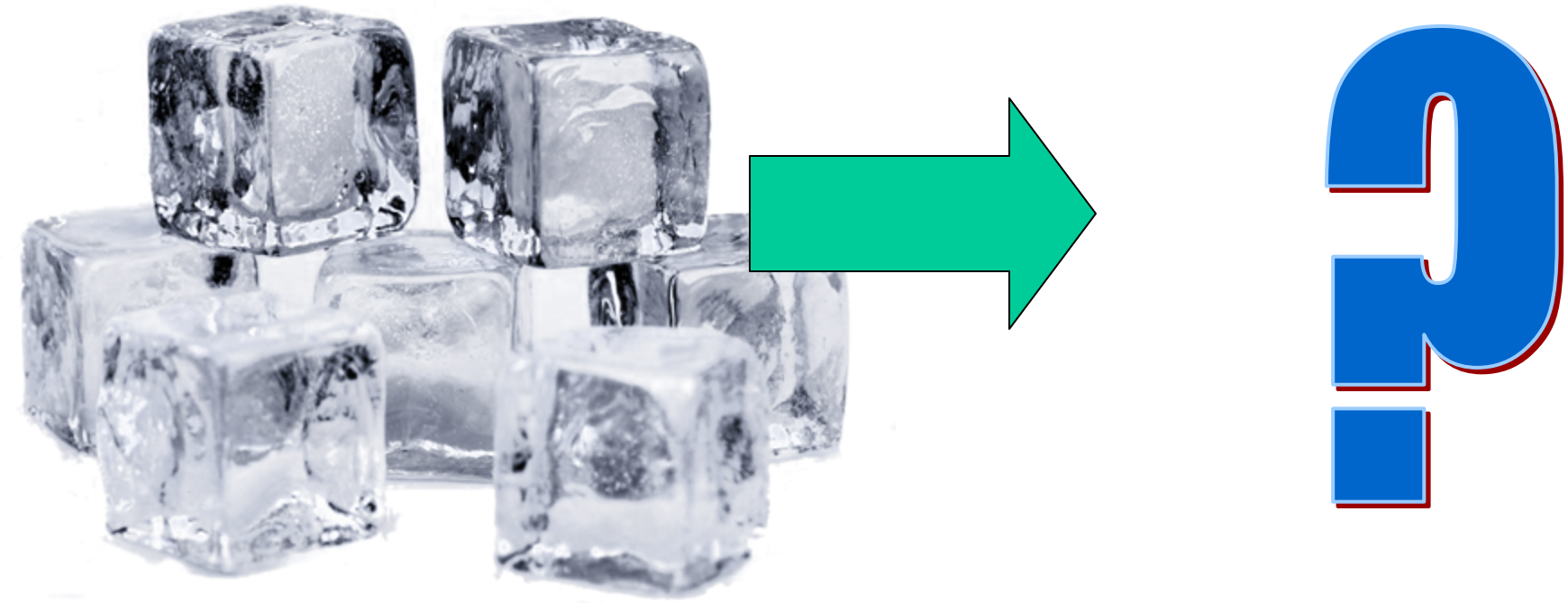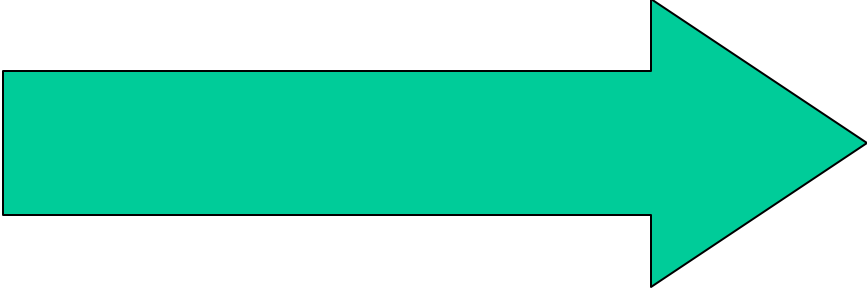# 23.1   I Scream, You Scream:

