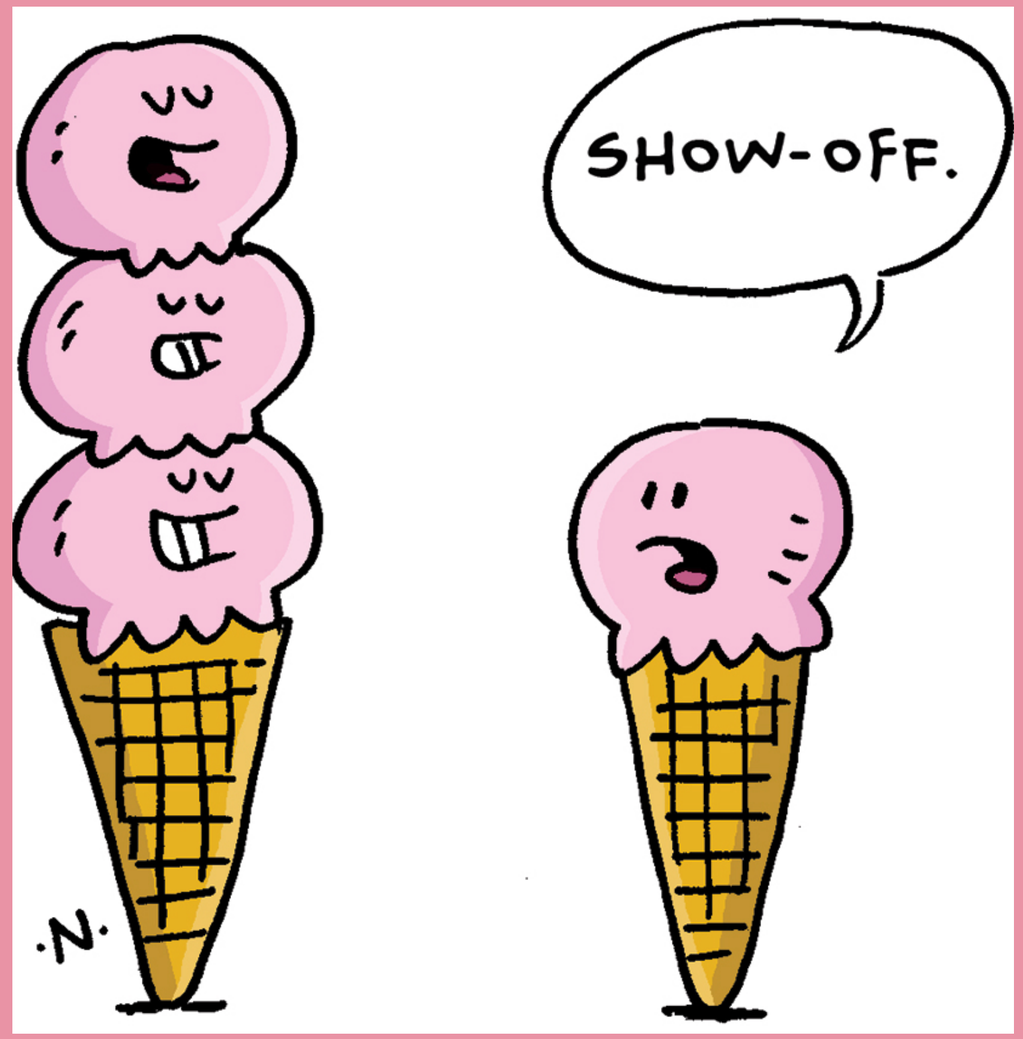
What's the scoop?

MARTA, VANESSA, SAM,
MEGHAN, SHEENA, KATARINA

Grade 2



We have the inside

scoop!

... can you

predict what we will be

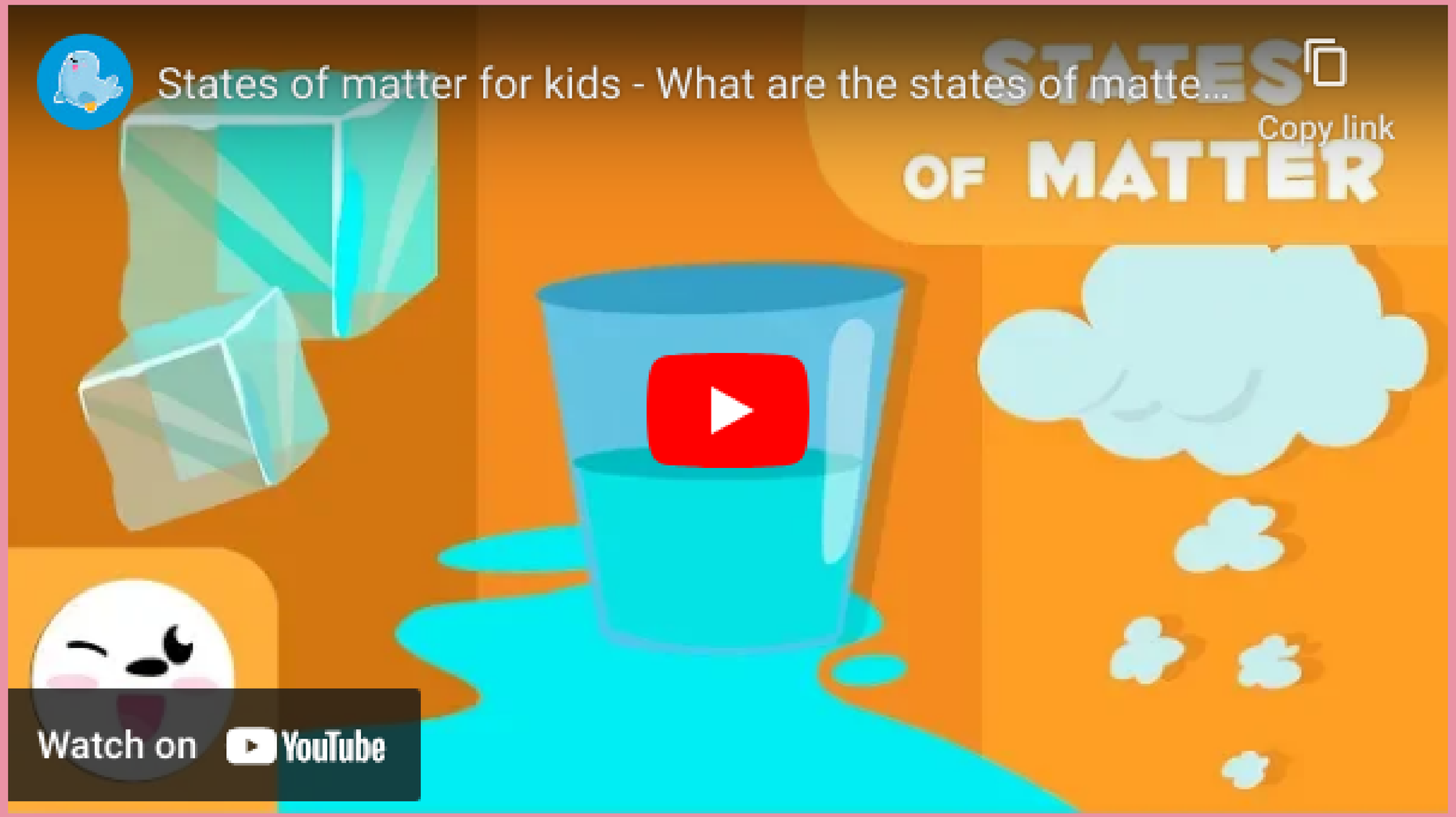
doing today?

Learning goals

- I CAN MAKE A PREDICTION ABOUT WHAT WILL HAPPEN DURING A SCIENTIFIC INVESTIGATION.
- I CAN MAKE OBSERVATIONS ABOUT CREAM AND ICE CREAM, PROPERTIES OF MATTER, AND HOW IT CHANGES WITH THE SHAPE OF THE CONTAINER.

