ACTIVITIES

Activity number 1 - an experiment

Purpose - To see the effect of the earth's tilt

Materials

- a globe or map of the earth
- a small flashlight.

Method

In a darkened classroom, have your students shine the light directly down on the equator. Is the light bright? Can you see its outline clearly?

Keeping the flashlight at the same height and over the equator, have them tilt the flashlight so that it shines on the Tropic of Cancer, north of the equator. Does the area of light look like the one which was created when they shone the flashlight directly on the equator? Does the light cover a larger area? What does the shape of the light look like? Are some parts of the area lit by the flashlight brighter than others?

Observations

The shape and the intensity of the light changed when they shone it on the Tropic of Cancer because the beam hit the surface at an angle and spread over a larger area.

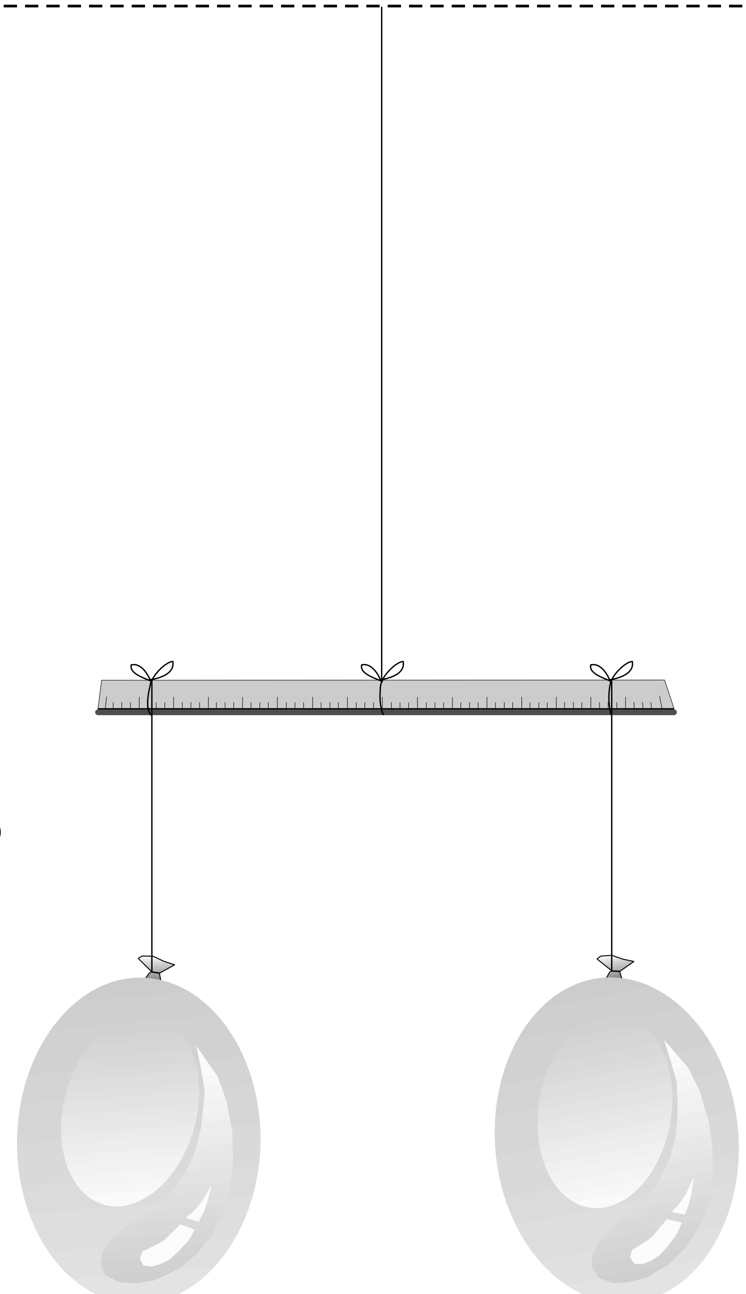
Conclusions

The earth's tilt affects the strength of the sun's rays at different points on the earth's surface.

Adapted from Brenda Wyman, Weather. Investigations in Science Series. (Cypress Calf. Creative Teaching Press Inc., 1995) P.15.

Activity number 2 - an experiment

Purpose - To show that air has weight



Materials

- two balloons
- tape
- ruler or yardstick
- string
- pin

Method

Have your students inflate the balloons until they are the same size; then tie them shut. Have them put a piece of tape on one of the balloons near the opening, and use 2 pieces of string to tie one balloon to each end of the ruler or yard stick.

Have them tie another piece of string around the centre of the ruler and hang it up so that the two balloons are balanced and they do not rub against a wall.

Take the pin and make a small hole in the tape on the one balloon. When you step away, make sure the two balloons are still balanced.

Observations

The balance changes as the air in the one balloon leaked out and the balloon became lighter.

Conclusions - Air has weight.

Adapted from the Internet site http://unitedlearning.com

Activity number 3 - Building a weather instrument

Purpose - This project explains how to make a barometer to show changes in air pressure

Materials

- Empty glass container or soup can
- Elastic band
- Glue
- Adhesive tape
- Balloon
- Drinking straw
- Index card about 8 cm by 13 cm (3 inches by 5 inches)

Method

Cut a piece out of the balloon large enough to cover the top of the glass jar or soup can.

Stretch that piece of the balloon tightly over the top of the jar or can and secure it in place with the elastic band.

Cut the straw so that it is about 10 centimetres long and trim one end to a point.

