



## Lesson 3: Pre-Visit

### *Snow Characteristics*

#### Materials:

- \* Thermometer
- \* Shovel
- \* Clipboard
- \* Data Collection Paper
- \* Pencil



#### Vocabulary

Insulation, snow crystal, snowflake, condensation, water cycle.

#### Method

Students take temperatures at different depths in the snow and compare them to the air temperature. Variations for students to see where in the snow gelatin will solidify fastest, and for catching and classifying snowflake shapes are presented.

#### Objective

Students will be able to investigate the insulating effect of snow and understand that temperature varies according to snow depth.

#### MT State Science Standard

MT.SCI.K-12.1.2 Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate results and reasonable conclusions of scientific investigations.

- A proficient student will select and use appropriate tools including technology to make measurements and represent results of basic scientific investigations.

#### Next Generation Science Standard

3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

- Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. (3-ESS2-1)

#### Background

Snow acts as insulation and provides an environment that has relatively stable temperatures. Small animals (mice, voles and shrews, etc.) spend most of the winter under a protective blanket of snow. Snowshoe hares, grouse, and ptarmigan snuggle into snow, protected from wind and temperature extremes. Large animals (deer, elk, moose, mountain goats, bighorn sheep, etc.) move to south facing slopes, as they are warmer and snow melts off sooner making walking and locating food easier. Temperatures within a snow pack can vary depending on the consistency of the snow. Snow consistency and depth can assist or impede the movement of animals.

#### Procedure

1. Show students a large picture of a thermometer. Review procedures and be sure everyone knows how to read it.
2. Divide students into teams to take and record temperatures. (Be sure that

## Procedure, Continued

- all students have a chance to take some of the temperatures).
- Go outside. Each team uses a shovel to dig a “pit” in the snow at different locations in your test area. Have them take temperatures at the following locations: the air temperature; the temperature at the surface of the snow and every few inches below the surface down to ground level if possible. Have them record their temperatures in a table, like the one below, so that teams can compare their findings:

Depth in snow	Observations of layer -hard, soft, fine, coarse...	Team 1 Temps	Team 2 Temps	Team 3 Temps
Air				
Surface of snow pit				
4 in. below surface				
8 in. “				
12 inches below				

- Inside, compare temperatures and layer observations. Discuss how the temperatures are the same or different and why. How might these differences affect animals in the winter? Did anyone notice any difference in the snow layers as they took the temperatures? What could have caused that?

## Evaluation

Have student groups prepare graphs showing their collected data. Groups can present their information and explain any temperature variations they observed.

Variation: Place equal amounts of water (or gelatin) in cups with lids and bury one cup in the snow and put the other cup on the surface of the snow. Which freezes faster? Why? (Start with cold water and get it outside early in the day).

## Extension

- Is Snow Clean? Collect fresh snow in a clean, empty container. Allow snow to melt. Hold a paper towel or coffee filter over an empty bowl. Slowly pour the melted snow into the bowl. Is there dirt collecting on the filter? A magnifying glass can give you a closer look. Dirt may collect on the filter because every snowflake forms on a speck of dust or salt (see diagram on facing page). As the snowflakes fall, they collect more dirt from the air.
- Flakes Up Close: Take students outside on a snowy day. Give everyone a hand lens. Have students look closely at the snowflakes that fall on their glove or sleeve. Encourage students to share their findings. Check out <http://snowflakebentley.com> for some great snowflake images.
- Permanent Impressions: Chill a piece of glass (a microscope slide works well) and spray it with chilled hair spray or chilled clear lacquer. Take the students and the sprayed glass (carried on a piece of cardboard) outside. Catch snow flakes on the glass as they fall. They will make imprints on the glass. Leave the slides in the cold until the lacquer dries. Look at the shapes under a microscope. Use the classification guide on the next page to see what shapes your snowflakes are in. You could record how many you get of each type and then find the percentage of each.

