Lean Manufacturing at FCI (B): Deploying Lean at Nantong, China

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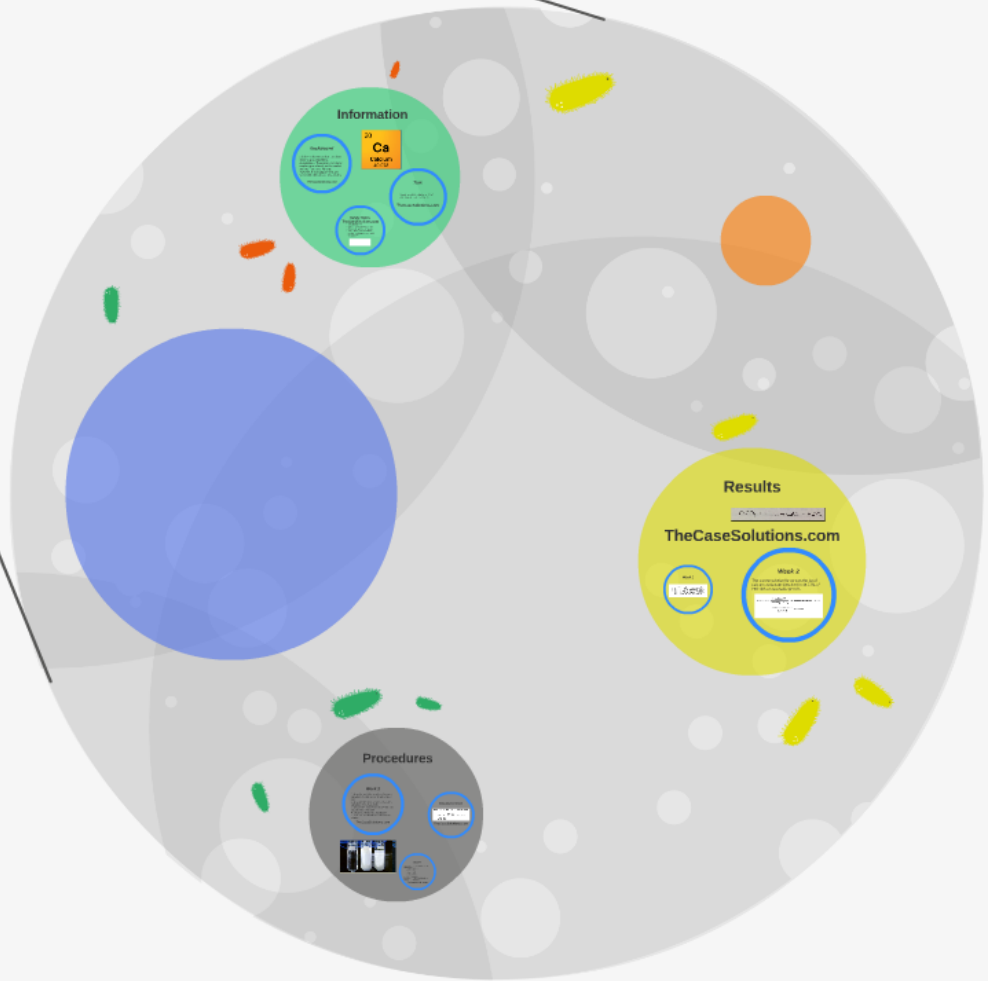

