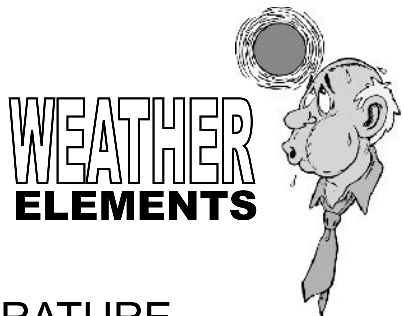
In this chapter

- **Temperature**
- **Humidity**
- **Clouds**
- **Precipitation**

CHAPTER 3



TEMPERATURE

Heat is one form of energy. The sun radiates energy in waves, in this case short waves, to the earth. The atmosphere does not absorb short-wave energy readily. The clouds, dust and water vapour in the atmosphere deflect about half of the sun's energy back into space. What passes through is absorbed by the land and water and converted to heat. The earth radiates this back as long-wave energy, which then warms the air above. In short, the earth acts as a radiator, which you probably know already, if you have ever walked down a long stretch of sidewalk or across a large parking lot on a hot day and watched (or felt) the heat rise from the pavement.

Several factors affect how much of the sun's energy a surface, such as a field, absorbs. One is its colour. This concept is called albedo. The albedo of an object is a decimal fraction that expresses what percentage of the incoming radiation it reflects back to space. Pure white has an albedo of 1.0, which means that all the energy is reflected back. Pure black has an albedo of 0.0, which means that all the energy is absorbed and none is reflected back. This comes into play in the earth's energy equation, too. A field covered by snow has an albedo of about 0.7. The same field covered by crops would have an albedo of 0.2, meaning that it absorbs 80 per cent of the incoming radiation. The more energy a surface absorbs, the more heat it will eventually release back into the atmosphere.

To show your students that the rate at which energy is absorbed depends on the colour of a material, try Activity number 7 on page 8-9 in the Activity Section.

Eventually, all the energy the sun radiates to earth returns to outer space creating the global balance of energy. This prevents the earth from heating up or cooling down.

The temperature on your thermometer this morning, however, was probably affected more by the season, the time of day, the latitude, and the geography of your area than by the global balance of energy.

If your students are interested in making a thermometer try Activity number 8 on page 8-10 of the Activity Section.

Night and Day

During the day, the earth receives more energy than it radiates back, so it warms up. At night, however, the earth continues to radiate heat, even though it receives no energy from the sun. Consequently, the earth cools down. This cooling process continues until after sunrise, which is one of the reasons why the lowest temperature for the day is often recorded then.

Winter and Summer

Canadians do not need to be reminded about the effect which the season of the year has on the temperature outside. Canada has its warmest weather when the sun is over the Northern Hemisphere. The sun passes over the equator around March 21 on the way north to the Tropic of Cancer at 23 ½ ° North latitude. This is the sun's northern-most position, which it reaches around June 21. From here, the sun starts the slow slide south again to the equator, reaching there about September 21. During the 6 months the sun is in the Northern Hemisphere, its rays shine down on Canada more directly than they do during the country's winter months, when the sun is over the Southern Hemisphere. For the record, the sun reaches the Tropic of Capricorn at 23 ½ ° South latitude around December 20 when it starts moving north again to the equator.

Activity

With the help of an atlas, have your students locate the spots where these record-setting temperatures were recorded.

