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17.0.C.1 Hands-on Consumer Product Assesment

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RECORDER REPORT, Chem 444A "Fire & Ice"

Group Member Name	Role	Date: March 26, 2015
Emily Koester	Recorder	
Kyle Reisert		
Cate Frost		

A

① Ice on thaw-matic → 5 min 5 sec to melt
② Ice in paper cup
③ Ice in plastic mug } After 15 min, ice has melted minimally

Observations

- The thaw-matic got colder
- Ice started to melt immediately on TM, not in cups.
- As ice started floating on water, it seemed to melt more slowly.

* The thaw-matic must be a good conductor
We think it is a metal, and we know the distribution of electrons across metal surfaces allows them to conduct energy efficiently.

B

How does this surface compare to other metals?

① Ice on TM → melted in 3 min 35 sec
② Ice on other metal surface → 5 min 10 sec

Observations

- Both surfaces got colder
- Both melted more rapidly than in the cups

Does the ridged design of thaw-matic cause the difference in melting speed by drawing water away?

(D) Ice held sideways away from ridges on TM

(C) Ice held sideways on other metal

Observations

- TM still melts more quickly

(D)

Bottom side of TM - 6 min 7 sec

coating is different, there are no ridges, and it's not raised off the table

(E)

Tilted TM rightside up w/ water draining - melted 3 min 14 sec

Tilted TM bottomside up (no ridges) w/ water draining - 3 min 30 sec

*The TM may have been colder for 2nd exp than first exp b/c we didn't have time to let it return to normal.

Observations

- Draining H_2O shortened the time for both
- Less H_2O puddle → more contact w/ surface and allows more conduction.

Christopher F. Bauer, Principal Investigator.
This material is based upon work supported by the National Science Foundation under Grant No. 1245730.

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Group Member Name	Role	Date: 3/26/2015
Heather		
Mandy		
Becky		

We are testing the miracle thaw by letting a piece of ice melt on both the table and the miracle thaw tray. From what we are observing the miraclethaw is melting faster than the table. We are thinking that the grooves in the miracle thaw may be helping to facilitate the heat transfer using conduction + convection. However we are unsure at this point. The miracle thaw ice is staying much closer together than on the table but this is due to the grooves + textured structure. We did not record until the end of the ice melting because it would take a long time, but it was clear that the ice on miracle thaw melted faster. The ice on the miracle thaw looked mostly thawed at 5:30 minutes. We also discussed that the material of the miraclethaw may have something to do with it. There was disagreement within the group but I felt it may have to do with that since it feels like a type of metal and we know metal is a good conductor. The grooves in the metal plate allow for air to travel underneath the ice which can't happen on the table which may allow for quicker thawing.

To test the conductivity matter which we disagreed on, we are performing a second experiment. We are testing which one melts fastest: ice on miracle thaw, ice in aluminum tray on metal stand, ice in aluminum tray on table, ice on bubble wrap

When able to all start at the same, the ice on the miracle thaw melted first. We have been able to determine that the ice melts faster on the miracle thaw due to conduction + convection.

Conduction: the ice is touching metal which we know is a good conductor. Also the metal is touching the table. the table is absorbing heat from the environment. the heat is being transfered from the air to the table to the metal to the ice through conduction.

Convection: the miracle thaw has grooves in it which allow for air to travel under the ice. The hot air traveling under the metal tray and under the ice in the grooves on the tray allows for convection to occur.

We also tested to see if placing the ice on the metal ring stands with an exaggerated amount of air under it. the ice still melted faster on the mirace thaw. This indicated to us that conduction was more important than convection. The miracle thaw raised above the table also played a role because we know that hot air rises. We also found that spreading out the ice on the metal made the ice melt faster due to the within-mass of the ice mass as well as the friction of it moving and the air able to travel through the grooves in the ice.

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Group Member Name	Role	Date: 3/26/15
Jake	Recorder	
Samantha		
Eliza		

Convection = the movement of heat through the flow of air or liquid, which carries heat energy with it.

Radiation = Instead of being carried through the flow of molecules, radiation is direct waves of energy that are more concentrated.