Learning goals

- I CAN USE MATH **PROBABILITY** TERMS, SUCH AS "IMPOSSIBLE," "POSSIBLE," AND "CERTAIN" TO DETERMINE HOW LIKELY SOMETHING IS TO HAPPEN.
- I CAN USE **UNITS OF TIME**, SUCH AS MINUTES, TO RECORD THE RESULTS OF THE ICE CREAM-MAKING INVESTIGATION.


States of matter for kids - What are the states of matte...
Copy link
STATES
OF MATTER
Watch on YouTube

1. What are the 3 states of matter?

2. A _ _ _ _ _ _ _ _ _ takes on the shape of it's container.

3. 3. A _ _ _ _ _ _ _ keeps it's shape.

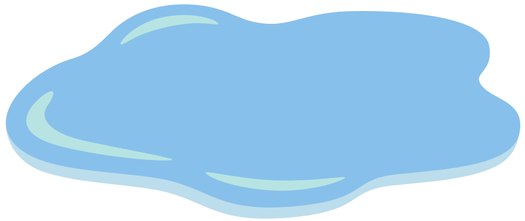
Properties of Solids, Liquids, and Gasses

SOLID

Maintains shape at room temperature

LIQUID

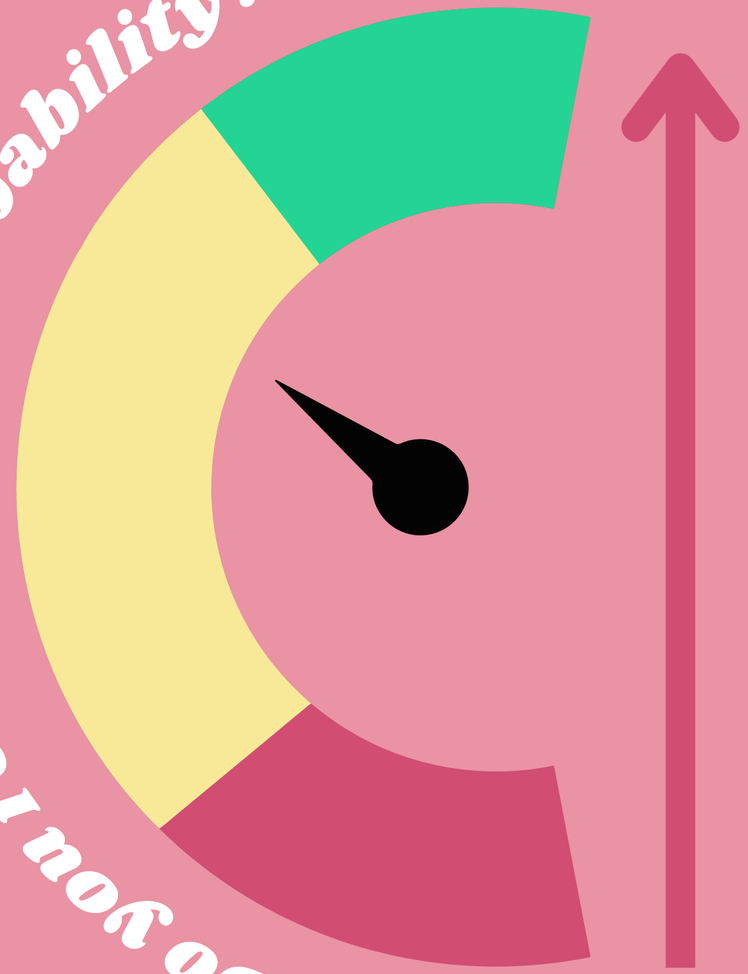
Maintains/ fills the shape of the container it lies in.



GAS

Gases have three characteristic properties: (1) **they are easy to compress**, (2) they expand to fill their containers, and (3) they occupy far more space than the liquids or solids from which they form.

Do you remember probability?



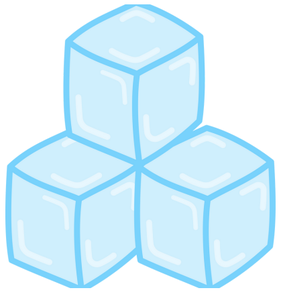
Certain

Possible

Impossible

Get ready... for the icecream challenge

Solid



Liquid

Gas

Cream is a _____.

I know this because _____.

Ice is a _____.

I know this because _____.

Salt is a _____.

I know this because _____.