Record-setting temperatures across Canada

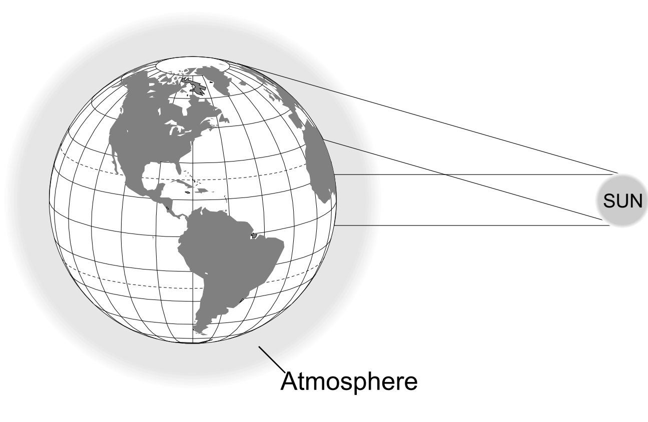
Province or Territory	Highest Temperature (°C)	Lowest Temperature (°C)
Alberta	43.3 Bassano Dam	-61.1 Fort Vermilion
British Columbia	44.4 Lytton, Lillooet	-58.9 Smith River
Manitoba	44.4 St. Albans	-52.8 Norway House
New Brunswick	39.4 Nepisguit Falls	-47.2 Sisson Dam
Newfoundland	41.7 Northwest River	-51.1 Esker 2
Nova Scotia	38.3 Collegeville	-41.1 Upper Stewiacke
Nunavut	33.6 Baker Lake	-57.8 Sheppard's Bay
Northwest Territories	39.4 Fort Smith	-57.2 Fort Smith
Ontario	42.2 Atikokan & Fort Frances	-58.3 Iroquois Falls
Prince Edward Island	36.7 Charlottetown	-37.2 Kilmahumaig
Quebec	40.0 Ville Marie	-54.4 Doucet
Saskatchewan	45.0 Midale & Yellow Grass*	-56.7 Prince Albert
Yukon	36.1 Mayo	-63.0 Snag*

* Marks the Canadian record

North and South

The latitude of a region also affects how much of the sun's energy an area receives. The countries around the equator receive more of the sun's direct energy than those that lie farther north or south. That is because the sun's rays are almost, but not quite, perpendicular to the earth's surface at the equator. To reach areas closer to the poles such as Canada, the sun's energy must travel at an angle and pass through more of the atmosphere. Consequently, by the time the sun's rays reach the country, they are weaker, more spread out and diffuse than the rays that hit the earth around the equator.

THE EFFECT OF LATITUDE ON THE SUN'S RAYS



Lake, Land, Hill and Dale

Finally, the geography of an area plays a role in its heating and cooling. For example, water warms up and cools down more slowly than land does. That is one of the reasons lake shore communities often have lower temperatures in the summer than communities which are farther inland. Similarly, in the winter, communities on the shores of large bodies of open water often have warmer temperatures than those farther inland. Temperatures also decrease with altitude, which explains why you see snow on mountain tops in July.

FACT Temperatures drop with height at an average rate of 1.6°C for every 300 metres.

All these factors along with the characteristics of the air mass over your region — is it cold and dry or warm and moist — affect the daily temperature.

Activity:

Ask your students to choose another school in the Sky Watchers program and prepare a line graph of the temperatures recorded at your school and at the other school. You may find out what schools are part of Sky Watchers by checking the Sky Watchers web page linked from http://www.weatheroffice.ec.gc.ca

Heat Waves

Despite the country's reputation as the land of snow and ice, Canada has heat waves. Environment Canada defines a heat wave as 3 or more consecutive days with temperatures of 32°C or higher. Most heat waves in Canada last about 5 or 6 days.

The worst heat wave on record was in July 1936. The heat rolled into the Prairies from the American southwest in early July and then spread into Ontario. Temperatures climbed to 44.4°C at St. Albans in Manitoba and to 42.2°C at Atikokan and Fort Frances, Ontario. Those records stand today. The heat wave lasted a week and was directly or indirectly responsible for killing 780 people in Canada, about 600 people in Ontario alone.

But the heat is only part of the story of summer. The humidity also plays a role in how hot you feel.

FACT

You can find out what the temperature is by listening to crickets chirp. Crickets chirp faster when it is warm than they do when it is cold. If you count the number of cricket chirps in 8 seconds and then add 4, you will have the current temperature in Celsius degrees. This works 9 times out of 10.

HUMIDITY

Air is made up of a mixture of invisible gases, primarily nitrogen and oxygen. A small portion of it, however, is water vapour. No matter where you are, the Sahara Desert or the High Arctic, there will be water vapour in the air. The temperature of the air determines the amount of water vapour that can exist in the air. Generally speaking, as the temperature increases, so does the potential for water vapour to exist.

When meteorologists talk about the amount of water in the air, the terms they use most frequently are relative humidity and the dew point temperature.

To show your students 2 ways water enters the air, try Activity number 9 on page 8-11 of the Activity Section.

Relative Humidity

The relative humidity is the amount of water vapour that is actually in the air compared to the amount of water vapour that could exist at that temperature. The figure is given as a percentage. For example, a relative humidity of 100 per cent means the air is saturated and cannot absorb any more water vapour. Similarly, relative humidity of 25 per cent means the air contains only one quarter of the moisture that could be present.