With the sharpened end pointing out, lay the straw on the balloon with the flat end at about the centre of the balloon. Glue the straw in place.

Draw reference marks on one of the long edges of the card at roughly half-centimetre intervals. Tape the opposite (unmarked) side of the card to the jar, with the narrow end of the rectangular card extending above the jar top and the marked edge just behind the straw. The marked edge should stick out so that the sharpened end of the straw points to the reference marks.

Points of discussion

The piece of the balloon that is stretched across the jar will act as a membrane. When the air pressure outside the jar rises, it will push down on the balloon, forcing it slightly into the jar. This, in turn, will cause the end of the straw to rise. Similarly, when the air pressure outside falls, the air pressure in the jar will be greater than the air pressure around it forcing the balloon to bulge slightly. This will cause the end of the straw to drop.

You can chart the position of the straw against the reference marks on the card each day. This will not give you a numeric reading but it will tell you whether the air pressure is rising or falling. The pressure trend is an important tool in forecasting.

Please remember to keep your barometer away from sources of heat such as radiators and sunny window ledges. If it is close to a source of heat, then your barometer will act more as a thermometer, with the air inside expanding and contracting to reflect changes in temperature, not pressure.

Activity number 4 - an experiment

Purpose - To show that air exerts pressure

Materials

- A thin rectangular board, for example a strip of thin plywood or paneling which is about a half metre long and 8 to 10 centimetres wide
- One full-size newspaper
- Ruler
- Paper and pencils

Method - Part one

Place the board on the table with slightly less than one half of the board hanging over the edge. Open the newspaper and lay it flat over the section of the board on the table. Ask your students what they think will happen to the paper if you strike the part of the board that is hanging off the table. Then strike the protruding part of the board as hard as you can. What happens to the paper? Does it move? Does the board flip up as some of your students thought it would?

Observations

The paper remained in place.

Conclusion

The paper did not move because the air pressure that is exerted downward held it in place. Since the paper is flat against the table, there is no air beneath the paper to counteract the pressure from above. If you hit hard enough, the board will break.

Method - Part two

Ask your students what will happen if you slowly push down on the protruding board. Then push down on the board slowly. What happens to the paper this time?

Observation

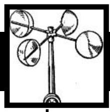
The paper slowly rises off the table.

Conclusion

Air exerts pressure on all surfaces that it touches. When an air space is created under the paper, the pressure exerted by that air counteracts the pressure from above and the paper is no longer held in place.

Final Activity:
Have your students calculate how much pressure was being exerted on the paper in part one of this experiment. They can measure the length and width of the newspaper in centimetres, then multiply the 2 measurements to get the surface area. Ask them how many kilograms of air are pressing down on that sheet of newspaper using the average sea level pressure of 1 kilogram per square centimetre.

Martha Suarez, Stephen F. Austin, University Nacogdoches, TES Course, 1994



Activity number 5 - Building a weather instrument

Purpose - An anemometer measures the speed of the wind. You can make one easily with a ping pong ball and the protractor from your math set

Materials

- Needle
- Thread
- Ping pong ball
- Protractor

Method

Cut a piece of thread about 20 centimetres long. Thread the needle and tie a large knot in the end of the thread.

Stick the needle into one side of the ping pong ball and out the opposite side. Draw the thread through until the knot at the other end stops the thread from moving.

Tie the thread to the centre of the straight base of the protractor so that the ball hangs below the arc of the protractor which has the angles marked on it. If the protractor is held level, where there is no wind, then the ball will hold the thread over the 90^0 mark.

Take the protractor outside. Hold it level and parallel to the wind. The wind will blow the ball and when it does, note the position of the thread on the protractor. Record the angle that the ball has been blown and use the chart to convert the angle to a wind speed.

Angle	Kilometres per hour
90^0	0
85^0	9
80^0	13
75^0	16
70^0	19
65^0	22
60^0	24
55^0	26
50^0	29
45^0	32
40^0	34
35^0	38
30^0	42
25^0	46
20^0	52

Activity number 6 - Building a weather instrument

Purpose - To make a wind streamer for use as a wind vane to discover from which direction the wind is blowing

Materials

- large paper plate
- magic marker
- scissors
- crepe paper streamers
- coloured pencils or felt pens
- paste or tape
- the Sky Watchers logo, Cloudy, on the next page

Note: if you have your students working in teams, you may want to photocopy Cloudy and have each team make a wind streamer.

Method

To make the wind streamer, have each team follow these steps:

1. Cut out the Sky Watchers logo along the black circle and colour it (optional).
2. Draw a cross on the bottom of the paper plate.
3. Cut a hole 2.5 centimetres by 2.5 centimetres at each of the four ends of the cross about 1.5 centimetres from the edge of the plate.
4. Using the crepe paper, cut four streamers about 2 metres in length.
5. Thread one end of a streamer through one of the holes in the plate. Pull the streamer through until the ends are even.
6. Using the 2 ends, tie a knot in the streamer tight against the plate. You should now have 2 lengths of crepe paper hanging freely from the plate.
7. Now repeat this step until all 4 holes have streamers in them.
8. Write in capital letters N(north), E(east), S(south), and W(west) next to each hole.
9. Paste or tape the Sky Watcher logo in the middle on the top of the plate.

To use the wind streamer, take your class outside and have each team do the following (you may want to take a compass):

1. Find an area outside where there are no buildings or woods to interfere with the wind, a hill for instance or a playing field.
2. Hold the wind streamer in front of you so that the plate is parallel with the ground and your thumb is on top of the plate near the letter S.
3. Turn the plate so that the N on your wind streamer is facing north. You can find north the first time using a compass or look for a landmark, such as lake or building which is to the north.

