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

- Solid
- Hydrogel
- Liquid
- Gas
- Plasma

Add Heat

= 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 ~30°C, add small amounts of the gelatin powder into the warm juice.
- Heat the juice until its very warm (~37°C - ~48°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?
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

ALIwebsite. Occupational Video - Food Scientist
https://www.youtube.com/watch?v=tweElJtj3o8