Today, humidity is measured with an electronic hygrometer. Not too many years ago, though, humidity was measured with a mechanical instrument that had a long, naturally blond hair as one of the principal components. As the humidity increased, the hair absorbed moisture and stretched. This caused the indicator arm on the hygrometer to change readings. Blond hair was used because it absorbs moisture more readily than other naturally coloured hair.

FACT

In 1783, the Swiss physicist Horace de Soussure discovered that hair stretches by about 2.5 per cent when the air goes from being completely dry to completely saturated.

You have probably noticed that dry air readily absorbs moisture from surfaces and moist air does not. That is why you may have difficulty cooling off on hot, humid days. Your body cools itself when it is warm by perspiring. The process of evaporation requires heat, and in this case, the heat needed to evaporate perspiration is drawn from your body, effectively cooling it off. On days when the relative humidity is low, perspiration evaporates easily and you cool down. On days when the relative humidity is high, though, perspiration does not evaporate as quickly.

FACT

You have an estimated 2 million sweat glands all working to bring moisture to the surface of your skin where the perspiration evaporates and cools you down. This process may remove 2 litres of water from the average adult an hour. That is why it is important to drink plenty of water on hot days.

Another factor that affects how quickly moisture will evaporate is the wind. For example, on a still calm day, puddles don't evaporate as rapidly as they would on a windy day. That is because, if the air isn't moving, the air immediately above the water puddle will absorb water until it's close to saturation, and then the rate of evaporation slows down. On a windy day, though, the movement of air over the surface of the puddle means that the water surface is continually exposed to fresh drier air and water will continue to evaporate at a faster rate. Similarly, a breeze will cool you off on a hot day by evaporating the perspiration more quickly.

Activity:

You can use 2 cookie sheets and a small fan to demonstrate this idea to your students. Set the pans at opposite ends of a table or desk and pour one cup of water into each. Set the fan in the centre and turn it so that the air blows across the surface of only 1 cookie sheet. The water will evaporate from that sheet sooner than from the other.

For the same reason, the directions for using the sling psychrometer in Chapter 1 specified that you should swing the psychrometer vigorously in a circular fashion to increase the air flow over the wet bulb and promote evaporation.

Dew Point Temperature

In contrast to relative humidity, the dew point temperature is the temperature to which the air must cool to be saturated. For example, if the temperature is 23°C and the dew point temperature is 10°C, then the temperature of the air has to fall to 10°C before the air becomes saturated and the water vapour in the air condenses to form water droplets or dew.

Activity

If you have a sling psychrometer, use the table provided with it to help your students track temperature, dew point, and relative humidity for at least a 2-week period. This can be done either indoors or outdoors, depending on the season, as long as the temperature is above 10°C.

That is why dew seldom forms on overcast nights when a blanket of clouds keeps the heat close to the earth. When this happens, the air does not cool down to the point of saturation. Conversely, on clear nights when earth's heat radiates back into space, the air cools down to the dew point temperature and dew forms on objects at the earth's surface such as grass and flowers.

Meteorologists use the term dew point temperature even on the coldest winter day, although frost point temperature may be a better name for it. On cold winter days, the water vapour changes from a gas directly to a solid without becoming a liquid first.

Activity

If you have a loaf of fresh bread to spare for a couple of days, bring it in to school, show it to the students and then put it in the freezer of the school's refrigerator. Leave the bread there overnight so that it freezes and ice crystals are visible inside the plastic wrapping. Show the bread to your students and ask them how and why the ice crystals formed. (The moist air, trapped inside the bag, cooled down to its dew point temperature in the freezer. The water vapour began to condense on the inside of the bag, then froze into ice crystals as the cooling continued.)

Humidex

The humidex is a Canadian invention which was introduced to the country on June 24, 1965. The humidex is a comfort index. It is a measure of what hot weather feels like to the average person. The air of a given temperature and relative humidity is equated in comfort to air of a higher temperature which has little moisture in it. For example, when the temperature is 32°C and the relative humidity is 75 per cent, the air feels as if it is 46°C. That is the humidex reading. How comfortable people feel in hot, humid weather also depends on their age and state of health.

Humidex and your comfort level	
20-29	Comfortable
30-39	Varying degrees of discomfort
40-45	Almost everyone is uncomfortable
45-up	Many types of work and exercise should be restricted

FACT

The highest humidex ever recorded in a Canadian city was in Windsor, Ontario on June 20, 1953. That day, the humidex was 52 (Environment Canada's climatologists worked this out using records for temperature and relative humidity.)

