Activity 1- Snow Sampling Materials List

Building snow kits for your class is relatively simple and low cost. For this activity you will need the following for each group: clipboard or waterproof notebook, data sheets (*see Thermal Index of Snow Data Sheet*), 2ft sections of 2" PVC pipe with end caps, a high-precision scale (to 0.001 kg), and measuring stick. The total cost to build the kit described will vary depending on the type of scale used. Digital hanging scales with high precision typically cost $225 each. However, a standard tabletop lab scale available at your school can be used instead, bringing the cost of each kit to ~ $35. The table below is a complete list of the equipment needed to construct one student snow kit for the *Thermal Index Snow Lab Activity*. Teachers are encouraged to construct their own kits using lower cost materials when available.

Item	Quantity	Price Per Unit	Total Price
CCi HS-30 Digital Hanging Scale	1	$225.00	$225.00
Plastic caps for snow tube	2	$0.25	$.50
2 in. x 2ft. PVC Pipe	1	$4.30	$4.30
Stainless Steal Spatula	1	$11.00	$11.00
Elan Waterproof Field Notebook	1	$8.25	$8.25
Wooden Meter Stick	1	$10	$10.00
Total			**259.05**

Sampling Procedures: Thermal Index Value Snow Lab

1) **Assign one person to be "data cop". This person is responsible for recording data into the field notebook or data sheet.**

2) **Record the date, time, and sample location.**

3) **Collect snow depth by inserting the pvc snow tube vertically into the snowpack. Record the snow depth to the nearest 1.0 cm.**

4) **Collect the snow in the tube by scraping away the snow with the spatula and carefully inserting the spatula underneath the base of the tube. Cap the tube with both caps and weigh using the digital scale. Record the weight of the snow, tube, and caps in grams.**

5) **Record any other observation notes about the condition of the snowpack. Include notes on patchy snow, grass showing, bare ground, and snow pack characteristics (ex: grainy, slushy, heavy, light & fluffy, etc).**

Winter Ecologists:

Thermal Index Value Data Sheet

(Adapted From Marchand, P.J. (1982). An Index For Evaluating the Temperature Stability of a Subnivean Environment, *Journal of Wildlife Management 46:* 518-520.)

$I_T = t/d$

Date: _____ **Time:** _____

Location: _____ **I_T:** _____

Condition of Snowpack: _____

_____

t = Snow thickness (cm) _____

d= Density (g/cm³) _____

Density = Mass(g)/ Volume (cm³)

Mass (g) _____ **Volume (cm³)** _____

Volume of a cylinder = $\pi r^2 h$

$I_T = t/d$

Date: _____ **Time:** _____

Location: _____ **I_T:** _____

Condition of Snowpack: _____

_____

t = Snow thickness (cm) _____

d= Density (g/cm³) _____

Density = Mass(g)/ Volume (cm³)

Mass (g) _____ **Volume (cm³)** _____

Volume of a cylinder = $\pi r^2 h$

Name and Class Period:

It Snow Lab Analysis Worksheet

Using the class Google spreadsheet data complete the table below:

	Site 1:	Site 2:	Site 3:	Site 4:
Maximum (I_t)				
Minimum (I_t)				
(I_t) Data Range				
I_t –Environmental Science Class Average				
I_t - Individual Group Value				
Whole Class Average Snow Depth				
Whole Class Average Snow Density				

Interpretation- Using the table above please answer the following questions:

1. Which location had the highest average snow depth? What is a possible explanation for this?

2. When someone says, "Site x has the lowest average snow density" what does this mean in terms of snowpack composition?

Name and Class Period:

3. Which location had the highest average snow density? What was the average snow depth at this location and what factors may contribute to increased snow density?

4. Which location had the highest I_t value? Lowest I_t value? Compare the snow density and snow depth at each location and describe any pattern you see.

5. Look at the average snow density and average thermal index value at each location. Do they appear to be related? If so how?

6. Look at the average snow depth and average thermal index value at each location. Do they appear to be related? If so how?

7. Provide 2 possible explanations for the between-group variation in snow depth recordings that can be observed at each particular location.