What happens to the ice when you make ice cream?
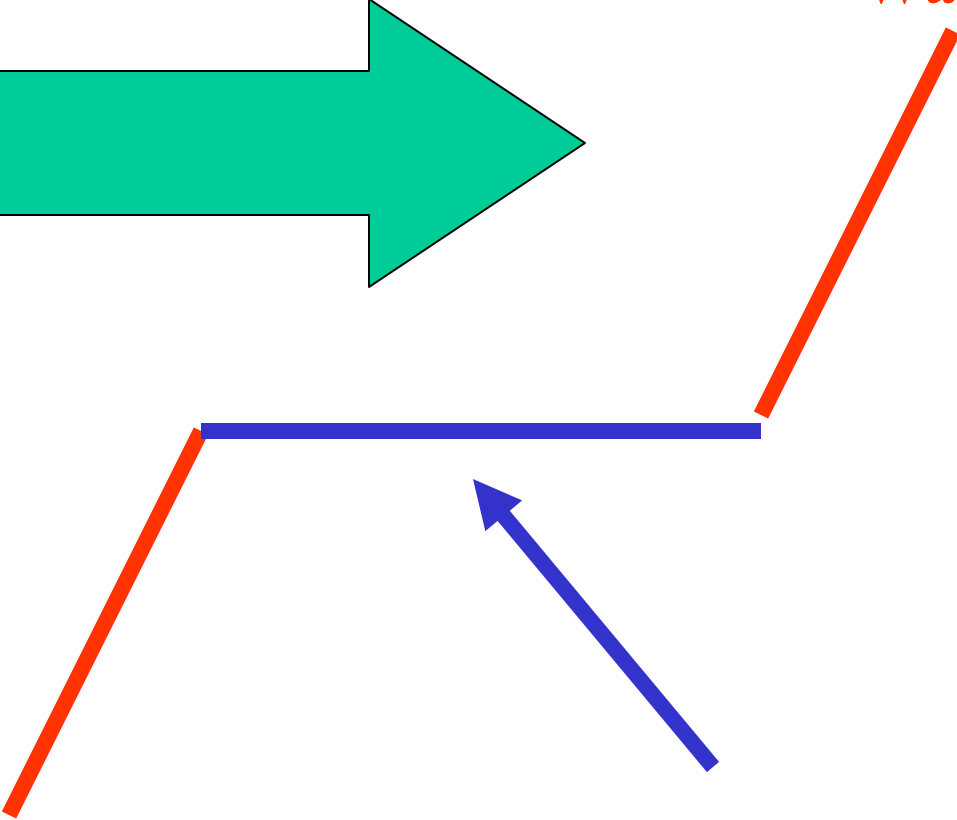
**Heat GAINED as
Ice MELTS**
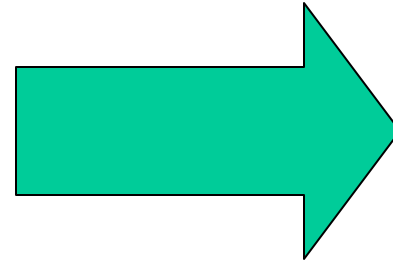
**Liquid
Water**

Ice

Phase Change

FUSION

What happens to the ice cream mixture as you make ice cream?