Wind Chill

Wind chill is an expression of the cooling sensation you feel on your skin when strong winds are combined with low temperatures. Canada's wind chill index uses temperature-like units to compare the wind's effect to the way your skin would feel on a calm day with that temperature. For example, if the outside temperature is -10°C and the wind chill is -20, your face will feel as cold as it would on a calm day when the temperature is -20°C.

Activity:

Position a fan on a cabinet at shoulder-level. Have a volunteer stand in front of the fan and turn it on. The student will feel colder because of the wind's cooling effect, although the temperature in the room has not changed. Now dab some water on one cheek and have the student stand in front of the fan again. The wet skin will feel much colder. This demonstrates how important it is to stay dry when outdoors in winter.

In most parts of Canada, the wind chill index is included in Environment Canada's forecasts when it reaches -25, the point where frostbite becomes a risk. In parts of the country with a milder climate, wind chill warnings are issued at -35. However, wind chill warnings are issued at progressively colder values as you move north. In extreme northern areas, where people are better adapted to very cold conditions, wind chill warnings are issued for values as low as -55.

The wind chill index can help you plan your outdoor activities and decide what to wear. But wind chill is only one of several factors that affect how comfortable you feel on cold winter days. Others include the humidity, your age, your physical condition and how sunny the day is as well as what you plan to do outside.

FACT

The coldest wind chill in Canada occurred at Kugaaruk in the Northwest Territories. The temperature outside was -51°C and the winds were 56 km/h, producing a wind chill of -78.

CLOUDS

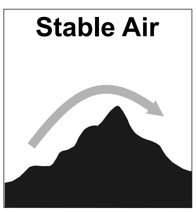
Water is the only substance that can change from a gas to a liquid to a solid at temperatures that are normally found on earth. What is more, water is everywhere. The air contains water in the form of water vapour, an invisible odourless gas. Clouds form when moist air cools to its dew point — the temperature at which the water vapour condenses — and water droplets or ice crystals form around little particles such as dust, pollution and volcanic ash. Clouds stay up because the water droplets are light and tiny. More than 2 billion of them are needed to fill 1 teaspoon with water.

The air may cool to its dew point and form clouds for several reasons. For instance, cold ground may cool the warm, moist air immediately above it to form low-lying clouds. Clouds may form when a cold air mass lifts up warmer air ahead of it or when air heated by the earth or water rises into the colder reaches of the atmosphere. Clouds also may form when mountains deflect warm, moist air up and over them. In each case, though, the air must continue to cool until it is saturated for the water vapour to condense and form clouds.

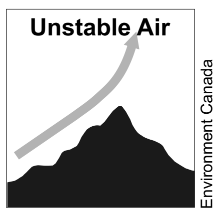
Clouds form at different levels in the atmosphere, with the stability of the air and the amount of moisture it contains affecting their size, shape, and type.

Air is called stable when it does not rise voluntarily because it is the same temperature as air surrounding it. In fact, stable air has a tendency to stay put unless a range of mountains or a colder air mass forces the air to rise. If this happens and the air is moist, then clouds form, usually in uniform layers.

In contrast, air is called unstable when it continues to rise because it is warmer than the air surrounding it. This parcel of rising air may extend for several kilometres horizontally. It will tend to travel upwards until it reaches the point where it is the same temperature as the air around it. When this happens, meteorologists say the air has reached a balance with the surrounding air.



Stable air does not rise voluntarily.



Unstable air continues to rise on its own.

If air is sufficiently unstable, it may produce clouds which extend high into the atmosphere, some as high as 14 kilometres. These very tall clouds are called cumulonimbus or thunderstorm clouds.

Naming the clouds

In the early years of the nineteenth century an Englishman, Luke Howard classified the clouds according to their appearance and behaviour. Mr. Howard was an apothecary or pharmacist with a keen interest in the atmosphere and all that it contained. He used the scientific language of the day, Latin, to name the types of clouds.

Stratus - Stratus means stretched out or layered.
Cirrus - Cirrus means curl, lock of hair
Cumulus - Cumulus means heap.
Nimbus - Nimbus means rain cloud, cloud burst, shower and cloud

Oliver Allen. Atmosphere. The Planet Earth Series. Ed. Thomas Lewis. (Alexandria, Virginia: Time-Life Books, 1983) P. 95-96.