Conditions

CONDITON 1

BAG WITH CREAM

Whipping cream
Sugar
Vanilla Extract

CONDITION 2

BAG WITH CREAM AND ICE

Bag 1: Whipping cream, Sugar, and Vanilla Extract

Bag 2: Ice

CONDITION 3

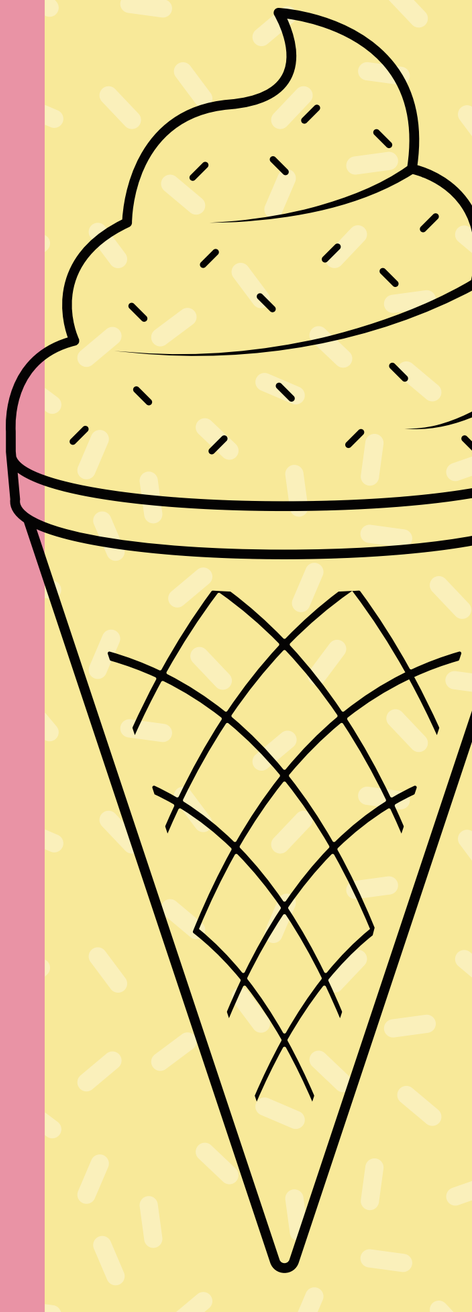
BAG WITH CREAM, ICE, AND SALT

Bag 1: Whipping Cream, sugar, and vanilla extract

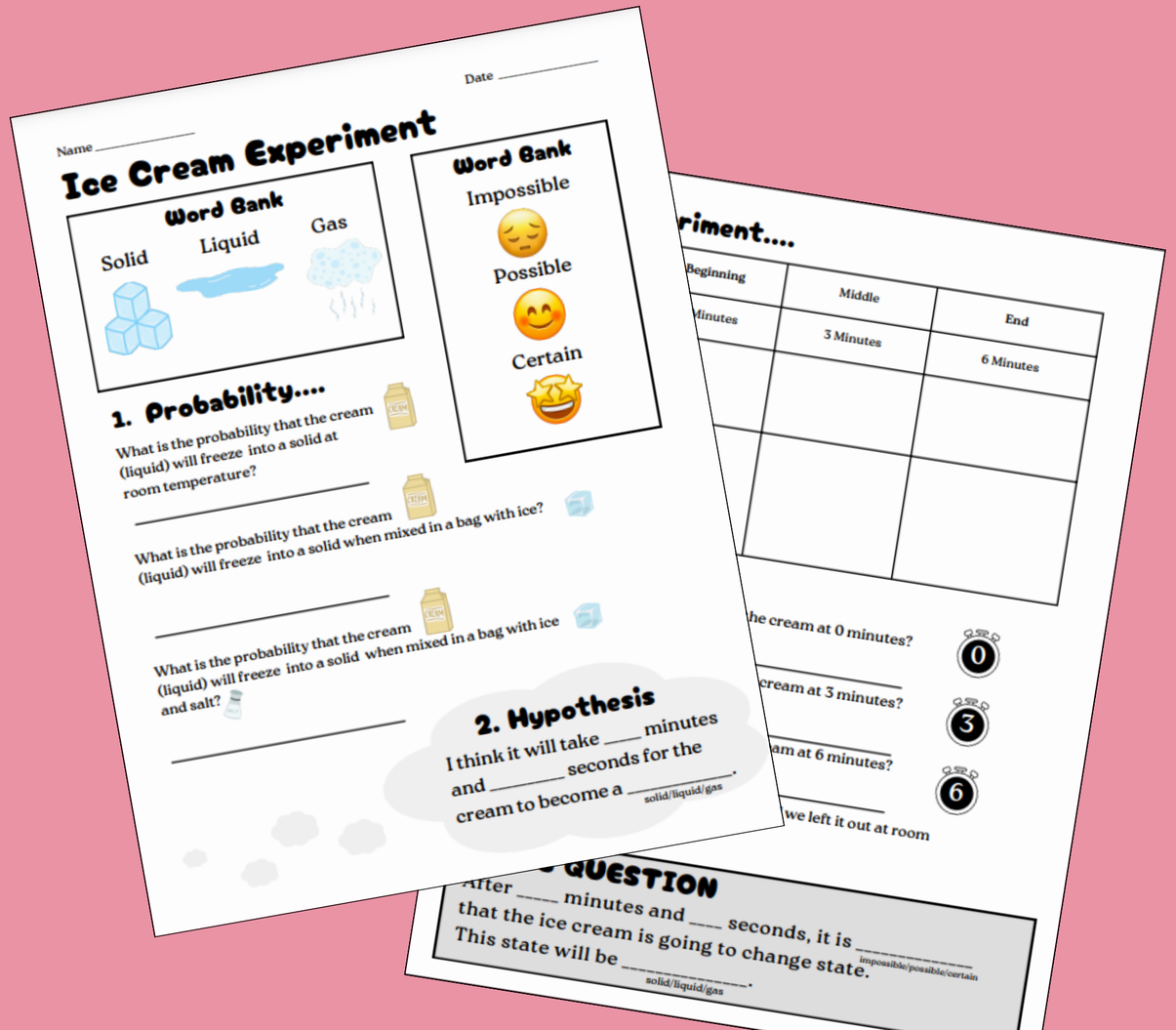
Bag 2: Ice with Kosher Salt

Instructions

Divide yourselves into 5 table groups.



Materials and Worksheets



Before we start...

IT WILL TAKE _____ MINUTES AND ____ SECONDS FOR THE CREAM TO BECOME A

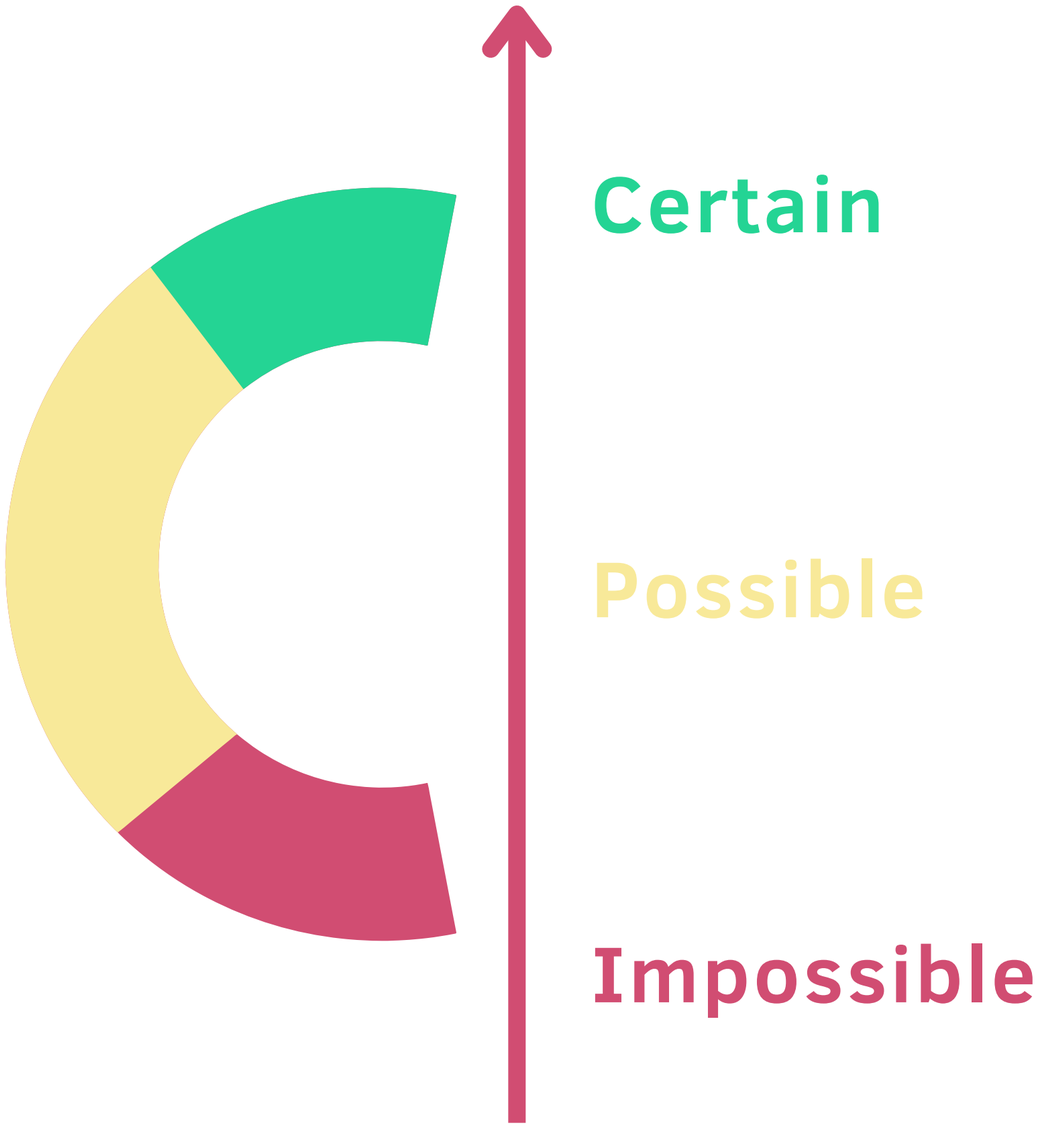
_____.

(SOLID/LIQUID/GAS)