Discussion points

Watch to see which direction the wind blows the streamers. For example, if the streamers are blowing toward the south, then the wind is coming from the north. Winds are always named for the direction they're blowing from. In this case, the student would report a north wind.

Adapted from the Internet site of the Miami Museum of Science at http://www.miamisci.org


SKY
WATCHERS

Activity number 7 - an experiment

Purpose - To show that the rate at which the sun's energy is absorbed is affected by the colour of a material

Materials

- 2 thermometers
- One white or very light coloured piece of cloth
- One black or dark piece of cloth
  (Note: the two pieces should be the same type of material.)
- Watch or timer
- Graph paper
- Sunny day (or a heat lamp as a substitute source of energy)

Method

Record the initial temperature on each thermometer. Make sure that the temperatures on the 2 thermometers are the same. Wrap each thermometer with a different colour of cloth and place both in bright sunlight. Note the temperatures at 5-minute intervals until the mercury seems to have stopped rising. Then graph the results of the temperature over time for each sample. Did the temperature rise faster when the thermometer was wrapped in the light-coloured cloth or the dark-coloured cloth?

Observations

The rise in temperature was more dramatic when the thermometer was wrapped in dark cloth.

Conclusion

Dark-coloured materials absorb the sun's energy more completely and therefore more rapidly than light-coloured materials. Some of the energy is reflected back by lighter colours.

Activity number 8 - Building a weather instrument

Following the instructions below, your students can build their own thermometer. They can then compare its performance against the Sky Watchers thermometer.

Materials

- Glass jar (the smaller and narrower, the better)
- A small quantity of cooking oil
- Stopper or cork for the jar
- A sealant such as petroleum jelly, candle wax or modeling clay
- Several drops of food colouring
- Clear narrow drinking straw at least 15 centimetres long
- Eye dropper
- Water
- An index or recipe card about 8 cm by 13 cm (3 inches by 5 inches)
- Thermometer for reerence — you can use your Sky Watchers thermometer for this

Method

1. Fill the glass jar with water and add a few drops of food colouring to make the water visible.

2. Cut a hole in the stopper or cork, just large enough to slip the straw through.

3. Place the stopper in the jar and insert the straw through the hole.

4. Add more water, but this time through the straw and until the water is about one quarter of the way up the straw.

5. Seal the straw into the stopper and the stopper onto the jar using either the petroleum jelly, modeling clay or candle wax.

6. Finally put a drop of the cooking oil into the straw so that the oil sits on top of the water. The oil prevents the water from evaporating.

7. Attach the index card to the straw. Allow the thermometer to settle for 2 or 3 hours.

8. Now use your reference thermometer to calibrate your home-made thermometer. To do this, note the level of water in the straw and mark a line on the card. Beside the line, record the temperature shown on your reference thermometer. Repeat this process over the next several days.

A final note

The width of the straw and the amount of liquid in the jar will affect how quickly and accurately your thermometer will respond. With a narrow straw, a smaller volume of water is required to raise the level in the straw noticeably.

Points to discuss

This thermometer is based on the principle that water, in fact most liquids, expand when heated and contract when cooled. Ask your students to predict where they think the hottest and coldest parts of room are located — then let them check out their predictions over the next 2 days using their thermometer. Remind them that this thermometer takes a long time to respond because the entire jar of water must adjust before it will register the new temperature.

Ask your students if there are any drawbacks to using their home-made thermometer, and see if they can identify at least 3:

- it's bulky
- it's delicate, because it is made of glass
- the water would freeze in winter or at temperatures below 0°C
- it's slow to adjust to changes in temperature.

Activity number 9 - an experiment

Purpose - To show that water vapour enters the air though evaporation and transpiration

Materials

- Water
- Saucer or shallow bowl
- Tape
- A healthy houseplant
- Plastic bag

Method

Pour some water onto the saucer or shallow bowl. Next, mark the height of the water level with a piece of tape. Place the dish with the water in it on the windowsill for the day. Wrap the plant (pot and all) in the plastic bag and put it too on the windowsill for a few hours. What happened to the level of the water? What did your students notice about the plastic bag covering the plant?

Observations

The level of the water dropped down below the tape mark. Droplets of water appeared on the inside of the plastic bag containing the plant.

Conclusion

These are two ways in which water enters the atmosphere: evaporation and transpiration. Water evaporated from the dish into the air above it, changing from a liquid to a gas. The plant lost water through its leaves into the air, through a process call transpiration.

Activity number 10 - an experiment

Purpose - To make your own rainbow

Materials

- clear plain glass bowl with water in it
- flashlight
- small flat mirror

Method

Place the bowl of water on a desk or table near a blank wall. Put the mirror in the water so that the mirror rests against the side of the bowl at a 45° angle. Standing behind the mirror, shine the flashlight straight down on the mirror.

Observations

A rainbow appeared on the wall opposite the mirror.

Conclusions

The light you shone down toward the mirror was broken into its component colours by the water and reflected back to you by the mirror. This is what happens to sunlight. It too is broken into its component colours when it enters the front of a raindrop, and then if the angle is right reflected by the back of the raindrop.

Adapted from Phillis Engelbert, The Complete Weather Resource Book. (Detroit: U.X.L. 1997.) Vol. 2: Weather Phenomena. P.338.