From the Ground Up

Low clouds

The bases of low clouds range from near the earth's surface to about 2 kilometres above it. Depending on the season, these clouds may contain water droplets, ice crystals, or a mixture of both.

Stratus clouds - Stratus clouds are the low, uniformly dull, gray clouds which hang heavily in the sky. Their bases may cover the tops of hills or if you live in the city, high buildings. If it is not drizzling already, stratus clouds are a good sign that precipitation in the form of drizzle may be on the way.

Nimbostratus - As the name suggests these are low-lying, dense, gray, clouds which may produce more or less continuous rain, or if is cold enough, snow. These clouds are thicker or deeper than stratus clouds.

Activity:

Ask your students to make a cloud. First, pour 2.5 centimetres of hot water into a jar. Then put a few ice cubes onto a baking dish and place that over the opening of the jar. Now watch what happens as the air inside of the jar rises and is cooled by the ice. (The water vapour in the air condenses into water droplets making a cloud.)

Stratocumulus - These clouds have a well-defined rounded appearance and are often organized into rolls with flat bases that have gray or dark gray patches. Stratocumulus clouds are common in the late autumn or in the winter.

Cumulus - These little, puffy, fair-weather clouds commonly form on a summer afternoon. They usually cover less than half the sky and produce no precipitation.

If a cumulus cloud continues to grow because the air is unstable, it will become either a towering cumulus or a cumulonimbus cloud.

Towering cumulus - These begin as cumulus clouds but grow vigorously into rising mounds or towers. Their tops are well-defined and often resemble cauliflowers. The bases are flat and dark. These clouds may produce showers or flurries.

Cumulonimbus - Meteorologists call these clouds CBs. They are thunderstorm clouds, which sometimes produce hail and tornadoes. These clouds can be huge. They are often more than 25 kilometres long and 12 kilometres high with temperatures at their tops as low as -55°C, even in the summer. If you look at this cloud from a distance, it has a well-defined, whitish, anvil-shaped top and a ragged and low bottom. When you look at this cloud from below, it has a dark base with curtains made of heavy rain.

STAGES OF A THUNDERSTORM

(1) Cumulus stage

(2) Towering Cumulus

(3) Cumulonimbus

FACT

Fog and mist are thin layers of stratus cloud that form at ground-level. Like any cloud, fog is composed of millions of tiny droplets of water, or in cold weather, tiny floating ice crystals. The thickness of a fog depends on the concentration of the water droplets. Weather observers report fog if the visibility is less than 1 kilometre, and mist if the visibility is 1 to 10 kilometres.

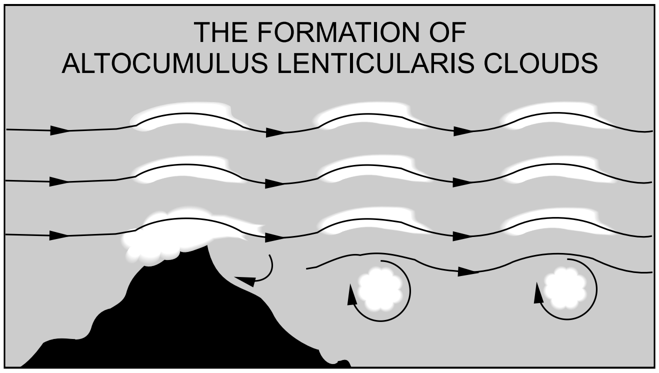
Middle clouds

Clouds with the prefix alto are middle-range clouds. Their bases usually range from 2 to 6 kilometres above the earth's surface.

Altostratus - These are gray or blue-coloured sheets of clouds with little texture. They cover most of the sky. In some spots, altostratus clouds may be thin enough to reveal the sun.

Altocumulus - These are white or sometimes gray clouds with rounded bottoms. The clouds may look as if they are arranged in rolls, rounded masses or thin layers. The individual rolls of cloud appear smaller than those in stratocumulus clouds because altocumulus clouds are farther away. Sometimes you can see the sky or the sun between the rolls but often these clouds cover the whole sky.

Altocumulus lenticularis - These lens-shaped clouds form when a mountain range deflects strong winds upwards on the windward slopes and downward on the leeward slopes. This creates a giant wave or ripple several kilometres in length. Moist air enters the crests of the waves, cools as it rises and forms a cloud. When the air descends, it warms up and condensation stops. Groups of these clouds floating along in what appears to be formation may look like a fleet of flying saucers.