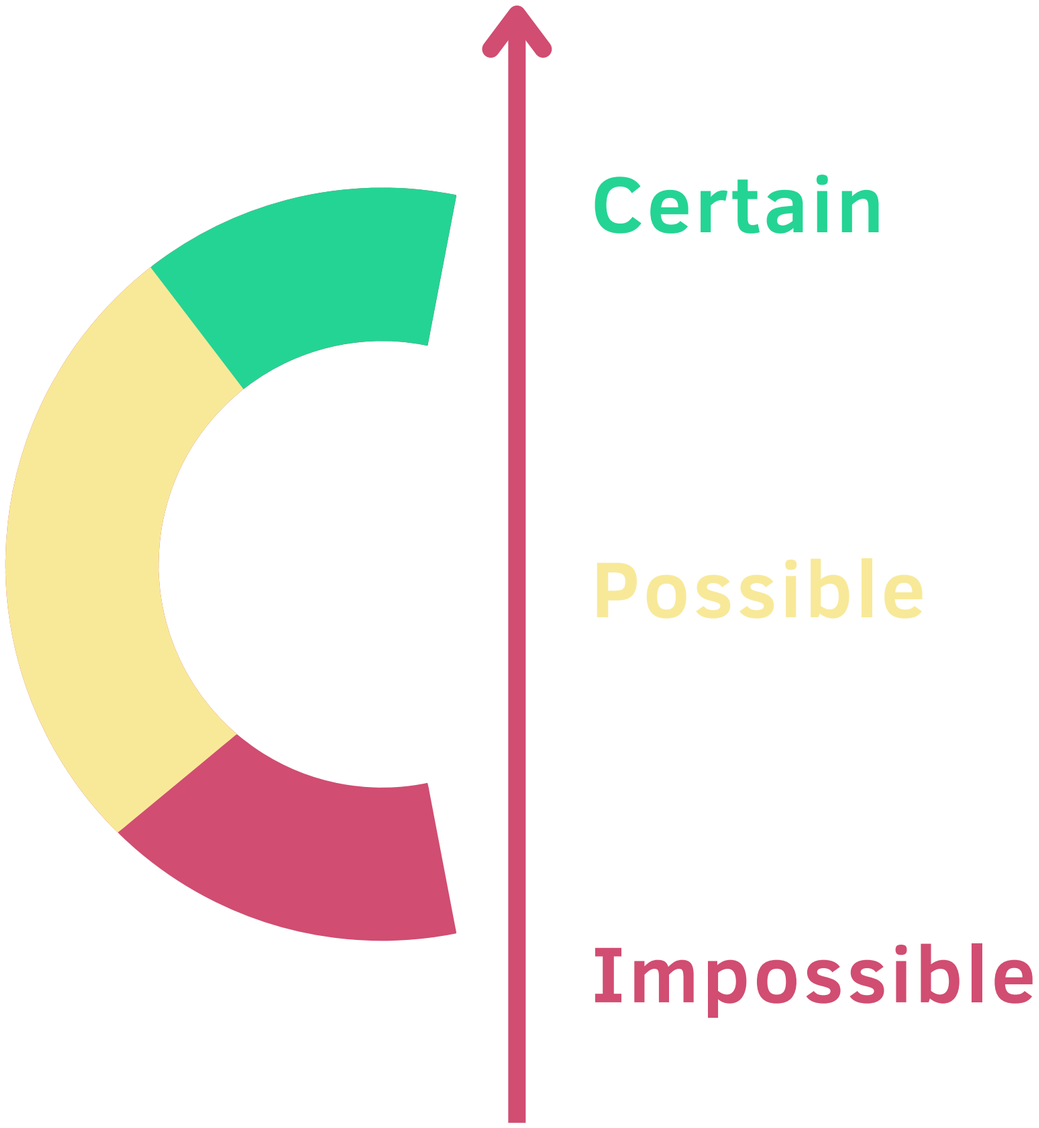
What is the probability that the cream will turn into a solid at room temperature?

Whipping Cream (liquid)

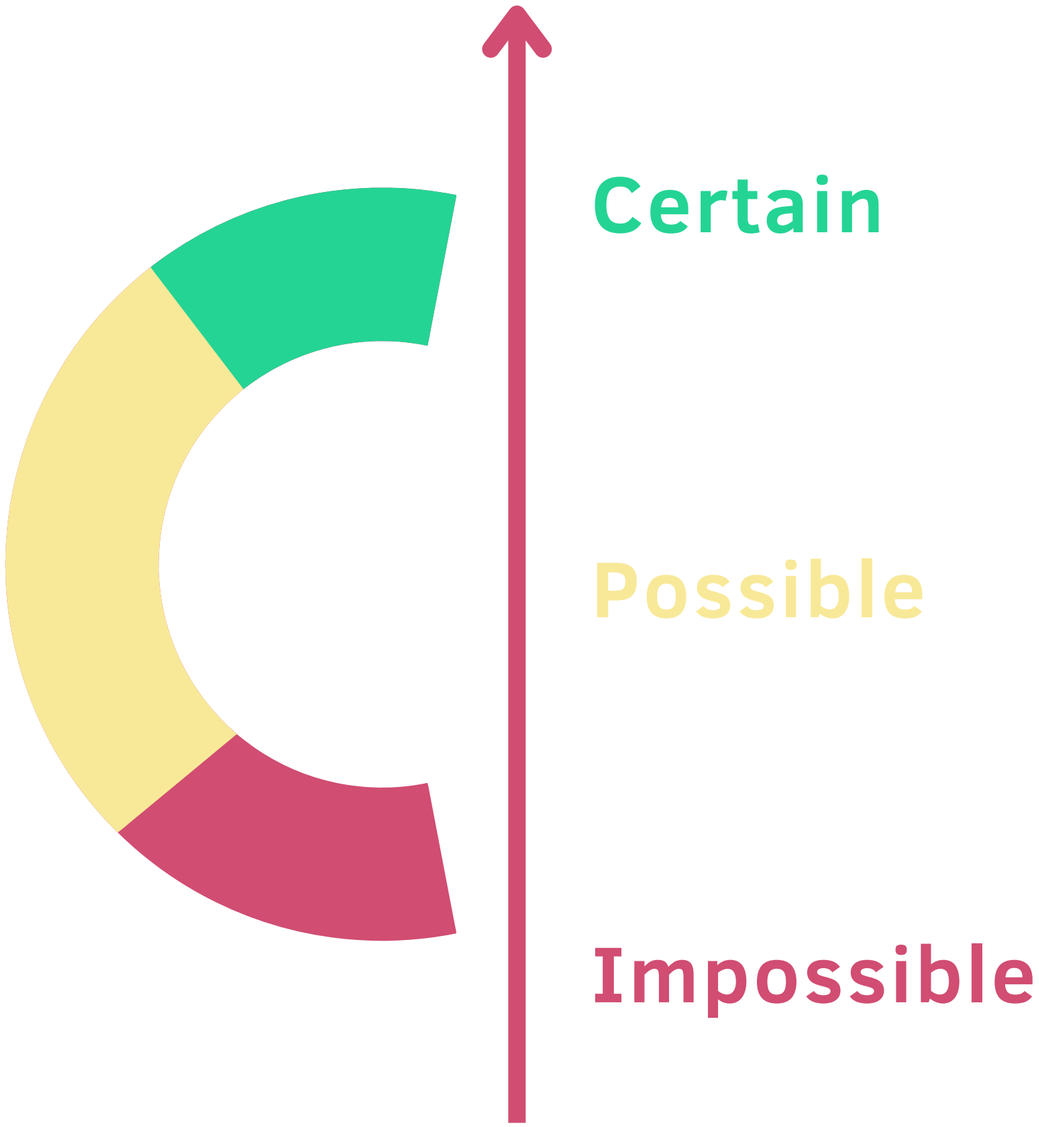
(solid)



What is the probability of the cream (liquid) freezing into a solid in a bag with ice?



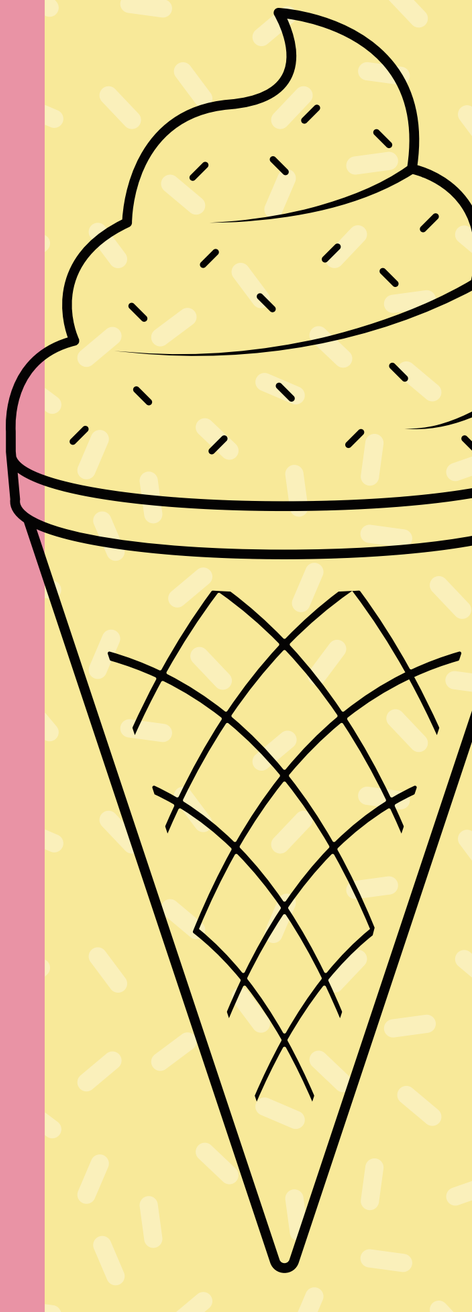
What is the probability that the cream (liquid) will freeze into a solid when mixed in a bag with ice and salt?