Activity number 11 - Building a weather instrument

This is a simple rain gauge that students can make on their own

Materials

- A plastic 2-litre pop bottle with straight sides
- Ruler at least 15 centimetres in length
- Scissors
- Stones or large gravel
- Clear tape
- Water

Method

1. Cut the bottle about 10 centimetres from its top. Save the top part.

2. Place stones or gravel in the bottom of the bottle until they fill the little bumps in the bottom and come up to the part of the bottle where the sides are straight. This will add weight to the gauge to make it more stable.

3. Tape the ruler to the side of the bottle so that the zero mark on the ruler is a centimetre or two above the stones.

4. Pour enough water into the bottle so that the water level is at the zero mark on the ruler.

5. Take the top of the bottle (the part you cut off earlier), turn it upside down, and put it into the bottom portion so that it looks like a funnel.

6. Set your gauge in an open area away from trees or buildings, which may affect the amount of rain that falls into the bottle.

7. When it has rained, take a reading using the ruler taped to the side of the bottle. Then pour out the excess water until the water level is once again at zero. (If you pour out too much water, simply add more until the water level again reaches zero on the ruler.)

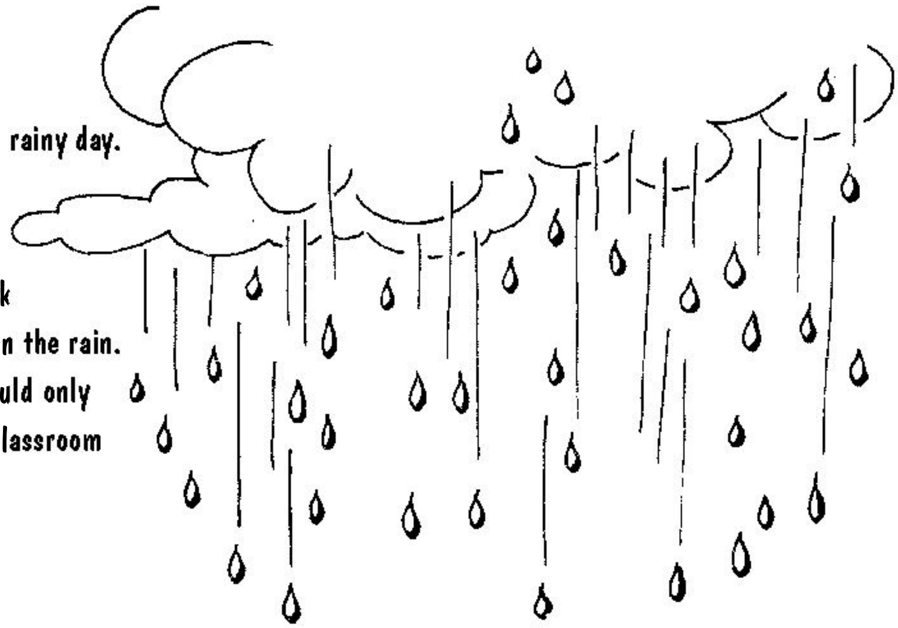
Points to discuss

If you leave your rain gauge out in the sun for a day, be sure to check the gauge as some of the water may evaporate. If that happens, just add water until the level is at zero again.

As a further exercise, your students may want to tape a coffee filter into the funnel part of the gauge to collect any particles that fall into the gauge. The rainwater will drip through the filter and into the bottle eventually. Your students can then look at the filter through a microscope and see what it captured.

Activity number 12 - an experiment

Purpose - To observe and compare different sizes of raindrops



Materials

- A dark sheet of construction paper and a rainy day.

Method

On a rainy day go outside and hold the dark construction paper parallel to the ground in the rain. Collect at least 25 drops of rain. This should only take 5 to 10 seconds. Then return to the classroom and observe the raindrops on the paper.

Observations

The raindrops made marks of various sizes on the construction paper.

Conclusions

Raindrops are different sizes some as small as 1 millimetre and some as large as 1 centimetre or 10 millimetres. A raindrop is composed of tiny water droplets. Many water droplets are present in a large raindrop and few water droplets are present in a small raindrop.

Activity number 13 - an experiment

Purpose - To observe a tornado

Materials

- 2, 2-litre clear plastic soft drink bottles
- water
- food colouring (optional)
- duct tape
- scissors
- pencil
- ruler
- cloth or paper towels

Method

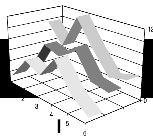
1. Fill one of the bottles with water until it is half full. Add a few drops of food colouring to make the water more visible.
2. Cut a piece of duct tape which is 5 centimetres long and cover the mouth of the bottle which contains the water.
3. With the pencil, make a hole in the centre of the duct tape. Make sure that the hole is a little bigger than the pencil.
4. Take the second bottle and turn it upside down on top of the bottle containing the water, so that the mouths of the bottles line up. With the cloth or paper towel, wipe any moisture from the necks of the 2 bottles.
5. Cut more duct tape and wrap it around the necks of the bottles so they are firmly attached.
6. Hold the 2 bottles by the neck; invert them so that the bottle containing the water is on top, and immediately start spinning them in circles.
7. Put the bottles on the table, with the empty one on the bottom.
8. Watch what happens.

Observations

The water takes on the shape of a funnel and looks like a tornado.

Conclusions

Tornadoes are fast, violent swirling winds. In this experiment, the spinning of the bottles caused the water to take the shape of a tornado. The hole in the bottle allowed for the appearance of the tornado's tail - the most dangerous part of the tornado.



