JANUARY POLYMER SNOW

TAKE-AND-MAKE BAG SUPPLIES
1 bag of sodium polyacrylate
Bowl

OTHER SUPPLIES
Water
Liquid measuring cup
Food coloring (optional)
Food scale (recommended)
DEFINING THE TERMS

POLYMER
A large chain of repeating molecules made up of many smaller units known as monomers ("poly" means many and "mer" is a unit or molecule).

ABSORPTION
The bonding of atoms or molecules to a surface.

SUPERABSORBENT
Extremely absorbent.

SUPERABSORBENT POLYMER (SAP)
A material that can absorb, draw in, and hold a great deal of liquid i.e., sodium polyacrylate (C3H3NaO2)

EXOTHERMIC
A chemical reaction that gives off heat.

ENDOTHERMIC
A chemical reaction that absorbs heat.
Superabsorbent Polymers (SAPs) were first used commercially in Japan in 1978. By the early 1980's, European countries were using the material in baby diapers.

The use of superabsorbent polymers revolutionized the diaper industry. Diaper manufacturers realized that they could absorb a lot of liquid without getting bulky or leaking. SAPs can absorb and hold about 30 times their weight. The swollen gel holds the liquid in a solid, rubbery state and prevents it from leaking onto the baby's skin and clothing.

Today, after advances in the science of these materials, some SAPs can hold 300-1500 times their weight.
Maximum absorbency garments are used by astronauts when they have to stay sealed in their spacesuits for long periods of time, such as during spacewalks or when the spacecraft leaves orbit to re-enter the atmosphere to return home.

SAPs are also infused into the innermost layers of spacesuits that NASA astronauts wear to help keep their skin from developing rashes during space flight.
EXAMPLES OF HOW SAPS ARE USED TODAY

AGRICULTURE

Potassium polyacrylate - a different SAP - is used for agriculture.

- Help retain moisture when mixed into the soil of potted plants. Florists often use SAPs to help keep flowers fresh.
- Increase soil's ability to retain water so crops do not need to be watered as often.
- Reduce water and nutrient loss.
- Slow the evaporation rate (less moisture lost) to make soil moisture more available to the plants.
- Help plants to grow better, particularly in dry areas.
- Reduce the amount of fertilizer required.

SAPs are non-toxic, harmless, and non-polluting!
EXAMLES OF HOW SAPS ARE USED TODAY

INDUSTRY
Used as powder, mats, and bags to clean up water and other water-based liquid spills.

PROTECT WIRES
SAPs are used in the coating of electrical wiring to keep moisture away from the wires. Water and moisture conduct electricity and can interfere with the transmission of electrical signals, causing damage to the wire and creating a potential fire hazard.
EXAMPLES OF HOW SAPS ARE USED TODAY

OTHER USES

- Baby diapers
- Hot/cold gel packs
- Growing toys
- Thickening agent
- Fragrance carrier
- Fire-retardant gel
- Anti-fog packaging material
- Waterbeds

There are MANY more ways that we use SAPs. 
Can you think of any others???
Use this formula to determine absorption ratio:
\[
\frac{\text{Weight of the water}}{\text{Weight of the SAP} \times \text{its weight in water}} = \text{the polymer absorbed times its weight in water}
\]
INVESTIGATE THE SAP IN A DIAPER

Find a new, clean diaper. On the counter, carefully open the lining and remove some of the batting. Shake the fibers and pull them apart, allowing the sodium polyacrylate granules and fibers to fall onto the counter.

With your hand, push everything that has fallen into a pile. Discard the top fibers. The white granules that remain are sodium polyacrylate, which makes the diaper super-absorbent. Using a dropper, slowly add water to the granules and watch gel instantly form.

Question: How is the gel different from the snow we created?

They are both made from the same type of SAP, but the sodium polyacrylate in the diaper is made to absorb even more liquid than the kind that we made snow from.
FREEZE IT!
It'll feel just like real snow and you can even make a snowball out of it!

MAKE COLORED SNOW
Add a few drops of food coloring to the water before you add it to the SAP. Presto - you have colored snow! Note: the coloring will be permeating the structure of the SAP.

HOW TO RUIN THE PARTY WITH SALT
When you are done with the polymer snow, before you put it in the trash... fully hydrate it then sprinkle table salt over it. The salt will break down the polymer links in the structure and cause it to release the water it absorbed.

CLEAN-UP
- Sweep or vacuum up spills
- Do not put down drains or disposals
- You can mix it into potting soil and then use it to re-pot a plant or two.
LOOKING FOR MORE?

Stop by the Bala Cynwyd Junior Room to check out books about snow, sodium, winter, & more!

NON-FICTION

Avalanche Dog Heroes: Piper and Friends Learn to Search
by Elizabeth Rusch

Super Cool Chemical Reaction Activities with Max Axiom
by Agnieszka Biskup

The Story of Snow: The Science of Winter's Wonder
by Mark Cassio

The Book of Ingeniously Daring Chemistry
by Sean Connolly

Chasing Extreme Weather
by Christine Honders

Clouds and Precipitation
by Elizabeth Krajnik

Sodium and Potassium
by Brian Knapp

Rain, Hail, and Snow
by Trudi Strain Trueit

Snow and Blizzards
by Robyn Hardyman

Sodium
by Salvatore Tocci
LOOKING FOR MORE?

Stop by the Bala Cynwyd Junior Room to check out books about snow, sodium, winter, & more!

FICTION

The Adventures of a South Pole Pig: A Novel of Snow and Courage
by Christopher Kurtz

Far Out Fairy Tales - Snow White and the Seven Robots
by Louise Simonson

Snow White and the Seven Dwarves
by Jacob Grimm

I am Ava, Seeker in the Snow
by Catherine Stier

A Pair of Friends in Winter
by Megan McDonald

Prisoner of Ice and Snow
by Ruth Lauren

Of Sorcery and Snow
by Shelby Bach

A Winter Wonderland
by Wong Herbert Yee

Ready, Set, Snow!
by Abby Klein

Snow Summer
by Kit Peel