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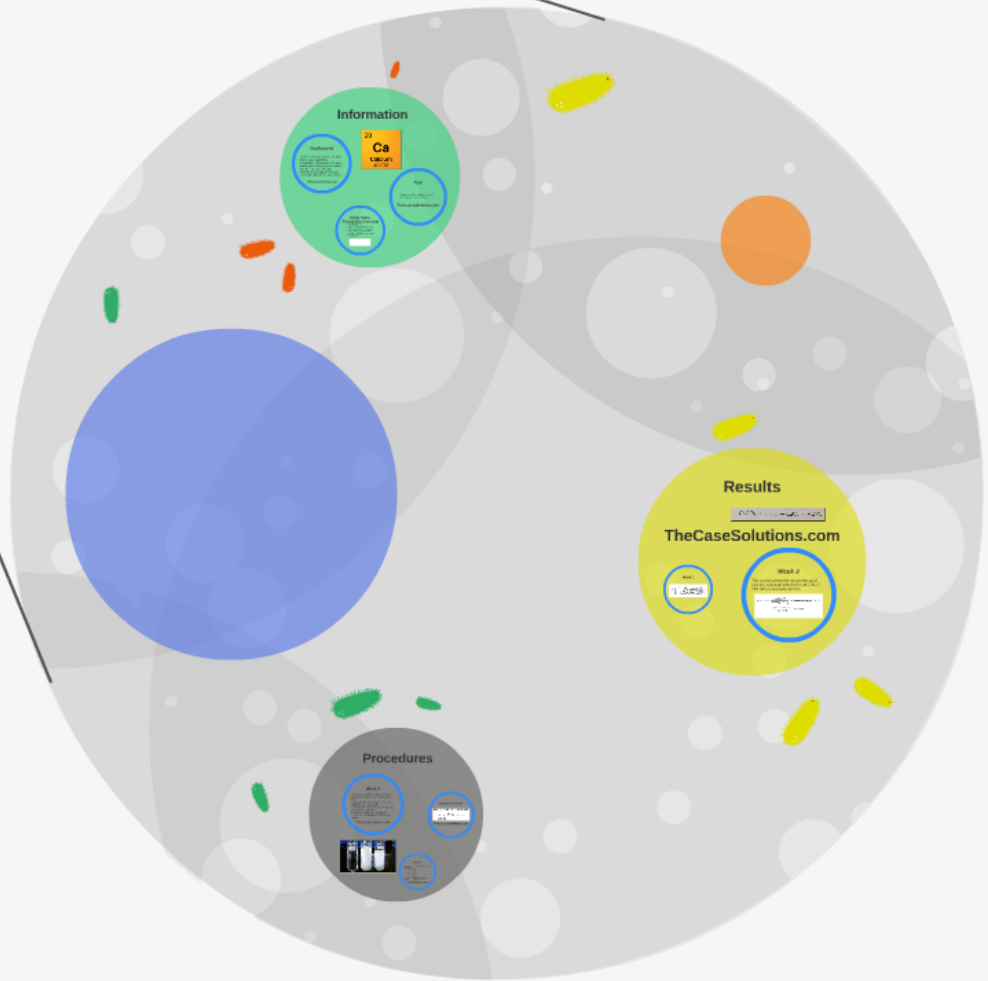

Background

A lack of calcium can lead to elders becoming susceptible to osteoporosis. There are a number of supplements already on the market such as Tums and Mylanta. However, these supplements are found difficult/unpleasant to swallow.

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Task

Design a calcium supplement that can be taken as a clear liquid.

Safety Notes

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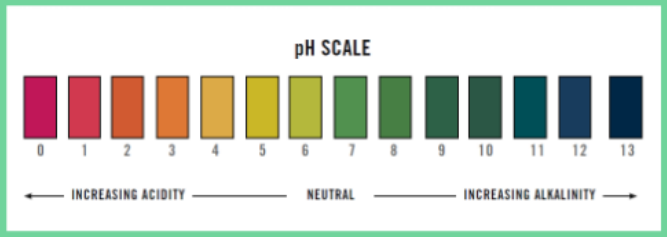
- It should be clear
- Have a pH between 4 and 10
- Doesn't contain toxic material
- Has a known concentration so people know how much should be consumed



Week 1

1. Mix calcium carbonate with six different sodium compounds
    a. sodium carbonate
    b. sodium sulfate
    c. sodium nitrate
    d. sodium chlorite
    e. sodium oxalate
    f. sodium phosphate
2. Record their reactions and indentify which ones produced precipitates

Week 2

1. Dissolve two 0.5g samples of calcium carbonate in nitric acid and hydrochloric acid
2. Dissolve two 1.0g samples of calcium carbonate in the two acids
3. Record the volume of acid used to fully dissolve the compound
4. Once fully dissolved, test the pH
5. Find the concentration for the correct solution

Equations Used

$$Starting\ Volume\ (mL) - Final\ Volume\ (mL) = Volume\ of\ Acid\ (mL)$$

$$Sample\ Weight \times \frac{1\ mol\ CaCO_3}{100.086\ g\ CaCO_3} = moles\ of\ CaCO_3$$

$$\frac{moles\ of\ CaCO_3}{volume\ of\ acid\ (L)} = solution\ of\ concentration\ (M)$$

Results

$$CaCO_3 + 2\,HCl \rightarrow CaCl_2 + H_2CO_3$$

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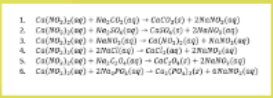
Week 1



Week 2

The correct solution for us was the 1g of calcium carbonate dissolved in 19.5 mL of HCl with a reasonable pH of 5

$$1g\ CaCO_3 \times \frac{1\ mol\ CaCO_3}{100.086g\ CaCO_3} = 0.0099914074\ mol\ CaCO_3$$

$$\frac{0.0099914074\ mol}{0.0195\ L} = 0.512M$$