Environment Canada

The clouds form at the top of the wave where the air cools and disappear at the bottom of the wave where the temperatures are slightly warmer.

High clouds

The bottoms of these clouds generally run from 5 to 12 kilometres above the ground. These clouds are composed mostly of ice crystals.

Cirrus - These thin clouds may appear as wispy streaks or streamers high in the sky. Extensive cirrus clouds may be the first sign of an approaching warm front.

Cirrocumulus - These are thin, white bands of clouds with tufted bottoms. These clouds often look like the ripples in the sand left by waves.

Cirrostratus - This whitish cloud covers the sky in a transparent veil or sheet. The cloud is usually thin enough for the sun to shine through, often producing a halo.

One other point about clouds, they move in the direction that the wind at their altitude is blowing. This is why clouds may travel in one direction while the wind at the surface is blowing in another. That also explains why 2 types of clouds which form at different heights, such as cirrus and cumulus clouds, may blow across the sky at one time but from different directions.

First the Cloud, Then the Rain

Rain, snow, hail, and other forms of precipitation occur when water droplets or ice crystals grow until they are too heavy for the air currents in a cloud to support. This process is slightly different in stable and in unstable air, and produces different types of precipitation.

To show your students how to make a rainbow, turn to Activity number 10 on page 8-11 in the Activity Section.

Stratiform clouds

The clouds that form in stable air are called stratiform clouds. These include stratus and nimbostratus clouds.

A stratus cloud is a shallow layer cloud which can range in depth from 100 metres to 2 kilometres. In these clouds, the air circulates slowly, providing little opportunity for water droplets or ice crystals to collide, combine and grow. Consequently, the precipitation formed in these clouds is small and tends to fall as drizzle or light snow.

A nimbostratus cloud is a deeper cloud than the stratus cloud. A nimbostratus cloud may form when a mountain range or air mass forces a parcel of air to rise. Such a parcel of air may have an area of hundreds of kilometres and may rise slowly, maybe at the rate of 1 to 10 centimetres a second. In these clouds, the air circulates with slightly more vigour than it does in stratus clouds. As nimbostratus clouds may extend upward for 8 to 9 kilometres, there is more opportunity for water droplets or ice crystals to collide and grow. This results in larger droplets than those formed in stratus clouds. Nimbostratus clouds are responsible for most of the steady rain and snow which falls in Canada.

FACT

One million tiny water droplets are needed to form an average rain drop which is about 1 millimetre in diameter. A water droplet needs more than 30 minutes to grow to that size. The rain clouds must be at least 1 kilometre thick for the growing droplets to remain in the cloud long enough to become raindrops.

Convective clouds

The clouds that form in unstable air are called convective clouds after the convection currents created by the rising warm air and sinking cold air within them. These clouds include towering cumulus and cumulonimbus clouds. Unlike nimbostratus clouds, the updrafts and downdrafts in towering cumulus and cumulonimbus clouds travel tens of metres per second. The force of the updrafts and downdrafts bounces water droplets or ice crystals around many times giving them ample opportunity to collide, combine and grow. The strength of the updrafts and downdrafts also allows the water droplets or ice crystals to grow much larger than they do in a nimbostratus cloud before they become too heavy for the air currents to support them.

The precipitation formed in these clouds usually falls in bursts or showers. Though short-lived, these bursts or showers may drop a lot of rain or snow in a short period of time.

Activity:

Ask your students to make a list of all the different sounds, they hear from weather, such as the sound of cars on wet pavement or rain on the roof. Using a tape recorder, ask your students to record a unique sound which they have discovered. When tape is complete, visit other classrooms and have those students guess what it is they hear.

PRECIPITATION

Precipitation comes in three forms, liquid, freezing and frozen — and in Canada, sometimes all in one day. More than 5 trillion tonnes of precipitation fall on this country each year. More than 60 per cent of this precipitation runs off into lakes and rivers. The rest evaporates from the earth's surface or passes back through the plants through the process known as transpiration.

If your students are interested in making a rain gauge, try Activity number 11 on page 8-12 in the Activity Section.