Let's start our ice cream challenge!

Instructions

We will do condition 1 and 2 at the front. With your table group, you will work on condition 3. In a real class, students would be doing all 3 conditions.



Let’s begin!

Record at these times...

0 min.

3 min.

6 min.

STEM Questions

What was the state of matter of the cream at 0 minutes?

What was the state of matter of the cream at 3 minutes?

What was the state of matter of the cream at 6 minutes?

Discussion time!

What happened? What did we notice? What did we learn? How were the different conditions different?

Take out your science journals!

Why Salt Makes Ice Colder

Salt lowers the freezing point of water. Ice absorbs energy as it melts, but the salt water does not release energy by freezing.

Melting is endothermic, so ice gets colder!

Freezing is exothermic, but the salt water has a lower freezing point.

What would happen to the ice cream if we left it out at room temperature for 1 hour?

After _____ minutes and ____ seconds, it is

_____

(impossible/possible/certain)

that the ice cream is going to change state. This state will be

_____

(solid/liquid/gas).

Possible extensions:

Scavenger hunt

Go on a hunt around the classroom or at home to find different things, in different states of matter. Find something that can change its state of matter. Try to change its state of matter and time how long it takes. How could you make it change states of matter faster?

Collage

Make an art collage filled with images of things, in different states of matter. Go through cookbooks. Look for pictures of bread dough rising, teapots boiling, or popsicles melting. Add in any other pictures that relate to the states of matter.

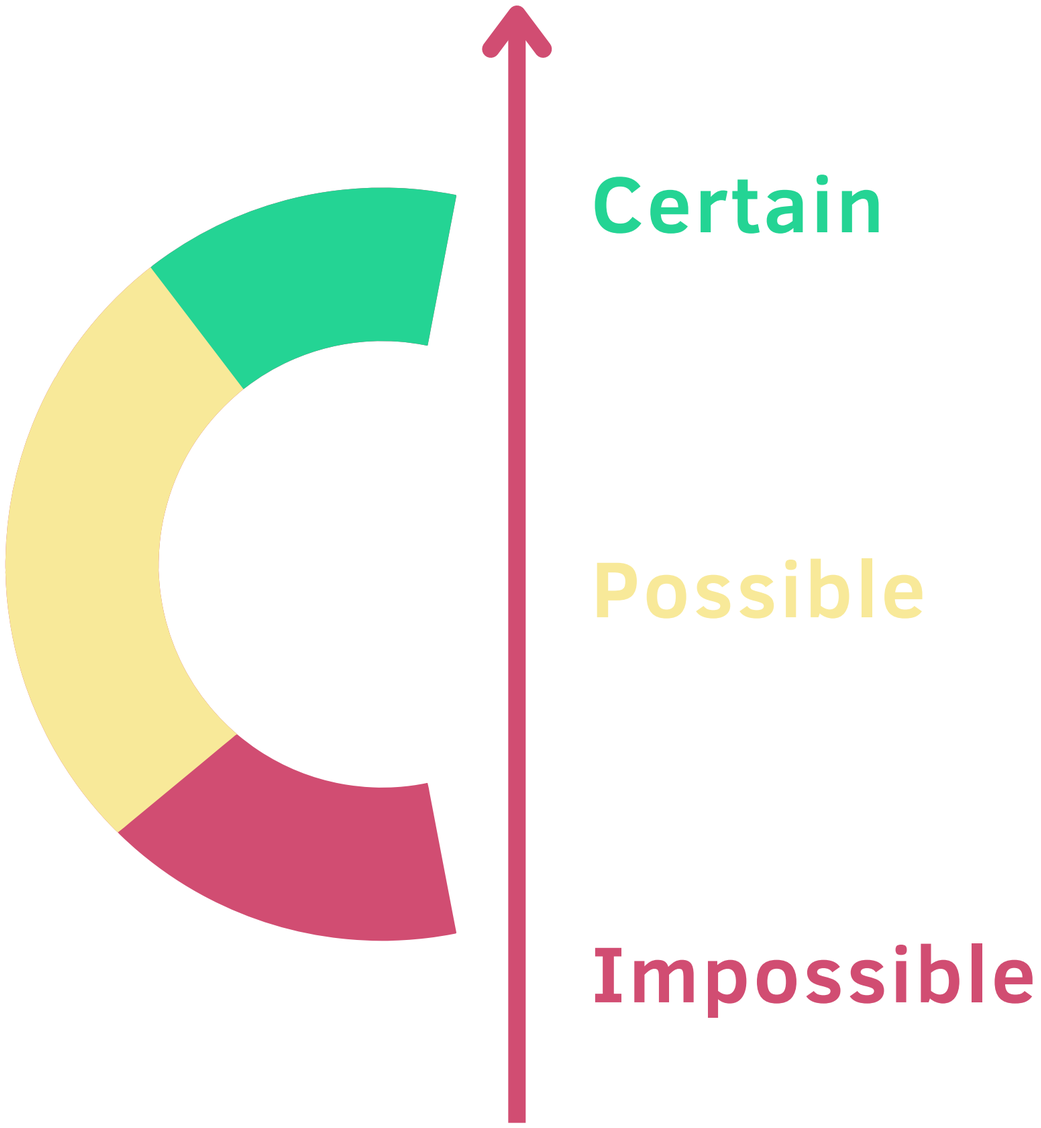
Inquiry project

Think of a question you have about states of matter. Look up information, to try and solve your question. Present your information any way you want to.

Dance

Make a dance about the states of matter. Consider this video for ideas: https://www.youtube.com/watch?v=3IW8E1YR0kE

What is the probability that you will eat your ice cream?



Take It Further... STEAM

Students must engineer their own ice cream flavour. They must list their ingredients, and come up with an aesthetic design of the ice cream flavour.

Art

- Must not be an existing flavour
- Must include a matter of some sort (not limited to solid state)

Media

- Using technology to create an persuasive advertisement

Forms, Conventions, and Techniques

A2.4 demonstrate an understanding of the forms, conventions, and techniques of digital and media texts, and apply this understanding when analyzing texts

Media, Audience, and Production

A2.5 demonstrate an understanding of the interrelationships between the form, message, and context of a text, the audience, and the creator

+ Language

Perspectives within Texts

C3.5 identify explicit and implicit perspectives communicated in texts, providing evidence, and explain how these perspectives could influence an audience

Thank you!

STEM Science Lesson Plan

Lesson Plan Information	
Names: Vanessa Li, Sam Park, Katarina Ingratta, Meghan Grandy, Marta Sokol, Sheena Brennan	**Date:** March 6, 2024
Grade: 2	**Subject:** Science: STEM, Matter and Energy Math: Data, Probability
Presentation timeframe: 30 minutes **Real grade 2 timeframe**: 100 minutes (science and math block)	**Topic:** STEM - The Ice Cream Challenge

Main Idea
This lesson is a cross-curricular STEM lesson that integrates the properties of liquids and solids with probability and measurement. Students will be making ice cream to see how cream (a liquid) can change into ice cream (a semi-solid) under different conditions.

Ontario Curriculum Expectations

Science: STEM Skills and Connections

A1. STEM Investigation and Communication Skills - use a scientific research process, a scientific experimentation process, and an engineering design process to conduct investigations, following appropriate health and safety procedures

- **A1.2** use a scientific experimentation process and associated skills to conduct investigations.

Science: Matter and Energy: Properties of Liquids and Solids

C2. Exploring and Understanding Concepts - demonstrate an understanding of the properties and physical changes of liquids and solids

- **C2.3** describe properties of liquid water and solid water and identify the conditions that cause changes from one state to the other.
- **C2.4** identify conditions in which the states of liquids and solids remain constant and conditions that can cause their states to change.

Math: Data

D2. Probability - describe the likelihood that events will happen, and use that information to make predictions

- **D2.1** use mathematical language, including the terms “impossible,” “possible,” and “certain,” to describe the likelihood of complementary events happening, and use that likelihood to make predictions and informed decisions

STEM Science Lesson Plan

Math: Spatial Sense

E2 Measurement - compare, estimate, and determine measurements in various contexts

- **E2.4** use units of time, including seconds, minutes, hours, and non-standard units, to describe the duration of various events.