Name

Thermal Index Value of Snow
Summative Assessment

#1- (30 Points) Determine the thermal index value of this hypothetical snowpack. Round values to the hundredth place. **Show all your work!**

Snow Depth = 40 cm

$$I_T = t/d$$

Date: _____ **Time:** _____

Location: _____ I_T: _____

t = snow Thickness(cm) _____

d = Density (g/cm³) _____

Density = Mass(g)/ Volume (cm³)

Mass (g) _____ **Volume (cm³)** _____

Volume of a cylinder $\pi r^2 h$

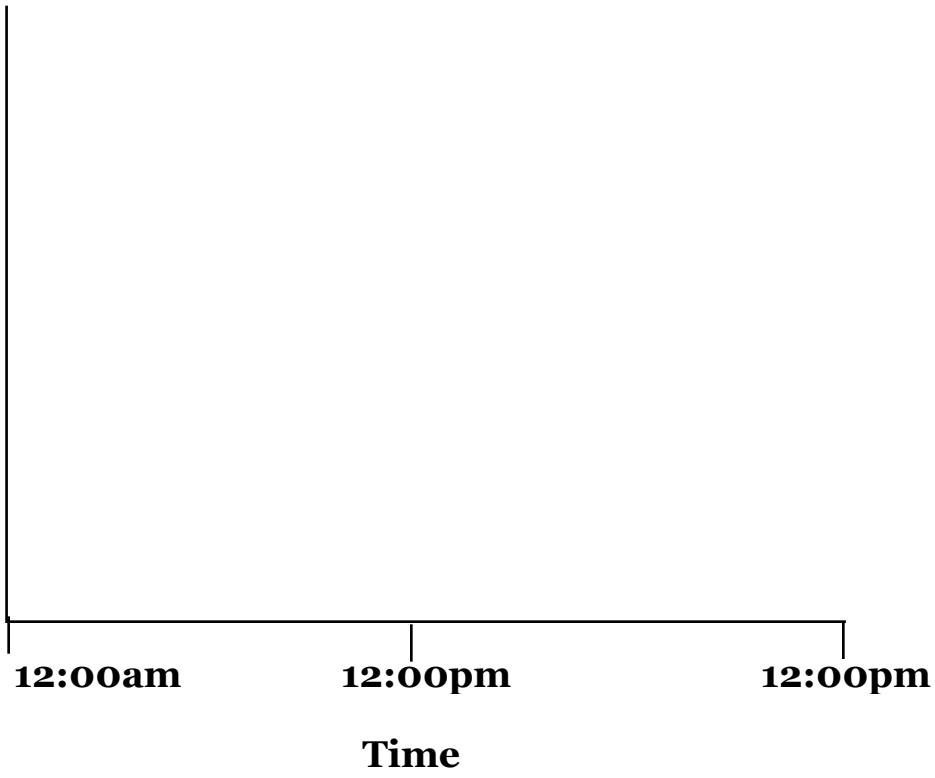
$\pi = 3.14$

r = 2.54cm

h (thickness of snow profile core) _____

r^2 = _____

#2- (20 Points) Using the thermal index value calculated in questions #1, model temperature fluctuation occurring at the ground/snow interface. Assume the temperature at midnight is 0° and 20° at noon. Title your graph and label your y axis.



I_t - Thermal Index Of Snow
Bar Graph Scoring Guide

Student Name _____ **Student Score _____**

1. _____ Bar Graph is titled with an appropriate and descriptive title **2 pts**
2. _____ X- Axis Assigned to Site Location 3 **pts**
3. _____ X- Axis Site Locations Properly Labeled **2 pts**
4. _____ Y-Axis is Assigned to Thermal Index Values **3 pts**
5. _____ Y-Axis Assigned for Thermal Index Value **2 pts**
6. _____ I_t Values for Class Averages are accurate **4 pts**
7. _____ Graph passed in on time **2 pts**
8. _____ Figure Key is present **2pts**

I_t - Thermal Index Of Snow
Bar Graph Scoring Guide

Student Name _____ **Student Score _____**

1. _____ Bar Graph is titled with an appropriate and descriptive title **2 pts**
2. _____ X- Axis Assigned to Site Location 3 **pts**
3. _____ X- Axis Site Locations Properly Labeled **2 pts**
4. _____ Y-Axis is Assigned to Thermal Index Values **3 pts**
5. _____ Y-Axis Assigned for Thermal Index Value **2 pts**
6. _____ I_t Values for Class Averages are accurate **4 pts**
7. _____ Graph passed in on time **2 pts**
8. _____ Figure Key is present **2pts**