Heat LOST as Ice Cream Freezes

Liquid Ice Cream

Solid ice cream

Phase Change

FUSION
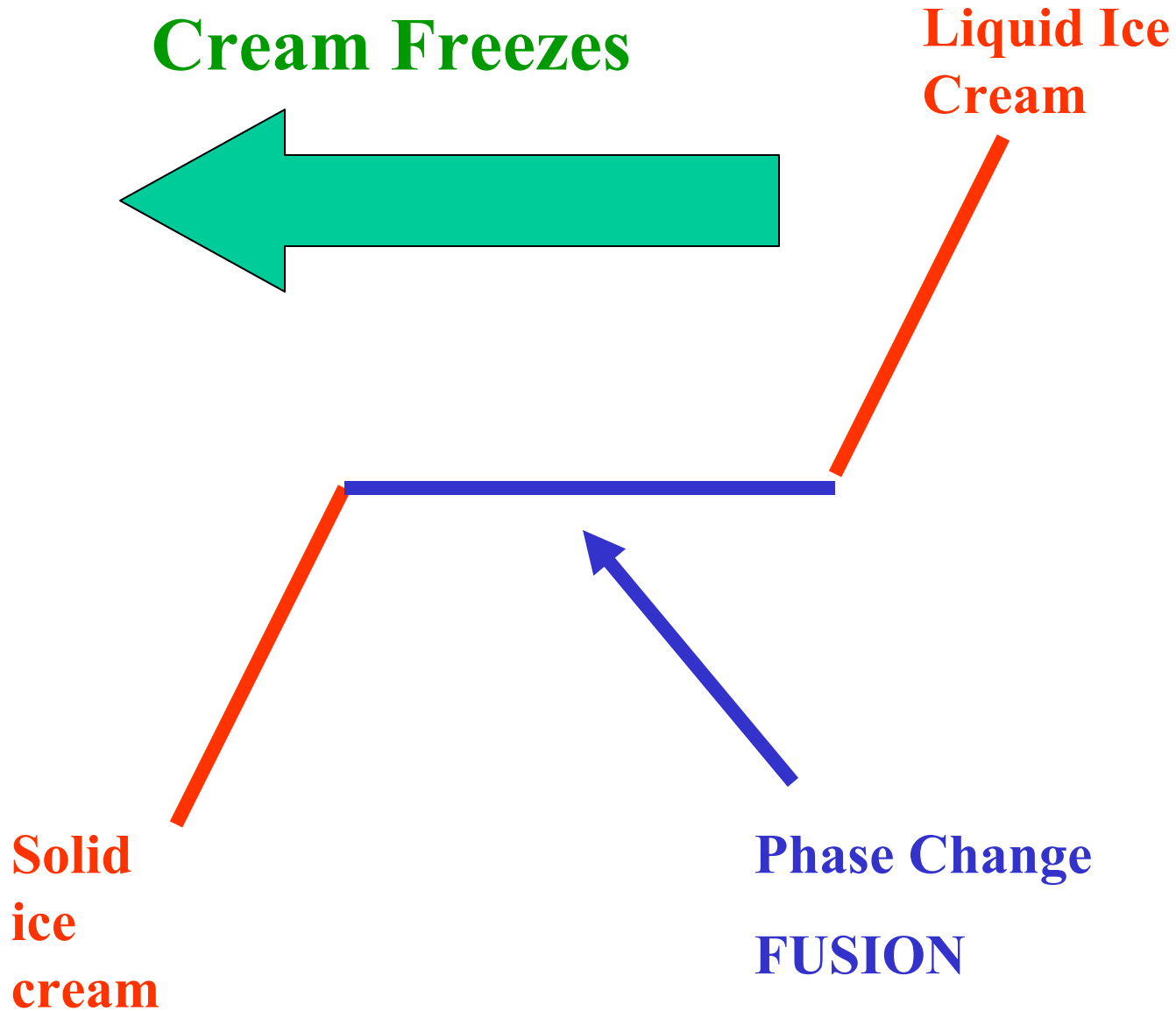
PURPOSE

1. Find Freezing point of ice cream.

PURPOSE

1. Find Freezing point of ice cream.

2. Determine the H_f of ice cream.

PURPOSE

1. Find Freezing point of ice cream.

2. Determine the H_f of ice cream.

3. Calculate the heat LOST as ice cream freezes. (Heat lost = heat gained)

PURPOSE

1. **Find Freezing point of ice cream.**

2. **Determine the H_f of ice cream.**

3. **Calculate the heat LOST as ice cream freezes. (Heat lost = heat gained)**

4. **How much heat did the ice gain when it melted?**

***Specific heat of ice cream mixture is 0.80 cal/g**

***Stir the test tube in the ice water, not the temperature probe**

***Only put the ice cream into the calorimeter, not the test tube**

***Make GREAT data tables, use your equations to determine what data is needed**

Day 2

Lab Follow-up, Day 1

1. Find Freezing point of ice cream.

2. Determine the H_f of ice cream.

Q lost = Q gained

How many calories did the water lose?

Change of temp: $Q = \underline{m} \cdot \underline{c} \cdot \underline{\Delta T}$

This would equal the calories gained as the ice cream melted and warmed.