Miracle Thaw: A metal plate, coated with some sort of paint. It has little trenches running across the plate

Test 1: We put an ice disk on the plate and an ice disk on the counter. The one on the plate to 2:36 to melt fully. At about 6 minutes the ice on the counter still hadn't melted.

Test 2: We put an ice chip on the back of the plate which has no grooves The ice melted faster than the counter but not as fast as the grooved side.

Test 3: We placed two ice chips on the plate at the same time. They initially slid away from each other. Both ice chips melted after 4:49.

Test 4: We stack two ice chips to see what would happen. The bottom chip melted but the top chip was sitting in a puddle so it didn't melt.

Test 5: We placed the plate on top of styrofoam cups. → 5:00

Test 6: We placed 3 ice chips on the plate at the same time. → 7:15

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Group Member Name	Role	Date: March 26, 2015
Kaleigh Zukowski		
Taylor Witkiewicz	Recorder	

Consensus:

- Convection transfers heat in a circular pattern through liquids or gasses. The heated liquid/gas will move away from the heat source and carry energy with it and the cold liquid/gas will take the place of where the heat was.
- Radiation transfers heat as energy waves. Radiation does not require matter for the heat energy to flow. The heat waves radiate heat to cooler objects by the wave hitting the molecules of the cool object, speeding them up and therefore the object becomes hotter.

exp 1.)
20mL of water in cup, 20mL of water on ThawMatic
initial water temp in cup = 22.5°C
initial water temp on ThawMatic = 22.5°C

- We hypothesized the water on ThawMatic would heat up and water in cup would stay same temp. No real difference occured. Possible explanation = water not cold enough, already at thermal equilibrium with ThawMatic

	1 min	2 min	3 min	4 min	5 min	6 min	7 min	8 min
ThawMatic	22.3°C	21.8°C	21.8°C	21.4°C	21.7°C	22.0°C	21.5°C	21.7°C
Cup	22.2°C	21.8°C	21.9°C	21.9°C	21.9°C	21.8°C	21.7°C	21.9°C

exp. 2 = 2 ice cubes, 1 on ThawMatic, 1 on Table
took 7 mins. for ice on ThawMatic to melt, faster than ice on table (17 1/2 mins on table still not melted all the way)
- Do materials make difference? ThawMatic is metal alloy, Table is synthetic material - plastic
ThawMatic is white, has ridges Table is black, Table smooth
metals good conductor of heat energy

exp. 3 = melt ice on white aluminum foil
- Does color make difference? - test on same color as ThawMatic
After 7 mins the ice was not completely melted (still about half ice)
we conclude the white color is not what made the ice on the ThawMatic melt faster.

exp. 4 = Do the ridges make the ice melt faster? Flip ThawMatic over and test ice cube
Ridges on grill - Are they there for reason? Do ridges heat up faster?
7'47" for ice to melt on back of ThawMatic

RECORDER REPORT, Chem 444A "Fire & Ice"

Group Member Name | Role | Date: 3/26/15

Miriam

Jon

Marisa

Convection is the transfer of heat through liquids or gases. Hot molecules ~~are~~ are less dense than the air around them and will rise. The hot molecules push cold molecules down.

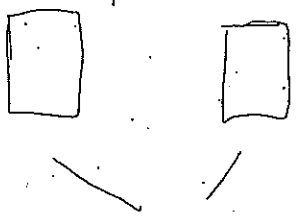
Radiation is the transfer of heat through electromagnetic waves. Heat is transferred from an origin to the surrounding space. Matter does not have to be present for radiation to occur.

1) Yes the product works. Heat is able to travel through the metal due to the metal's conductivity. Metals don't have specifically placed electrons, which means they can carry heat faster and more efficiently.

2). We used the non-Miracle Thaw metal square. We placed an ice cube on the metal and on the table. The ice cube on the metal melted faster at around 13 minutes. The metal also felt colder than the table.