Activity number 14 - Graphing

Goal: To plot a graph

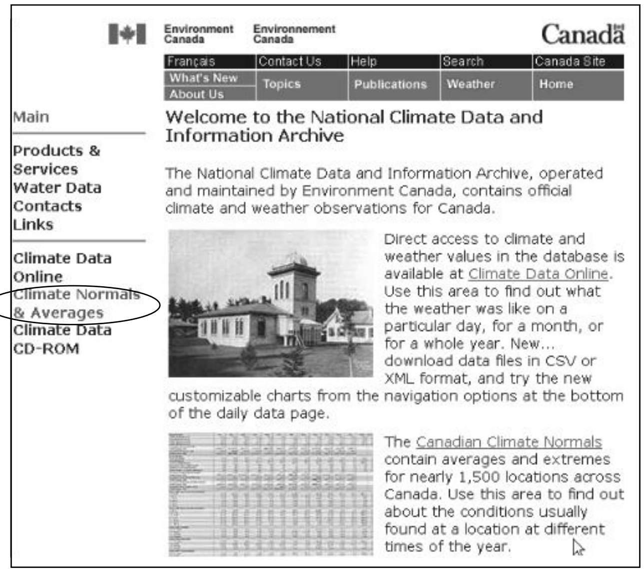
Have your students visit the site

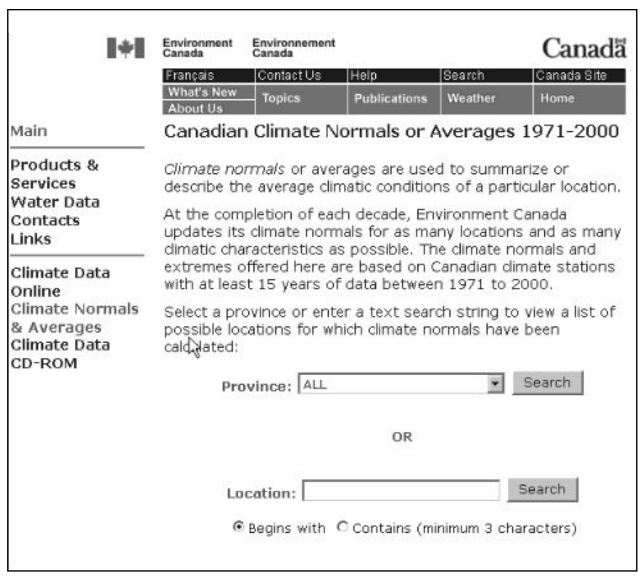
www.climate.weatheroffice.ec.gc.ca

This page is called National Climate Data and Information Archive. Go to the option labeled Climate Normals and Averages on the left. When you click on it, it will take you to a list of the all the provinces and territories.

By selecting the region and then further selecting a community, you can find the monthly average temperature, rainfall, snowfall, sunshine, wind speed and direction and much more for each site.

Have your students print off the climate averages for the location closest to you and then do a line graph of the mean temperature for each month of the year. Your students could add a bar graph to the same chart to show total monthly precipitation. You can do this exercise with graph paper or on a computer using a spreadsheet program.





Activity number 15 - mapping

Goal: to locate and name major geographic features, bodies of water and communities in your region

Materials

- Copies of the blank map for your area
- Atlas (optional)
- Copies of the appropriate list of major features and communities from the table below

Method

Provide each student with a copy of the map and the list for your area. Ask them to locate the features and communities on the map. If your community does not happen to be on the list, have them correctly place it on the map as well.

Area of Coverage	Major Features	Communities
British Columbia	Pacific Ocean, Rocky Mountains, Strait of Georgia, Queen Charlotte Islands	Abbotsford, Blue River, Castlegar, Comox, Cranbrook, Fort Nelson, Fort St. John, Kamloops, Kelowna, Penticton, Port Hardy, Prince George, Princeton, Prince Rupert, Smithers, Terrace, Vancouver, Victoria
Yukon	Beaufort Sea	Beaver Creek, Burwash Landing, Carcross, Carmacks, Dawson City, Haines Junction, Mayo, Old Crow, Ross River, Teslin, Watson Lake, Whitehorse
Alberta	Rocky Mountains, Lake Athabasca	Calgary, Edmonton, Lethbridge, Medicine Hat, Fort McMurray, Edson, High Level
Saskatchewan	Lake Athabasca	Swift Current, Regina, Saskatoon, La Ronge, Prince Albert, Cree Lake
Manitoba	Lake Winnipeg, Lake Manitoba, Lake Winnipegosis, Hudson Bay	Churchill, Dauphin, Brandon, Lynn Lake, Thompson, The Pas, Winnipeg
Northwest Territories	Arctic Ocean, Great Slave Lake, Great Bear Lake, Mackenzie River, Beaufort Sea	Fort Smith, Inuvik, Norman Wells, Yellowknife, Fort Simpson
Nunavut	Hudson Bay, Foxe Basin	Alert, Baker Lake, Cambridge Bay, Clyde River, Coral Harbour, Eureka, Resolute
Ontario	Lake Superior, Lake Huron, Lake Ontario, Lake Erie, Lake of the Woods, Lake St. Clair, Lake Nipigon, Lake Simcoe, Georgian Bay, Hudson Bay, James Bay	Kenora, Big Trout Lake, Thunder Bay, Armstrong, Timmins, Moosonee, Sault Ste Marie, Muskoka, Windsor, Toronto, Ottawa
Quebec	Magdelein Islands, Grindstone Island, Hudson Bay, James Bay, Ungava Bay, Gulf of St. Lawrence	Kuujjuaq, Inukjuak, Huujjuarapik, Sept Isles, Baie Comeau, Val d'Or, Maniwaki, Montreal, Sherbrooke, Quebec City
Maritime Provinces	Bay of Fundy, Bay of Chaleur, Mt. Carleton, Grand Lake, Confederation Bridge, Cape Breton Island, Cape Breton Highlands, Atlantic Ocean, Cabot Strait, Northumberland Strait, Gulf of St. Lawrence	Charlo, Chatham (Miramichi), Fredericton, Moncton, Saint John, Charlottetown, Summerside, Halifax, Yarmouth, Sydney, Greenwood, Sable Island
Newfoundland	Long Range Mountains, Atlantic Ocean, Strait of Belle Isle, Cabot Strait, Lake Melville	Daniels Harbour, St. John's, Gander, Stephenville, Deer Lake, St. Anthony, Happy Valley-Goose Bay, Wabush, Churchill Falls, St. Lawrence, Cartwright, Port Aux Basques, Daniels Harbour, Bonivista, Burgeo

