Learning About Polymers Through Hands-On, Minds-On Investigation
REVISITING YOUR
THOUGHTS

Thoughts
NEXT STEPS—WHAT’S ON THE HORIZON
WRAP UP
A Vision for Expanded Learning in California


California’s Expanded Learning programs are an integral part of young people’s education, engaging them in year-round learning opportunities that prepare them for college, career, and life.

Developed by the California Department of Education. After School Division in collaboration with K-12 educators, program practitioners, and support providers.

January 2014
Four Strategic Initiatives

- System of Support
- Grant Administration and Policy
- Communication/Information Systems
- Expanded Learning/K-12 Integration
Strategic Initiatives & Goals

**Goal 4.1:** California Education Leaders promote ‘Expanded Learning.’

**Goal 4.2:** CDE divisions support Expanded Learning / K-12 integration.

**Goal 4.3:** K-12 stakeholders support Expanded Learning and Expanded Learning / K-12 integration.

**Goal 4.4:** The CDE and California Expanded Learning advocates champion Expanded Learning at the national level.

**Goal 4.5:** K-12 and Expanded Learning work together to implement strategies that lead to growth (social, emotional, behavioral) and learning (cognitive) for children and youth.
Quality Standards for Expanded Learning Programs

The standards should be considered in the context of the five Learning in After School and Summer Principles, which clearly communicate how expanded learning programs contribute to children’s learning.

### Point-of-Service Quality Standards

1. **Safe and supportive environment**
   - The program provides a safe and nurturing environment that supports the developmental, social-emotional and physical needs of all students. [Page 7]

2. **Active and engaged learning**
   - Program design and activities reflect active, meaningful and engaging learning methods that promote collaboration and expand student horizons. [Page 8]

3. **Skill building**
   - The program maintains high expectations for all students, intentionally links program goals and curricula with 21st century skills and provides activities to help students achieve mastery. [Page 9]

4. **Youth voice and leadership**
   - The program provides and supports intentional opportunities for students to play a meaningful role in program design and implementation, and provides ongoing access to authentic leadership roles. [Page 10]

5. **Healthy choices and behaviors**
   - The program promotes student well-being through opportunities to learn about and practice balanced nutrition, physical activity and other healthy choices in an environment that supports a healthy lifestyle. [Page 11]

6. **Diversity, access and equity**
   - The program creates an environment in which students experience values that embrace diversity and equity regardless of race, color, religion, sex, age, income level, national origin, physical ability, sexual orientation and/or gender identity and expression. [Page 12]

### Programmatic Quality Standards

7. **Quality staff**
   - The program recruits and retains high quality staff and volunteers who are focused on creating a positive learning environment, and provides ongoing professional development based on assessed staff needs. [Page 13]

8. **Clear vision, mission and purpose**
   - The program has a clearly defined vision, mission, goals, and measurable outcomes that reflect broad stakeholder input and drive program design, implementation and improvement. [Page 14]

9. **Collaborative partnerships**
   - The program intentionally builds and supports collaborative relationships among internal and external stakeholders, including families, schools and community, to achieve program goals. [Page 15]

10. **Continuous quality improvement**
    - The program uses data from multiple sources to assess its strengths and weaknesses in order to continuously improve program design, outcomes and impact. [Page 16]

11. **Program management**
    - The program has sound fiscal and administrative practices supported by well-defined and documented policies and procedures that meet grant requirements. [Page 17]

12. **Sustainability**
    - The program builds enduring partnerships with the community and secures commitments for in-kind and monetary contributions. [Page 18]
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