

Shivering Ice

M₃₋₄ PHYSICS

Question

- How does the solute in a frozen solution affect the freezing rate.

Abstract

- My problem is “How does the solute in a frozen solution affect the freezing rate?” To test this I froze water with chocolate powder, water with lemonade powder, and water by itself, 20 times each to see which one freezes the quickest. My hypothesis was that If I place 2 solutes (lemonade powder and chocolate powder) with water, and just water by itself, into the fridge, the water without anything in it will freeze the quickest, because it doesn't have any solute in it to affect its freezing rate. Out of the two solutes and water by itself, water froze the quickest with an average time of 54.6 minutes and chocolate powder froze the slowest with an average time of 1 hour and 7.5 minutes.

Hypothesis

- If I place 2 solutes (lemonade powder and chocolate powder) with water, and just water by itself, into the fridge, the water without anything in it will freeze the quickest, because it doesn't have any solute in it to affect its freezing rate.

Procedure

1. Gather the materials
2. Pour water in each of the ice cube trays' holes up to the same amount
3. Put an ounce of lemonade powder in 20 holes, an ounce of chocolate powder in 20 holes, and leave 20 of the holes just with water and no solute (20 trials)
4. Place the trays into the refrigerator at the same time
5. Start the time on your watch or timer
6. Watch the water and solutes freeze
7. Record how long it took for each solute to freeze

Materials

- Kenmore Refrigerator
- Nesquik Chocolate Powder
- Country Time Lemonade Powder
- Ice Cube Trays
- Timer or Watch
- Water
- Pencil and Paper (for gathering information)

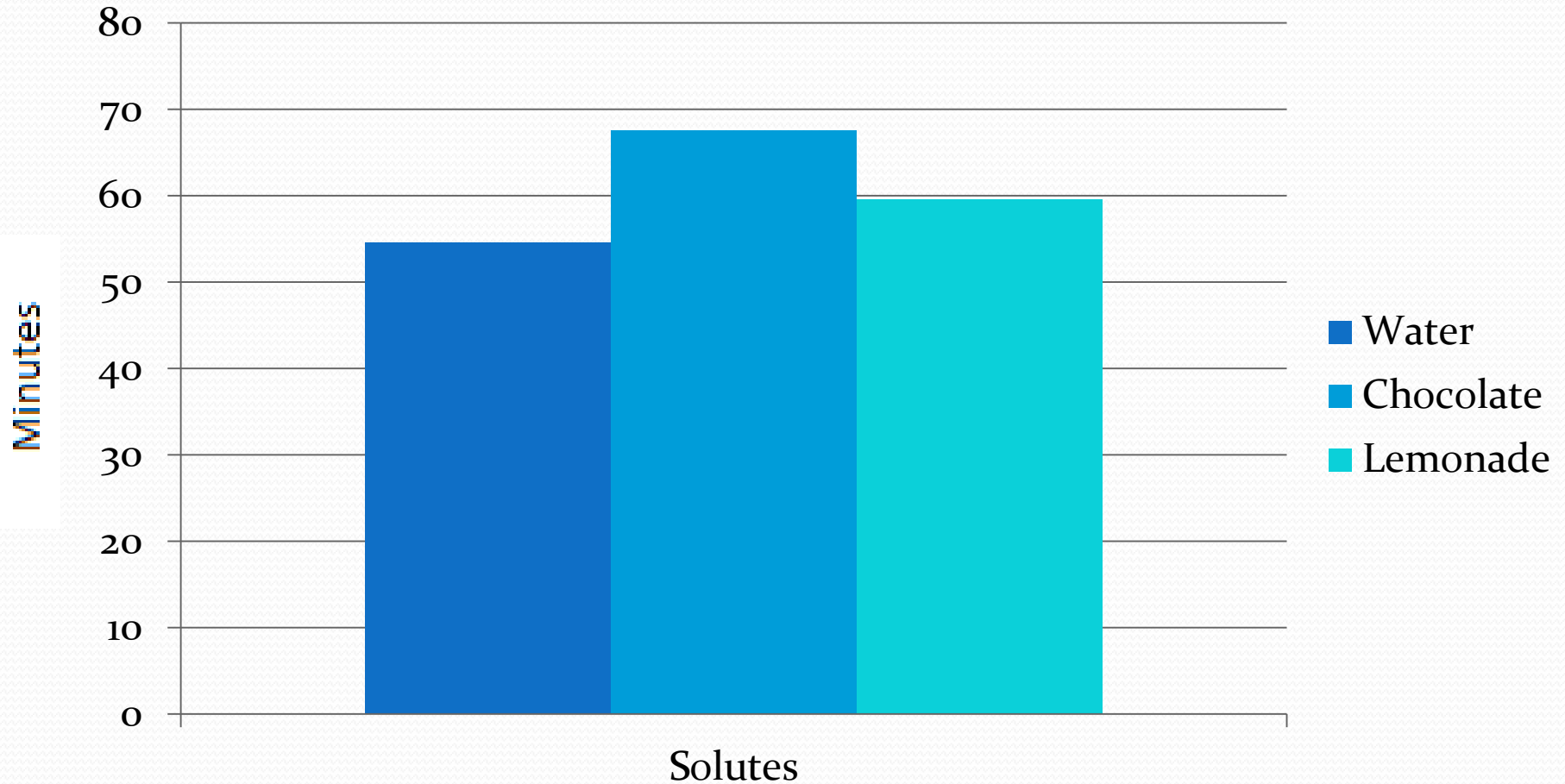
Experiment



Results and Data

	Water	Chocolate Powder	Lemonade Powder
Trial 1	52 mins	57 mins	1 hr 7 mins
Trial 2	49 mins	1 hr 24 mins	52 mins
Trial 3	53 mins	1 hr 16 mins	1 hr 22 mins
Trial 4	56 mins	53 mins	1 hr 17 mins
Trial 5	47 mins	1 hr 12 mins	59 Mins
Trial 6	39 mins	1 hr 16 mins	50 mins
Trial 7	1 hr 4 mins	46 mins	1 hr 23 mins
Trial 8	38 mins	1 hr 25mins	1 hr 3 mins
Trial 9	58 mins	1 hr 23 mins	1 hr 12 mins
Trial 10	1 hr 2 mins	1 hr 15 mins	49 mins
Trial 11	1 hr 13 mins	1 hr 2mins	46 mins
Trial 12	58 mins	43 mins	1 hr 19 mins
Trial 13	46 mins	1 hr 8 mins	57 mins
Trial 14	44 mins	54 mins	45 mins
Trial 15	51 mins	1 hr 8 mins	1 hr 9 mins
Trial 16	50 mins	51 mins	1 hr 30 mins
Trial 17	1 hr 11 mins	1 hr 30 mins	53 mins
Trial 18	1 hr 13 mins	1 hr 33 mins	1 hr 6 mins
Trial 19	49 mins	49 mins	59 mins
Trial 20	59 mins	1 hr 5 mins	1 hr 7 mins
Average	54.6 mins	1 hr 7.5 mins	59.6 mins

Graph: Average Freezing Time



Conclusion

- Out of the two solutes and water by itself, water froze the quickest with an average time of 54.6 minutes and chocolate powder froze the slowest with an average time of 1 hour and 7.5 minutes.

Works Cited

- "Changing State: Freezing." *Changing State—Freezing*. N.p., n.d. Web. 15 Sept. 2016.
- "What Is the Difference between a Solute and a Solvent?" *Reference*. N.p., n.d. Web. 15 Sept. 2016.
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- <https://student.societyforscience.org/rules-all-projects>.