Change of temp: $Q = \underline{m} \cdot \underline{c} \cdot \underline{\Delta T}$

Phase change (fusion) $\underline{Q} = \underline{m} \cdot H_f$

1. Temperature of ice cream mixture

2. Ration salt

3. 1st sample of ice cream for experiment

4. 100 ml of ice cream mixture = 104.3 grams – bag

5. ½ bag of ice: supplemental 500 g mass

6. Reuse ice

Part 1 Corrections

Calculate the heat LOST as ice cream freezes. (Heat lost = heat gained)

How much heat did the ice gain when it melted?

Day 3 **Super cooled water**

Part 1 Grading Criteria:

5. Data Table needed to calculate the heat LOST as as the water cooled and GAINED as the <u>ice cream</u> melts and warms:

Q =	m •	c •	ΔT
water & cup cup water only	_____ _____ _____ g	 _____ cal/g	starting _____ ending _____ ΔT _____ °C
Test tube & ice cream test tube Ice cream only	_____ _____ _____ g	 _____ cal/g	starting_____ ending _____ ΔT _____ °C

	Q =	m •	Hf
ice cream	_____ cal	_____ g	? cal/g

6. Calculate the heat LOST as as the water cooled and the heat GAINED as the ice cream melts and warms:

Water: Q = $m \cdot c \cdot \Delta T$

Ice Cream Warming: Q = $m \cdot c \cdot \Delta T$
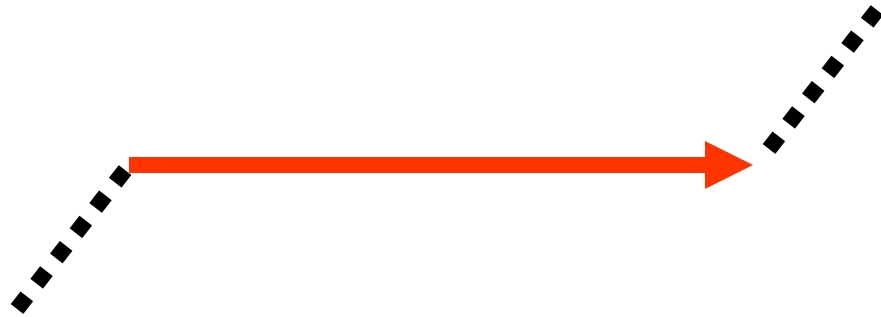
Ice Cream Melting: Hf = Q / m

Q (of water) - Q (of liquid ice cream warming) = Q (of heat of fusion for the ice cream)

SHOW EQUATIONS, YOUR WORK & LABEL THE 4 ANSWERS

Lab Follow-up, Part II

How much heat did the <u>ice</u> GAIN when it melted?

$$Q = \underline{m} \cdot \underline{Hf}$$

Calculate the heat LOST as the <u>ice cream</u> cools and freezes:

Change of temp: $Q = \underline{m} \cdot \underline{c} \cdot \underline{\Delta T}$

Phase change (fusion) $Q = \underline{m} \cdot \underline{H_f}$

Part 2 Grading Criteria:

1. Data Table needed to calculate the heat LOST as <u>ice cream</u> cools and freezes:

Q	=	m	•	c	•	ΔT	
	bag	____		____ cal/g		starting	____
	bag & ice cream	____				ending	____
	ice cream	____ g				ΔT	____ °C

Q	=	m	•	Hf
ice cream		____ g		____ cal/g

2. Calculate the heat LOST as ice cream cools and freezes.

$Q = m \cdot c \cdot \Delta T$

$Q = m \cdot Hf$ $Q + Q =$ Total Q or   _____ cal

SHOW EQUATIONS, YOUR WORK & LABEL THE 3 ANSWERS

3. Data Table needed to calculate the heat GAINED as the ice melts:

$$Q \quad = \quad m \quad \bullet \quad H_f$$

bag	_____	_____ cal/g
ice and bag - bag	_____	
- ice remaining	_____	
Ice used	_____ g	

4. Calculate the heat GAINED as ice melts.

$$Q = m \cdot H_f$$

SHOW EQUATION, YOUR WORK & LABEL THE ANSWER

Homework due Monday:

    22   1-6

    23   1-10

    24   1-6

Labs:

    23.1 (part 1) due Tuesday

    23.1 (part 2) due Wednesday

Test: Wednesday Chapters 21-24