Activity number 16 - mapping

Goal: To locate the capital of Canada, the 10 provinces and 3 territories and their capital cities on a map and label the 3 oceans, the Great Lakes, and Hudson and James bays

Materials

- Copies of the blank map of Canada
- Atlas (optional)
- Jumbled list of 10 provinces, 3 territories, capital cities, and bodies of water

Method

Give each student a blank map and a copy of the list below.

Ask your students to label the capital of Canada on the map, then match the capital cities with the correct province or territory and label them as well. Finally, have them label the larger water bodies on the map from the list provided.

As your atlas may not have the new territory of Nunavut, you may need to help them find it this time round.

Provinces/Territories	Capital Cities	Bodies of Water
Saskatchewan	Ottawa	Great Slave Lake
Nova Scotia	Toronto	Lake Erie
Alberta	Fredericton	Arctic Ocean
Quebec	Victoria	Lake Michigan
Nunavut	St. John's	Atlantic Ocean
British Columbia	Quebec	Hudson Bay
Newfoundland	Iqaluit	Lake Ontario
Yukon	Edmonton	Georgian Bay
Ontario	Winnipeg	Pacific Ocean
Northwest Territories	Charlottetown	Lake Superior
New Brunswick	Regina	Lake Huron
Manitoba	Halifax	Great Bear Lake
Prince Edward Island	Yellowknife	James Bay
	Whitehorse	

Activity number 17 - mapping

Goal: To show how the climate varies across a country with the size and geography of Canada

Materials

- Copies of the blank map of Canada
- The list of locations with climatic data (page 8-19)
- An atlas

Method — part 1

Using the list, have your students write the average daily high temperature for July for each location beside the appropriate dot on the map. They may need to use the atlas to locate communities correctly.

As an optional exercise, you might ask your students to analyse this map to reinforce the differences between various parts of the country. To help you with the analysis, here are 4 common meteorological terms.

- Isopleth - a general term describing a line that joins points of equal value.
- Isotherm - a line which joins points of equal temperature.
- Isohyet - a line which joins points of equal amounts of precipitation.
- Isobar - a line which joins points of equal pressure — this is the type of line normally drawn by forecasters on a weather map.

To analyse the map using temperatures, have your students draw isotherms at 5° intervals. Again, an isotherm joins points of equal temperature. For example, if 1 community has an average daily high of 23°C and the neighbouring community has an average of 17°C, then you know that at some point between them, the average is 20°C.

TIPS

It will be easiest to begin with the 10° isotherm in the Arctic and work southward.

Method — part 2

To analyse the map using the amount of snowfall take a second blank map, and still using the list, have your students plot the average annual snowfall for each community. They could analyse this map as well by drawing isohyets at intervals of 100 centimetres (cm), 200 cm, and so on. For instance if 1 community has an average annual snowfall of 139 cm and the next closest community has an average of 228 cm, then you know that somewhere between the 2 lies a point with 200 cm. When your map is complete, it will resemble a contour map, the kind atlases contain showing elevations. (See sample p.125)

TIPS

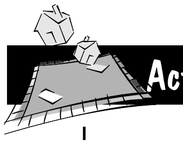
It will be easiest to begin with the 100 cm isohyet in the north and then work southward.

When the maps are complete, have your students find the community that has, on average, the hottest summer days (Kamloops and Windsor) and the community that has the snowiest winters (Churchill Falls). Invite them to compare figures for different parts of the country and encourage them to discuss the roles that elevation, latitude, land forms, and large bodies of water may have on the climate. For example, Mayo in the Yukon has the same average high in July as does Lynn Lake in Manitoba. Halifax, Nova Scotia, gets twice as much snow on average as Baker Lake in the Northwest Territories.

If you would like to do a similar plot of climatic information for more locations in your province or territory, visit the web site www.weatheroffice.ec.gc.ca. and select Climate Data from the menu on the left. Print the climatic values you wish to use and then have your students plot them on the appropriate provincial or territorial map.