Learning Goals

- I can make a prediction about what will happen during a scientific investigation.
- I can make observations about cream and ice cream, properties of matter, and how it changes with the shape of the container.
- I can use math probability terms, such as "impossible," "possible," and "certain" to determine how likely something is to happen.
- I can use units of time, such as minutes, to record the results of the ice cream-making investigation.

Prior Learning

This will be a **mid-unit lesson**. Students will already be familiar with the following concepts and terms:

- States of matter
  - Solid
  - Liquid
  - Gas
- Properties of matter
  - A solid keeps its shape.
  - A liquid takes the shape of its container.
- Probability
  - Impossible
  - Possible
  - Certain

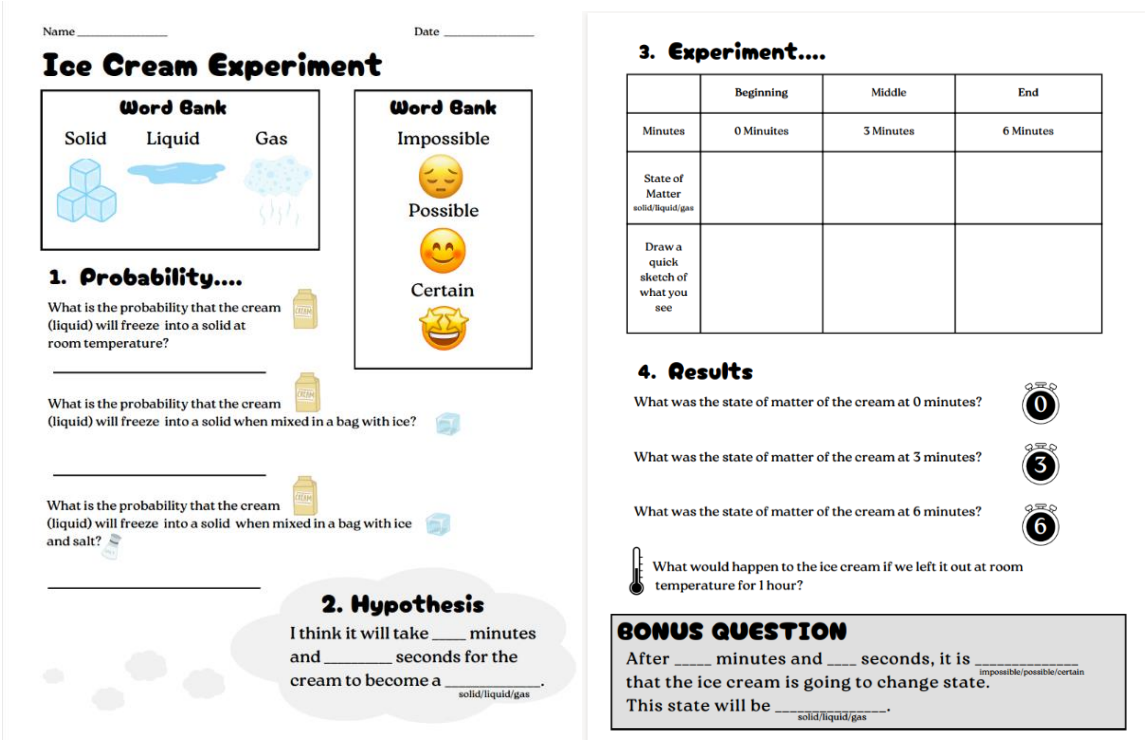
Materials

Teaching resources:

- Lesson reference: https://www.sciencebuddies.org/stem-activities/ice-cream-bag
- Canva presentation: https://www.canva.com/design/DAF7dkuhMXw/AiRXg_wIqwwcGjl_kSVObQ/edit?utm_content=DAF7dkuhMXw&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton

STEM Science Lesson Plan

- Worksheets for students (5 copies for 5 groups)



Name _____ Date _____

Ice Cream Experiment

Word Bank

Solid Liquid Gas

Word Bank

Impossible

Possible

Certain

1. Probability....

What is the probability that the cream (liquid) will freeze into a solid at room temperature?

_____

What is the probability that the cream (liquid) will freeze into a solid when mixed in a bag with ice?

_____

What is the probability that the cream (liquid) will freeze into a solid when mixed in a bag with ice and salt?

_____

2. Hypothesis

I think it will take ____ minutes and _____ seconds for the cream to become a _____.
solid/liquid/gas

3. Experiment....

	Beginning	Middle	End
Minutes	0 Minuites	3 Minutes	6 Minutes
State of Matter solid/liquid/gas			
Draw a quick sketch of what you see			

4. Results

What was the state of matter of the cream at 0 minutes?

What was the state of matter of the cream at 3 minutes?

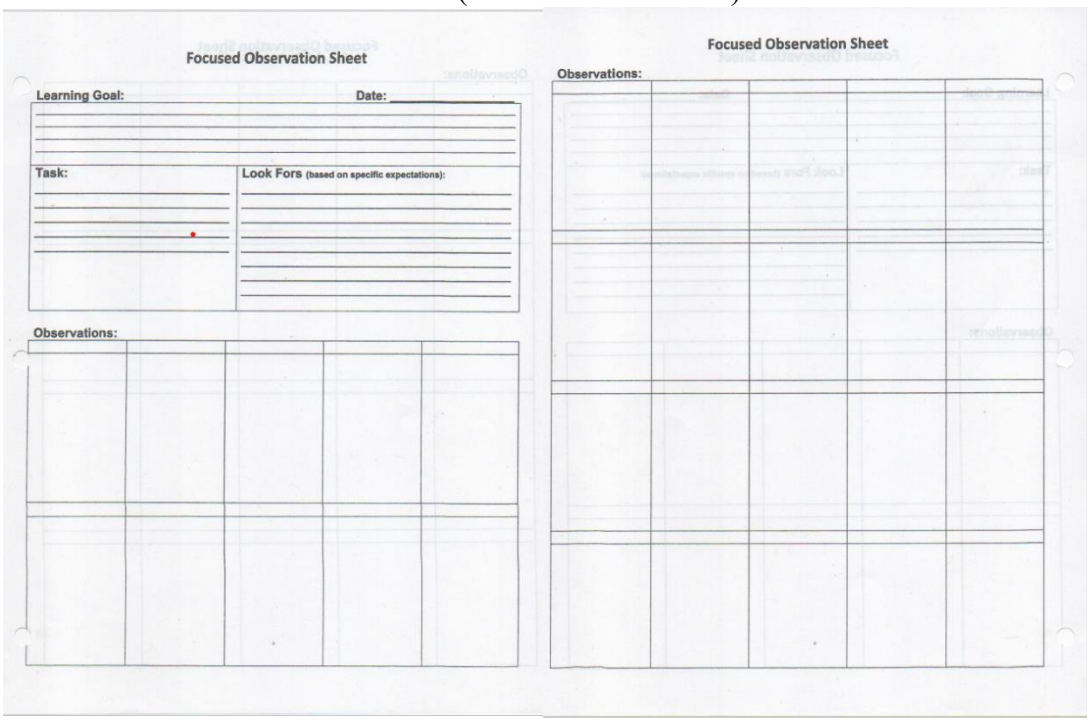
What was the state of matter of the cream at 6 minutes?

What would happen to the ice cream if we left it out at room temperature for 1 hour?

BONUS QUESTION

After ____ minutes and ____ seconds, it is _____
impossible/possible/certain
that the ice cream is going to change state.
This state will be _____.
solid/liquid/gas

- Focused observation sheets (for assessment notes)



Focused Observation Sheet

Learning Goal: Date: _____

Task: Look Fors (based on specific expectations):

Observations:

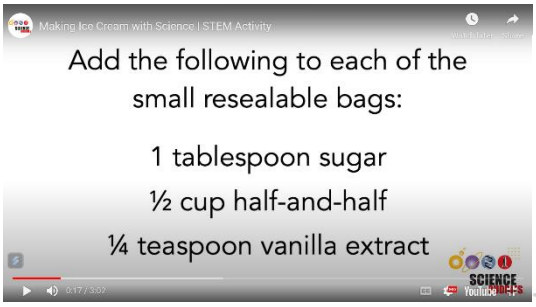
Focused Observation Sheet

Observations:

STEM Science Lesson Plan

Experiment materials:
*Note: All materials and ingredients should be measured and prepared in advance. Refer to the "lesson reference" link (above) for more information.