# Birth of a Snowflake

from Discover Nature in Winter

4. As it rises, it cools and freezes.

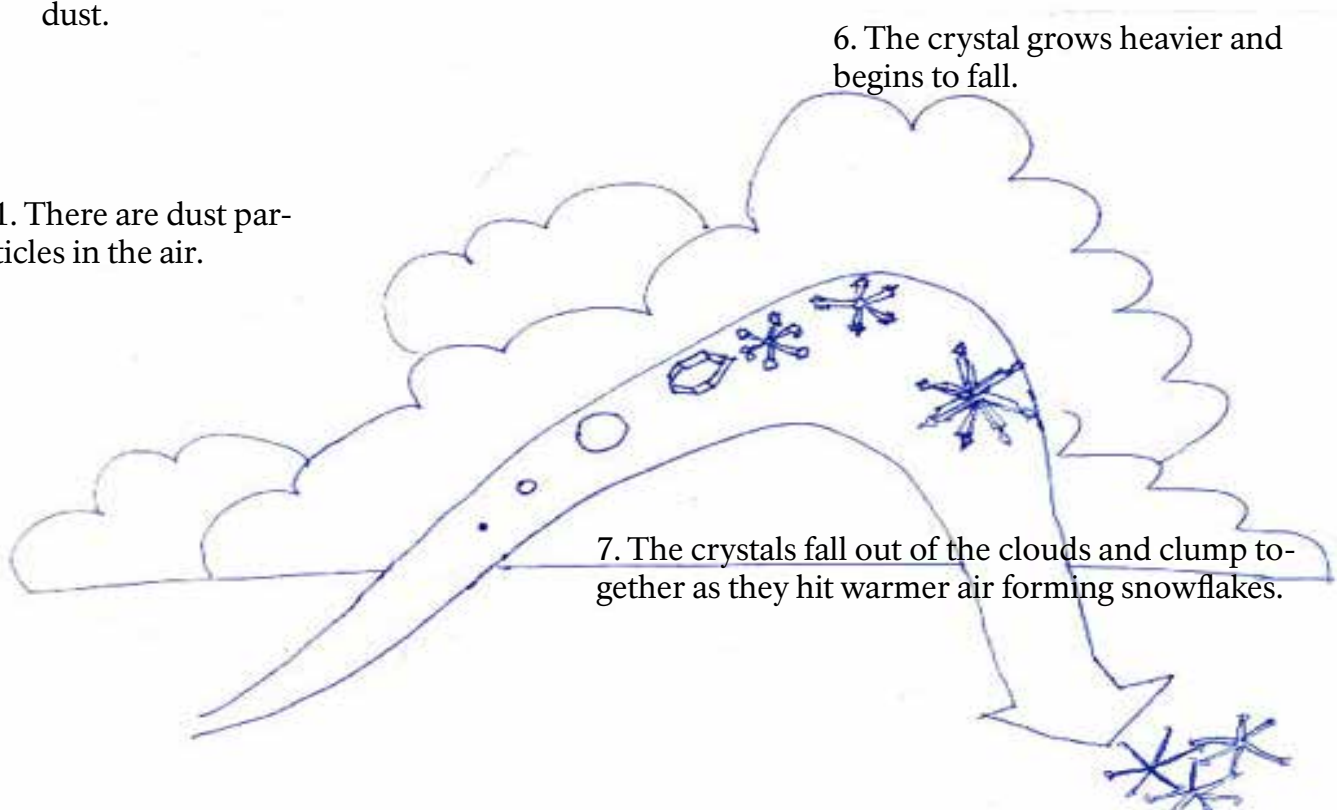
3. The droplet grows.

5. The ice crystal grows six branches.

2. Water vapor condenses on the dust.

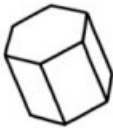
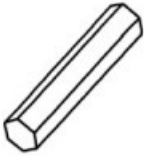

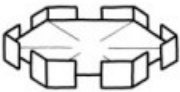

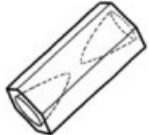





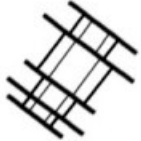




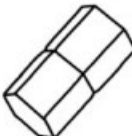



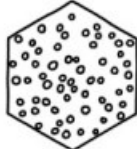



6. The crystal grows heavier and begins to fall.

1. There are dust particles in the air.



## Did You Know?

In 1951 the International Commission on Snow and Ice produced a fairly simple and widely used classification system for solid precipitation. This system defines the seven principal snow crystal types as plates, stellar crystals, columns, needles, spatial dendrites, capped columns, and irregular forms. To these are added three additional types of frozen precipitation: graupel, ice pellets, and hail. The classification system in the following pages is one by Libbrecht who has been studying snow crystals for years and prefers a more [complex system](#).

				
Simple Prisms	Solid Columns	Sheaths	Scrolls on Plates	Triangular Forms
				
Hexagonal Plates	Hollow Columns	Cups	Columns on Plates	12-branched Stars
				
Stellar Plates	Bullet Rosettes	Capped Columns	Split Plates & Stars	Radiating Plates
				
Sectoried Plates	Isolated Bullets	Multiply Capped Columns	Skeletal Forms	Radiating Dendrites
				
Simple Stars	Simple Needles	Capped Bullets	Twin Columns	Irregulars
				
Stellar Dendrites	Needle Clusters	Double Plates	Arrowhead Twins	Rimed
				
Fernlike Stellar Dendrites	Crossed Needles	Hollow Plates	Crossed Plates	Graupel

Types of Snowflakes ... [SnowCrystals.com](http://SnowCrystals.com)

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