Province/Territory	Community	Average High Temperature July (°C)	Average Annual Snowfall (cm)
Yukon	Mayo	22	145
	Watson Lake	21	219
	Whitehorse	20	145
Northwest Territories	Fort Smith	23	154
	Fort Simpson	23	164
	Inuvik	20	175
	Norman Wells	22	149
	Yellowknife	22	133
Nunavut	Alert	6	165
	Baker Lake	16	130
	Cambridge Bay	12	80
	Clyde River	8	197
	Coral Harbour	14	135
	Eureka	8	53
	Hall Beach	9	120
	Iqaluit	12	257
	Resolute	7	97
British Columbia	Cranbrook	26	148
	Fort Nelson	23	191
	Fort St. John	22	198
	Kamloops	28	86
	Prince George	22	234
	Prince Rupert	16	143
	Vancouver	22	55
	Victoria	22	47
Alberta	Calgary	23	135
	Edmonton	23	127
	Lethbridge	26	160
	Medicine Hat	27	108
	Fort McMurray	23	172
	Edson	22	180
Saskatchewan	Swift Current	25	128
	Cree Lake	21	180
	Regina	26	107

Province/Territory	Community	Average High Temperature July (°C)	Average Annual Snowfall (cm)
Saskatchewan	Saskatoon	25	105
	La Ronge	23	155
	Prince Albert	24	117
Manitoba	Churchill	17	200
	Brandon	26	106
	Dauphin	25	138
	Lynn Lake	22	206
	Thompson	23	201
	The Pas	23	170
	Winnipeg	26	115
Ontario	Big Trout Lake	21	233
	Thunder Bay	24	196
	Timmins	24	352
	Moosonee	22	225
	Sault Ste Marie	24	316
	Windsor	28	123
	Toronto	27	124
	Ottawa	26	222
Quebec	Kuujjuaq	17	271
	Kuujjuarapik	15	238
	Sept Iles	20	415
	Baie Comeau	21	362
	Val d'Or	23	318
	Sherbrooke	25	288
	Quebec City	25	337
New Brunswick	Fredericton	25	241
	Moncton	24	367
Prince Edward Island	Charlottetown	23	339
Nova Scotia	Halifax	23	261
	Sydney	23	330
Newfoundland	St. John's	20	322
	Daniels Harbour	18	427
	Happy Valley-Goose Bay	21	464
	Churchill Falls	19	481
	Port Aux Basques	16	316

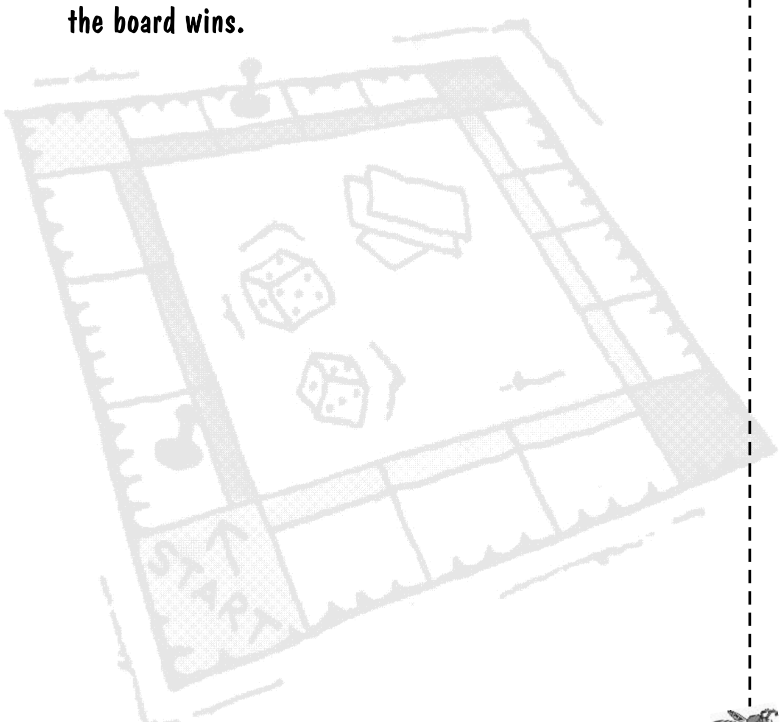


Activity number 18 - Design a board game

Here is a chance to have some fun with all the weather knowledge your students have accumulated during their time as Sky Watchers.

Working in teams, have your students design a board game to teach their classmates about weather — the more creative, the better! For example, they could make jeopardy-type questions in categories such as severe weather, weather in song titles, or historic storms. The most knowledgeable player gains the most points and wins.

Or they may create a game similar to Snakes and Ladders using tornadoes, downbursts, and blizzards. A player who lands on one of these severe weather squares must be able to answer a weather trivia question correctly to proceed — answer it wrong and the storm blows you back several squares on the board. The first player to travel all the way across the board wins.



Activity number 19 - an experiment

To demonstrate the effect of UV on newspaper

Materials

- newspaper
- book
- clear glass bowl
- piece of plastic such as a pair of work glasses

Method

1. On a sunny day in May or June, spread a newspaper out on a flat surface in the schoolyard early in the day. Place a book on the left side of the paper and invert the bowl on the right side. Place the plastic in the middle of the paper.
2. Leave it exposed, untouched for at least 4 hours.
3. After 2 p.m., remove the objects from the newspaper and note any differences in colour.

Observations

The exposed portion of the newspaper has yellowed. The part of the paper that was under the book is still white; the part under the plastic has coloured slightly; and the part under the glass bowl has yellowed even more but not as much as the totally exposed portion.

Conclusion

UV rays affect the colour of newspaper. Plastic blocks more UV rays than glass, but the book offered the most protection.

Activity number 20 - Today's UV

This activity could be done in conjunction with a track and field meet or other activity that requires your class to be outdoors for an extended period

Purpose

To increase understanding of daily variation in UV

Materials

- UV meter
- graph paper
- pencil
- ruler
- notepad

Method

1. Prepare graph axes and labels, with the UV Index listed vertically on the left. Mark the vertical axis with UV Index units from 0 to 11 in increments of 0.5 units. The horizontal axis will show time in increments of ½ hour. Label both axes. Add a title to your graph, including the date and location. Include a space for the UV Index forecast.