Measurements based on having 5 groups of students.



- Worksheets (2 pages × 3 conditions × 5 groups = 30 pages)
- Measuring spoons (omit if pre-measured)
- Measuring cup (omit if pre-measured)
- Oven mitts or a small towel (5 for 5 groups)
- Stopwatch or cellphone to track time (5 for 5 groups)
- Sugar (1 tablespoon × 3 conditions × 5 groups = 15 tablespoons)
- Half-and-half. Alternatively, milk or heavy whipping cream may be used. (½ cup × 3 conditions × 5 groups = 7.5 cups)
- Vanilla extract (¼ teaspoon × 3 conditions × 5 groups = 3 and ¾ teaspoons)
- Rock salt. Note: Different types of salts, such as table salt will all work, but may give slightly different results. (½ cup × 1 condition × 5 groups = 2.5 cups)
- Ice cubes (4 cups × 2 conditions × 5 groups = 40 cups)
- Small, sealable bags, such as pint-sized or sandwich-sized Ziplocs (1 bag × 3 conditions × 5 groups = 15 small bags)
- Gallon-sized sealable bags (1 bag × 2 conditions × 5 groups = 10 large bags

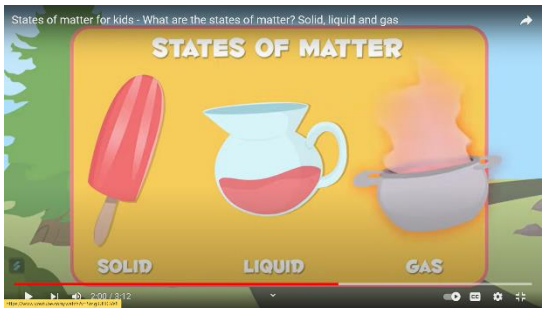
Activities

Presenting the Canva Slides

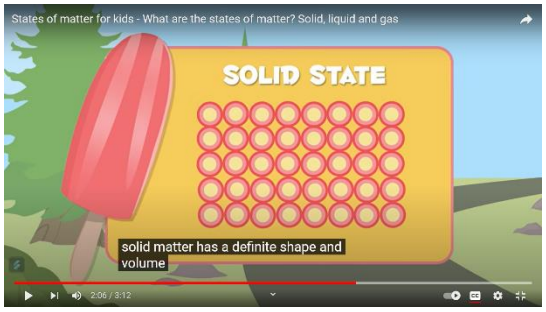
- **Introduction and learning goals**
- Students will make a prediction (educated guess) about what they will be learning, based on the visuals they see, and words they hear.
- The students and teacher will discuss the learning goals for the lesson.
- Goals: Make predictions using scientific investigation, make observations about properties of matter, use math probability terms, use units of time

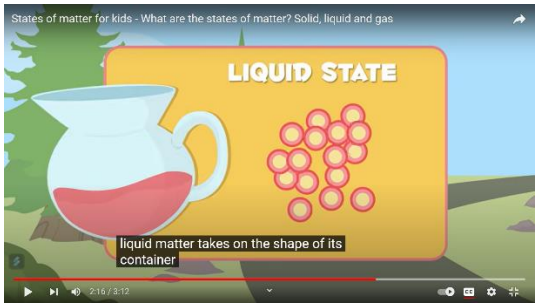
- **States of matter video**

- As a whole class, students will watch a video to review the states of matter: Solid, liquid, and gas.



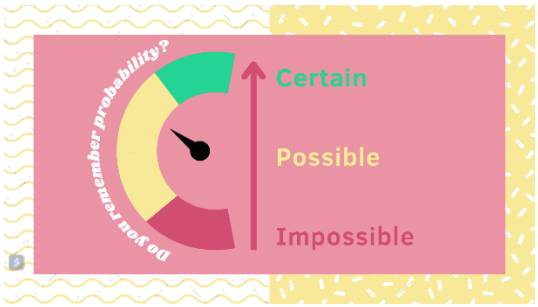
- The video will also review the properties of liquids and solids. (Liquids take the shape of the container they are in. Solids keep their shape.)





- **Review of probability**

- Students review probability terms: “Certain”, “Possible”, “Impossible”



STEM Science Lesson Plan

- **Science Investigation Begins!**
- The materials (ice, salt, cream) and their states of matter are discussed.
- The 3 different conditions are discussed.

I. Bag with cream

II. Bag with cream and ice

III. Bag with cream, ice, and rock salt

Students get into groups of 4 (adjustable, based on class size). This lesson plan assumes there are 20 students total, with 5 groups of 4.

Materials and worksheets are handed out.

*Note: All materials and ingredients should be measured and prepared in advance.

STEM Science Lesson Plan

For each condition (I, II, and III):

- The students make a prediction about the time it will take for the cream to become a solid.
- The students use probability to make predictions about the experiment.
- The students record their results at 0, 3, and 6 minutes (beginning, middle and end).

Beginning (0 minutes)	Middle (3 minutes)	End (6 minutes)
		

Discussion

- After all the conditions have been completed, and the results have been recorded, the class will have a whole-group discussion.
  - What happened? What did we notice?
  - What was different between the different conditions?
  - Which condition made the best ice cream?
  - How did salt in the bag change the ice cream? Why do you think this happened?

Extension Questions:

- **[Connection C2.4]** When does ice cream melt faster – in the summer or in the winter? Why does ice cream melt faster in the summer than in the winter?
- **[Connection D2.1]** Is it possible for a liquid to become a solid?
- **[Connection D2.1]** Is it possible for a solid to become a liquid?
- **[Connection D2.1]** Is it certain that a liquid will become a liquid again?
  - Example: Milk to ice cream to melted ice cream
  - Example 2: Egg whites to cooked eggs
- **[Connection E2.4]** Estimate how long it would take for your ice-cream to return to a liquid state.

STEM Science Lesson Plan

Extra Time /Extension Tasks

1. **Scavenger hunt**

Go on a hunt around the classroom or at home to find different things, in different states of matter. Find something that can change its state of matter. Try to change its state of matter and time how long it takes. How could you make it change states of matter faster?

2. **Collage**

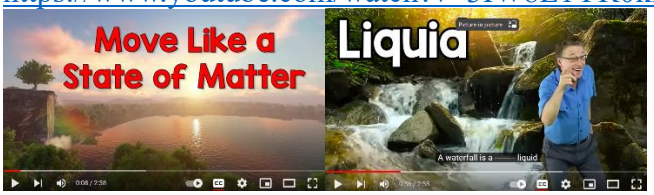
Make an art collage filled with images of things, in different states of matter. Go through cookbooks. Look for pictures of bread dough rising, teapots boiling, or popsicles melting. Add in any other pictures that relate to the states of matter.

3. **Inquiry project**

Think of a question you have about states of matter. Look up information, to try and solve your question. Present your information any way you want to.

4. **Dance**

Make a dance about the states of matter. Consider this video for ideas:
https://www.youtube.com/watch?v=3IW8E1YR0kE

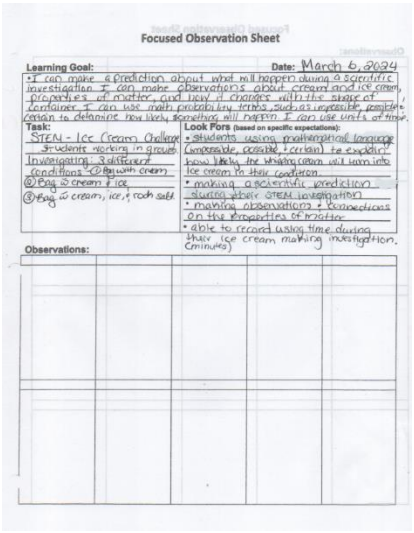


Assessment and Evaluation

Assessment for this lesson:

- Exit ticket in science journals
  - After the group discussion on the following questions, students will write in their science journals to reflect and share their own answers.
    - What happened? What did we notice?
    - What was different between the different conditions?
    - Which condition made the best ice cream?
    - How did salt in the bag change the ice cream? Why do you think this happened?
- Taking pictures as students are engaging in the STEM activity. Photos could go in a students' science portfolio as visual documentation of learning and achievement.
- Student checklist and notes (Focused observation sheets)
  - Look Fors include:
    - Use of specific vocabulary (i.e. Solid, liquid, hard, soft, etc.)
    - Orally and visually describing the different states
    - Able to make a scientific prediction during the investigation

- Students understanding the concept of probability by using mathematical language (impossible, possible, and certain) to explain the probability of the 3 different states of matter turning from liquid to solid.