We used an aluminum black tray and white tray and placed ice in each

Black tray White Tray



White tray melted first

Time to melt

We used a black Thawmatic & then a white thawmatic

Black Thawmatic took 3:15 to melt

White Thawmatic took 4:30 to melt

Ridge 59
Non Ridge 61

> ridges must let air up under the ice

Paper plate black is cooler than white paper plate

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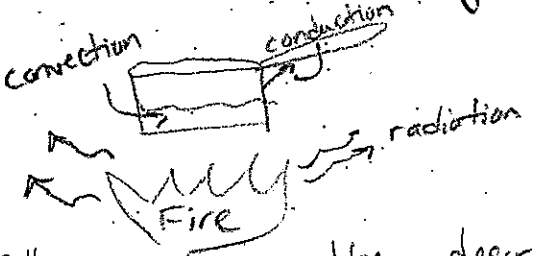
Group Member Name	Role	Date: 3/26/15
Nicholas Bouchard	Recorder	
Charles Cappetta		
Emma Addison		

- convection: heating through fluids such as water or air, heat transfer through the movement of fluids.
-radiation: heat transfer through waves, rays etc.



- we all agreed on the descriptions of convection, and radiation.
- The chimney experiment related to convection, since heated air becomes less dense causing it to rise. (air contains thermal energy).
- The microwave experiment dealt with radiation since waves directly heated the water.

1.) We think it works. How?: The tray is black which means it absorbs all light because of its color. Light contains thermal energy as we saws in our experiments therefore the light transfers heat to the tray and the tray transfers heat to the food through conduction. It is suggested to run it under hot water to transfer heat to it, the material probably holds heat well allowing it to transfer heat to the item.

Expi. Started: we placed one ice cube on the tray and the other on the table. The ice on the tray immediately started

melting. There was a drastic time difference between the ice melting on the tray and on the table

	Time Tray	Time Table (Synthetic, hard, composite)
Exp. 1	6:32 (not shown)	22:00

Exp: 2

Substance	Attributes	Time
Aluminum	black	27:50
plastic	black	38:20

	Time
tray suspended by paper cups	5:32

↳ to see if the table was transferring heat to the tray

- heat is moving from tray to ice

tray - 75.4
table - 73.6
aluminum - 71.0
plastic - 71.2

Our control was the color
our experimental was the composition

Conclusions

We think the tray is a very good conductor of heat. we think it pulls heat from the table (surroundings) and transfers it into the metal, we also think it absorbs heat from light because of its color (i.e. black t-shirt in the summer). We know that the material has a lot to do with why it works because we tried other black materials and they didn't melt the ice nearly as quickly.

Thoughts:

- The ridges add surface area.
- Its a better conductor of heat allowing it to "pull" heat from the air quicker and more efficiently than other materials.
- Size could have an effect, bigger = Conducts more heat.

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Group Member Name | Role | Date: 3/26

Tim
Emily D
Amanda J

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convection: the movement of hot and cold, hot air rises and cold air sinks. This is because hot air is less dense

radiation: the movement of heat as different waves of energy and the two objects do not need to be touching to transfer heat

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1.) Yes this product does work. The process of conduction is what allows this pan to work. The ice is in direct contact with the surface as it thaws and transfers heat between the two objects.

2.) a.) ice cube on table compared to ice cube on miracle thaw plate and according to claims it should melt faster on the miracle thaw.

Platform	Time to thaw
Table	47 mins
Miracle thaw	6 mins 46 sec
ring stand	6 mins 21 sec
household pan	6 mins 33 sec

(original xp)

we then decided to try another metal platform to see if it had anything to do with the make-up of metal in the metal alloy.

since the ring stand metal was faster than miracle thaw we wanted to see if people could just use a common household pan.

(more info on back)

Platform	Temp of surface
Table	78.3 °F
Miracle Thaw	70.7 °F
ring stand	64.8 °F
household pan	(66 ? °F

Room Temperature = 74.2 °F

Household Pan

Time	Temp of surface (°F)
30 sec	63
1 min	61.4
1.5 min	59.5
2 min	58.5
2.5 min	59
3 min	58.4
3.5 min	58
4 min	56.1
4.5 min	56.4
5 min	55.9
5.5 min	56
6 min	55.5
6.5 min	55.2

Miracle Thaw

Time	Temp of surface (°F)
30 sec	65.4
1 min	62.5
1.5 min	59.8
2 min	57.0
2.5 min	55.0
3 min	53.7
3.5 min	52.6
4 min	51.8
4.5 min	51.7
5 min	51.4
5.5 min	51.2
6 min	50.9
6.5 min	51

Surface Temp over time