2. Check the day's UV Index forecast maximum for the location nearest you from the newspaper, radio or TV, or from the public forecast on any of Environment Canada's web sites. Record this value in the space provided.

3. Every 30 minutes, use the meter to take a UV reading in an open sunny area. Class members can take turns. Note if any cloud was blocking the sun at the time you took the reading.

4. Record the time and UV Index reading for each observation. Then enter each reading as a point on the graph. Circle the point if the sun was behind cloud at the time.

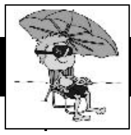
5. Join the points on the graph. Compare the highest point on the graph to the forecast maximum obtained earlier. Identify the period of time when the UV Index was above 3. Observe what happens to the UV Index when the sky is cloudy.

Observations

On a clear day, a graph of UV Index measurements will have a smooth bell shape, peaking at "solar noon" — roughly noon Standard Time or 1 p.m. Daylight Time. In southern Canada, the UV Index would normally be high or very high from 11 a.m. to 4 p.m. on sunny summer days. Thick cloud will reduce UV and produce irregularities in your graph.

Conclusions

During the early afternoon, UV is generally twice as strong as in the early morning or late afternoon. That's why protection from the sun is particularly important then. There is less UV when significant cloud is present.



Activity number 21 - Made in the shade

To show the importance of reducing direct UV exposure, and to illustrate the degree of protection provided by various sources of shade

Materials

- UV meter
- pencil and pad
- calculator

Method

1. Take the UV meter outdoors near noon on a sunny day in April through September. Best results will be achieved in May or June.
2. Record the UV reading obtained under a variety of conditions; for example:
   - direct sunlight
   - full shade, e.g. beside a building or under a group of trees
   - partial shade, e.g. under a single, small tree
   - portable shade, e.g. under a beach umbrella
3. Calculate the percentage of UV transmitted through each type of shade, compared to the full sun reading.

   UV transmitted (%) = (shade reading ÷ full sun reading) x 100%

   UV reduction (%) = 100% - UV transmitted

Observations

UV reductions will vary with your particular circumstances, but for UV, all shade is not created equal. Different degrees of shade can reduce UV exposure by roughly 60 to 95%.

Conclusions

The more of the sky around you that is blocked by trees and other objects, the lower the amount of UV reaching you. Conversely, the more open sky visible around you, the higher the UV, because the atmosphere scatters UV rays so effectively. Therefore, UV under a group of trees, for example, is lower than under a single beach umbrella.

Activity number 22 - UV and clothing

To demonstrate the effectiveness of a variety of fabrics on reducing UV

Materials

- UV meter
- pencil and pad
- at least five different fabric swatches or items of clothing in a variety of weaves, colours, and weights.

Suggestions: bathing suit, white cotton T-shirt, dark coloured T-shirt, polyester shirt, jeans, mesh T-shirt.

Method

1. Carefully identify each clothing sample (numbered adhesive labels and a legend sheet are recommended).
2. Take a UV reading with the UV meter in direct sunlight and record the value.
3. Remain in direct sunlight. Place the clothing samples, one at a time, on the UV meter over the black sensor button. Make sure that the button is completely covered. <u>Do not touch the sensor with your fingers</u>.
4. Wait a minute for the UV meter to adjust and record the new reading. Change the clothing sample. Record all measurements on your sheet.
5. Calculate the percentage of UV transmitted through each type of clothing, compared to the full sun reading.

$$\text{UV transmitted (\%)} = (\text{reading under clothing} \div \text{full sun reading}) \times 100\%$$

$$\text{UV reduction (\%)} = 100\% - \text{UV transmitted}$$

Observations

Compare the amount of UV that penetrated various fabrics depending on the type, weave, colour and weight. As with shade, all fabrics are not created equal when it comes to UV protection.

Conclusions

In general, denim and polyester protect better than cotton; tight weaves, better than loose; dark colours, better than white; and heavy fabrics, better than light.

Activity number 23 - UV and Sunglasses

To show that some sunglasses block a high percentage of UV radiation

Materials

- UV meter
- pencil and pad
- several pairs of sunglasses (students can test their own)

Method

1. Take a UV reading with the UV meter in direct sunlight and record the value.
2. Remain in direct sunlight. Rest one of the sunglass lenses on the UV meter over the black sensor button. Make sure that the button is completely covered by the lens. Do not touch the sensor with your fingers.
3. Wait a minute for the UV Index to adjust and record the new reading. Continue to test the remaining pairs of sunglasses. Record all measurements on your sheet.
4. Calculate the percent UV-B passing through sunglasses as follows:

   Percent UV-B Passing through Sunglasses = (UV Index with Sunglasses ÷ Direct UV Index) x 100%

Points for Discussion

This test only shows approximately how well a pair of sunglasses protect your eyes from UV-B. Accurate UV testing for sunglasses can only be conducted by an optometrist or ophthalmologist.

UV-A is also harmful to the eye. When buying sunglasses, it's wise to check the label for the degree of protection from both types of UV.

You may want to visit the Health Canada web site at www.hc-sc.gc.ca and navigate to the It's Your Health fact sheet series. Three fact sheets are of particular interest: Sunglasses, Preventing Skin Cancer and Ultraviolet Radiation from the Sun.