Focused Observation Sheet

Learning Goal: Date: March 6, 2024

I can make a prediction about what will happen during a scientific investigation. I can make observations about cream and ice cream, properties of matter, and how it changes with the shape of container. I can use math probability terms such as impossible, possible, certain to determine how likely something will happen. I can use units of time.

Task:
STEM - Ice Cream Challenge
Students working in groups
Investigating: 3 different conditions - ① Egg with cream
② Egg & cream & ice
③ Egg & cream, ice, & rock salt

Look Fors (based on specific expectations):
- students using mathematical language (impossible, possible, certain) to explain how likely the whipping cream will turn into ice cream in their condition.
- making a scientific prediction
- stating their STEM investigation
- making observations + connections on the properties of matter
- able to record using time during their ice cream making investigation. (minutes)

Observations:

Accommodations and Modifications

Content

- The student(s) may have a copy of the Canva slides and/or lesson plan.
- The student(s) may only need to learn some of the curriculum expectations in this lesson.
- The student(s) may do a different activity, or have a different worksheet, based on modified curriculum expectations.

Process

- The student(s) may perform one of the experimental conditions, instead of all three.
- The student(s) may watch others perform the investigations, instead of performing it themselves.
- The student(s) may work in a larger or smaller group, or by themselves.
- The student(s) may have extra time to complete experimentation tasks.
- The student(s) may work with an Educational Assistant.

Product

- The student(s) may verbally respond to questions, instead of writing on the worksheet.
- The student(s) may have a scribe to help write on the worksheets.
- The student(s) could type their answers instead of using paper and pencil.
- The student(s) could demonstrate their understanding in a completely different and unique way.

*Note: Always refer to a student's IEP if they have an identified accommodation.

STEM Science Lesson Plan

Next Steps
In subsequent lessons, students will analyze real-life examples of states of matter and apply it to STSE. They will consider the societal and environmental concerns regarding melting polar ice caps and present their findings. • For example, students can learn/investigate about the melting polar ice caps and climate change.

Appendix

Pictures of Ice Cream Challenge from In-class Presentation

Students put the cream mixture in a big zip-lock bag filled with salt and ice.

Students cover the bag in a towel, shake for 6 minutes; stopping to check at 0min, 3min, & 6min.

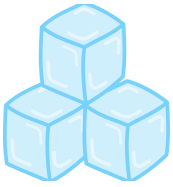
Students should take it out the bag to see and touch the state of the cream at 0min, 3min, & 6min.

Name _____ Date _____

Ice Cream Experiment

Word Bank

Solid Liquid Gas



Word Bank

Impossible

Possible

Certain

1. Probability....

What is the probability that the cream (liquid) will freeze into a solid at room temperature?

_____

What is the probability that the cream (liquid) will freeze into a solid when mixed in a bag with ice?

_____

What is the probability that the cream (liquid) will freeze into a solid when mixed in a bag with ice and salt?

_____

2. Hypothesis

I think it will take ____ minutes and _____ seconds for the cream to become a _____.

solid/liquid/gas

3. Experiment....

	Beginning	Middle	End
Minutes	0 Minutes	3 Minutes	6 Minutes
State of Matter solid/liquid/gas			
Draw what you see			

4. Results

What was the state of matter of the cream at 0 minutes?

_____

What was the state of matter of the cream at 3 minutes?

_____

What was the state of matter of the cream at 6 minutes?

_____

What would happen to the ice cream if we left it out at room temperature for 1 hour?

BONUS QUESTION

After ____ minutes and ____ seconds, it is _____
impossible/possible/certain
that the ice cream is going to change state.
This state will be _____.
solid/liquid/gas

Focused Observation Sheet

Learning Goal: **Date:** March 6, 2024

• I can make a prediction about what will happen during a scientific investigation. I can make observations about cream and ice cream, properties of matter, and how it changes with the shape of container. I can use math probability terms, such as impossible, possible & certain to determine how likely something will happen. I can use units of time.

Task:

STEM - Ice Cream Challenge
Students working in groups.
Investigating: 3 different conditions - ① Bag with cream
② Bag w cream & ice
③ Bag w cream, ice, & rock salt.

Look Fors (based on specific expectations):

• students using mathematical language (impossible, possible, & certain) to explain how likely the whipping cream will turn into ice cream in their condition.
• making a scientific prediction during their STEM investigation
• making observations & connections on the properties of matter
• able to record using time during their ice cream making investigation. (minutes)

Observations:

Summary Reflection

The ice cream challenge science lesson serves as a demonstration of how STEM activities can align with social constructivism in education. This lesson allows teachers to provide a meaningful and captivating learning experience for students. According to Pedretti et al. (2015), “Often students view science as a body of facts to memorize and pursuit that yields definite answers from a specific method,” (p.4); however, by participating in the ice cream making process, students can learn through engagement.

Social constructivism is the building of knowledge through the social, cultural, and motivational communication with peers and teachers (Barak, 2017). This lesson emphasizes a social constructivism approach through collaboration, as students actively engage and construct their knowledge by collectively discussing and testing their ideas of the conditions that change the states of matter. In the activity, students are encouraged to use their prior knowledge about states of matter and probability to make predictions, explore, and participate in a collaborative learning experience. As a result, students will build on their understanding through discussion and observation to make further predictions about conditions that affect different states of matter. Through this hands-on experience, they can develop their scientific knowledge and enhance their critical thinking, problem-solving, and communication skills.

This lesson seamlessly incorporates learning outcomes that engage the multiple levels in Bloom's Taxonomy. Blooms Taxonomy allows teachers to gauge the cognitive skills of students to allow for deeper learning and transfer of knowledge (Adams, 2015). The lesson starts with a review and initial questions to engage the knowledge level, as students can demonstrate their previous knowledge and understanding of various states of matter—the phases of water and its transitions from liquid to solid and gas. As the lesson progresses, students engage in higher levels

as they apply their knowledge to make a hypothesis on the condition of the cream on ice and salt—predicting that salt could potentially dissolve ice. As they engage in the ice-cream making activity, students witness firsthand the gradual changes from liquid cream to semi-solid ice cream. Ultimately, the lesson aims to allow students to use their knowledge, understanding, and observations to analyze and comprehend the ice cream-making process, concluding that the ice and salt condition play a role in the transformation from liquid to a semi-solid state.

As assessment for, as, and of learning gauge the knowledge and understanding gained by students, this lesson uses observation and questioning to assess student learning. As stated by the Ontario Growing Success document (2020), assessments are to be gathered by a variety of means to accurately reflect on students' learning and achievement. By using a formative assessment observation sheet and summative assessment student worksheet, this lesson considers different avenues to demonstrate and improve student learning. The observation sheet aims to capture student learning—orally or physically—done during the experiment and the student worksheet aims to consolidate student learning—written or visually—after the experiment.

The ice cream challenge science lesson empowers students to immerse themselves in experiential learning, fostering critical thinking, scientific inquiry, and a deeper comprehension of states of matter through an engaging and interactive activity. In the real-world contexts, students encounter multiple instances where externals factors change states of matter. Freezing water to ice, melting ice to water, and boiling water to steam are some examples that they may encounter. As students connect this lesson to real-world contexts, they may draw parallels with the usage of salt when de-icing roads in Southern Ontario. These connections are crucial as students will investigate further the global issue of melting polar ice caps from climate change.

References

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