

Engineering the Perfect Gummy Candy



A food engineering activity for students to learn math, test solution preparation, and engage in teamwork.

How are these items related?



**Can you match the items
with the pictures?**

Jell-O

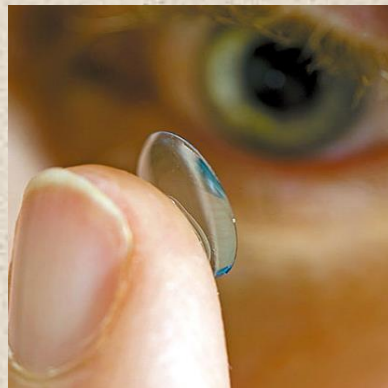
hydrobeads

contact lens

ketchup

gel pad

gummy candy



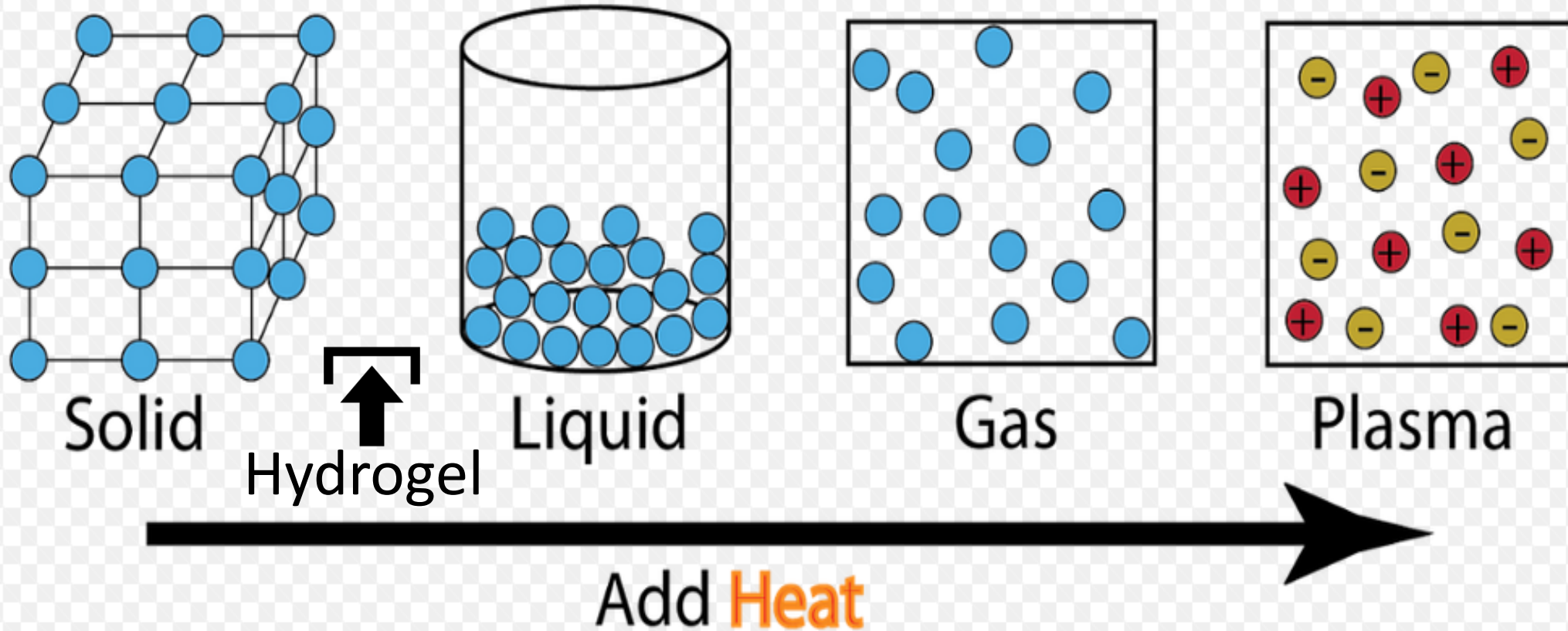
Background: Hydrogels

- Sometimes known as “aqua gels”
- Belong to a unique group of nano-polymers
- Hold large quantities of water in a three-dimensional “lattice” that encase the substances into a solid
- Occur both naturally, as in collagen, and synthetically, as in powdered gelatin
- Changes in shape depending on the environment

Hydrogels: Solid-Liquid State

States of Matter

- = atom
- ⊕ = nucleus
- ⊖ = electron



Activity: Calculations and Procedure

Gummy Bear Candy Ratio

- Recipe **proper** ratio:
 - **1 cup** pure 100% juice, no sugar added
 - **2 tbsp** unflavored gelatin
- Calculate the conversion factor to prepare the volume needed to fill the molds.
- Calculate the ratio to scale the amount of product to fill the mold.

Edible Hydrogel

Instruments with heat, temperature control, and a magnetic stirrer used to prepare hydrogel gummy candy.



- When temperature reaches $\sim 30^{\circ}\text{C}$, add small amounts of the gelatin powder *into* the warm juice.
- Heat the juice until its very warm ($\sim 37^{\circ}\text{C}$ - $\sim 48^{\circ}\text{C}$) but not boiling.
- If the liquid is too hot, it could break down the gelatin protein and your gummies may not set.

Edible Gummy Solutions Placed into Molds

- Add hydrogel solutions to silicon candy molds.
- Carefully place the molds on a metal oven tray on top of ice in a cooler and chill for about 20 minutes.
- Or, position molds on a paper plate and place in a refrigerator and chill at 0-4°C for 20-40 minutes.



Students prepare edible hydrogels using varied concentrations of gelatin in beet, apple and orange juice.

Discussion Post Activity:

- Why does the weight of gelatin and volume of juice effect how the hydrogel formed?
- Why should the dry ingredients such as gelatin be added into the juice instead of adding the juice to a beaker of dry gelatin?
- What might happen if the ingredients were not thoroughly mixed?
- What would happen if the temperature of the juice varied?

YouTube Videos

Kara Spiller. Biomaterials Lecture - Natural polymers and hydrogels

<https://www.youtube.com/watch?v=gxGeK4rzEr0>

Mitch Plumley. Hydrogel Polymers

<https://www.youtube.com/watch?v=BE1xk1rlrGg>

ALLwebsite. Occupational Video - Food Scientist

<https://www.youtube.com/watch?v=tweElJtj3o8>