The Pacific Ocean, Gulf of Mexico and Caribbean Sea are the primary sources of water for precipitation in Canada. But water also recycles itself several times between the air and the ground. The water evaporates from soil, lakes, and rivers, rises into the air as water vapour, forms clouds, and then falls elsewhere as rain, drizzle, freezing rain, snow or hail.

Rain, Snow, Drizzle, Ice Pellets, Hail - Canada Has It All

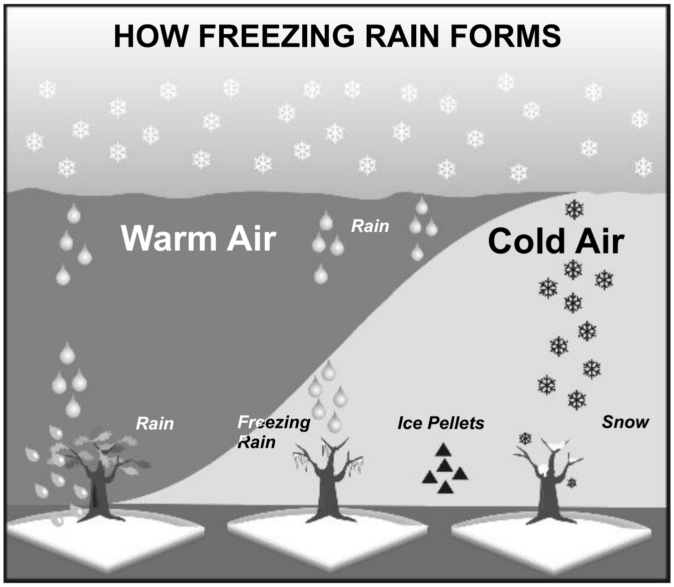
Drizzle - Precipitation is called drizzle when the water droplets are less than 0.5 millimetres in diameter, which is about the size of the head of a pin.

FACT Drops of drizzle fall at a rate of 1 to 2 metres per second while raindrops reach speeds of 4 to 9 metres per second.

Rain - Precipitation is called rain when the water droplets are greater than 0.5 millimetres in diameter. Some raindrops are as large as 10 millimetres across.

To show your students the different sizes of rain drops, try Activity number 12 on page 8-13 of the Activity Section.

Freezing drizzle and freezing rain - Freezing drizzle and freezing rain occur when there is a shallow layer of air at the earth's surface which is below freezing and a layer of air above it which is warmer and above freezing. Water droplets form in the warmer layer and fall into the colder air. The droplets cool as they fall and freeze when they hit objects such as fences or sidewalks with temperatures which are below zero.



Environment Canada

In the winter there can be as many as 4 different types of precipitation when a warm front passes.

FACT The Ice Storm of 1998 lasted from Jan. 4, 1998 to Jan. 10 1998 and left nearly 3 million people in Ontario and Quebec freezing in the dark.

Ice pellets - Ice pellets form under the same conditions as freezing rain and freezing drizzle. The water droplets form in the higher, warmer layer of air and fall into the lower layer of colder air. In this case, though, the cold layer is deep enough to give the water droplets time to freeze before they hit the ground.

Hail - Hail forms only in cumulonimbus clouds when the strong updrafts carry water droplets high into the upper reaches of the clouds where temperatures are below freezing. Here the water droplets freeze. Layers of ice are added when the updrafts throw more water droplets upward, which then collide with the frozen particles. This process continues until the ice particles become too heavy for the updrafts to support. Then the ice particles fall as hail.

FACT A hailstone of a few millimetres in diameter needs updrafts of more than 100 kilometres per hour to support it. In Canada, hailstones range in size from 5 millimetres, or the size of a pea to 114 millimetres or the size of a grapefruit.

Snow - Snow is precipitation of white or translucent ice crystals which are clustered together to form snow flakes. The shapes and sizes of snow flakes depend on the temperature and the amount of water vapour in the cloud where the flake forms and in the air through which the flake falls.

The big, soggy flakes are conglomerations of hundreds of smaller snow flakes that have fallen through relatively mild air and stuck together. Some of these flakes have measured as much as 2 centimetres across. In contrast, dry snow tends to fall as small, single flakes that do not bind together as they fall through cold, dry air.

FACT About 36 per cent of Canada's precipitation falls as snow, compared to the world average of 5 per cent.

Activity:

A cubic metre of snow weights about 100 kilograms. Ask your students to measure the size of the sidewalk leading into the school and calculate the weight of the snow which would have to be cleared following a snowfall of 15 centimetres.