Canada

Science.gc.ca

Activity Book 7

Welcome to the seventh edition of the Science.gc.ca Activity Book!

Science is all around us and can be discovered, explored and used in so many ways! This new Activity Book showcases the diversity of the world of science through activities in health, energy, environment, agriculture, meteorology, astronomy, the living world and much more!

Science.gc.ca is the official Government of Canada website for Science and Technology (S&T) information and resources. We have put together this Activity Book to stir your inner scientist. Whether you are in elementary, intermediate or secondary school there are activities for all ages and skill levels. These activities can be done individually or with friends in class, at camp, at home or with your Girl Guides of Canada or Scout Canada clubs.

If you would like to *make a tornado in a bottle*, learn about *echolocation* or even *test your knowledge of atomic elements*, you'll find it all inside this Activity Book!

For more activities, you can visit Science.gc.ca and download our previous Activity Books. While you are there, don't forget to check out our Videos, Games and Educational Resources for more science and technology experiments, activities and facts. You can even submit a question to "Ask a Scientist!"

Science.gc.ca challenges you to go out, explore and look for science everywhere you go.

We would like to thank our funding partners for their ongoing participation and support:

- ✓ Aboriginal Affairs and Northern Development Canada
- ✓ Agriculture and Agri-Food Canada
- ✓ Canadian Food Inspection Agency
- ✓ Canadian Space Agency
- ✓ Defence Research and Development Canada
- ✓ Environment Canada
- ✓ Fisheries and Oceans Canada
- ✓ Health Canada
- ✓ National Research Council Canada
- ✓ Natural Resources Canada
- ✓ Natural Sciences and Engineering Research Council
- ✓ Public Health Agency of Canada

Go ahead, get started; discover and explore the fascinating world of science!

Sincerely,
The Science.gc.ca Team

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Elementary Level Activities

Best suited for ages 5 to 10

Create Sky Effects in a Glass

Aboriginal Affairs and Northern Development Canada

CREATE SMALL SUNSETS!
By doing this experiment, you can figure out why the sky is normally blue and why it then becomes orange or red during sunsets!

What you need:

You need a clear drinking glass, water, 1 tablespoon of milk, and a flashlight.

What you do:

1. Fill the glass 2 two thirds of the way with water and add 1 tablespoon of milk. Stir well!

2. Take the glass into a dark room and turn on the flashlight.

3. Shine the light down on the glass so that the light is above the glass while facing down (the light should pass through the water to the bottom of the cup). When the light is at this angle, the water mixture should appear blue.

4. Now, place the light by the side of the glass so that it shines through to the other side. If you look at the water toward the light, the water appears red.

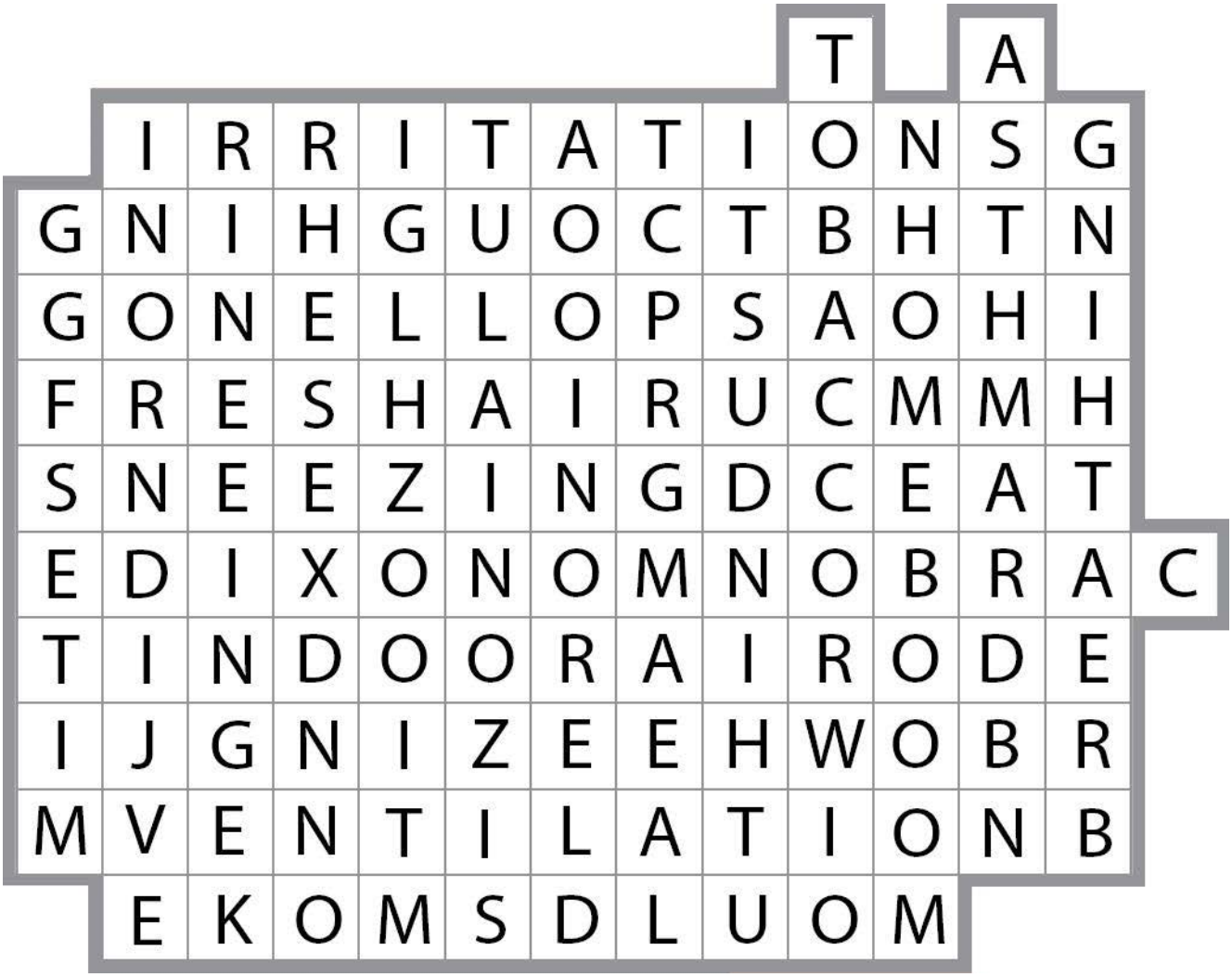
5. If you place the light under the glass so that it shines from the bottom to the top, the water will have a stronger red color than before!

Why does the color change when you place the light in different spots? The sky's atmosphere has dust particles that scatter the sun's rays. When rays are scattered, they move about and produce different colors! Here, the milk particles act like the dust particles and scatter the light's rays! You just created a sky in a glass!

Indoor Air Word Search

Health Canada

Find these hidden words related to indoor air! The words could be up, down, left, and right so look carefully!



ASTHMA
BREATHING
CARBON MONOXIDE
COUGHING
DUST
FRESH AIR
HOME
INDOOR AIR
IRRITATION
MITES
MOULD
POLLEN
SMOKE
SNEEZING
TOBACCO
VENTILATION
WHEEZING

Simulating a Tornado

Environment Canada

Materials

- two 2 L 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 5 cm piece of duct tape and cover the mouth of the bottle containing 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 two bottles.

5. Cut more duct tape and wrap it around the necks of the bottles so they are firmly attached.

6. Hold the two 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.

Questions

- Why does this look like a tornado?
- What part of the tornado do you expect to be the most dangerous?
- Why do you think the origin of a tornado is called a funnel cloud?

Explanation

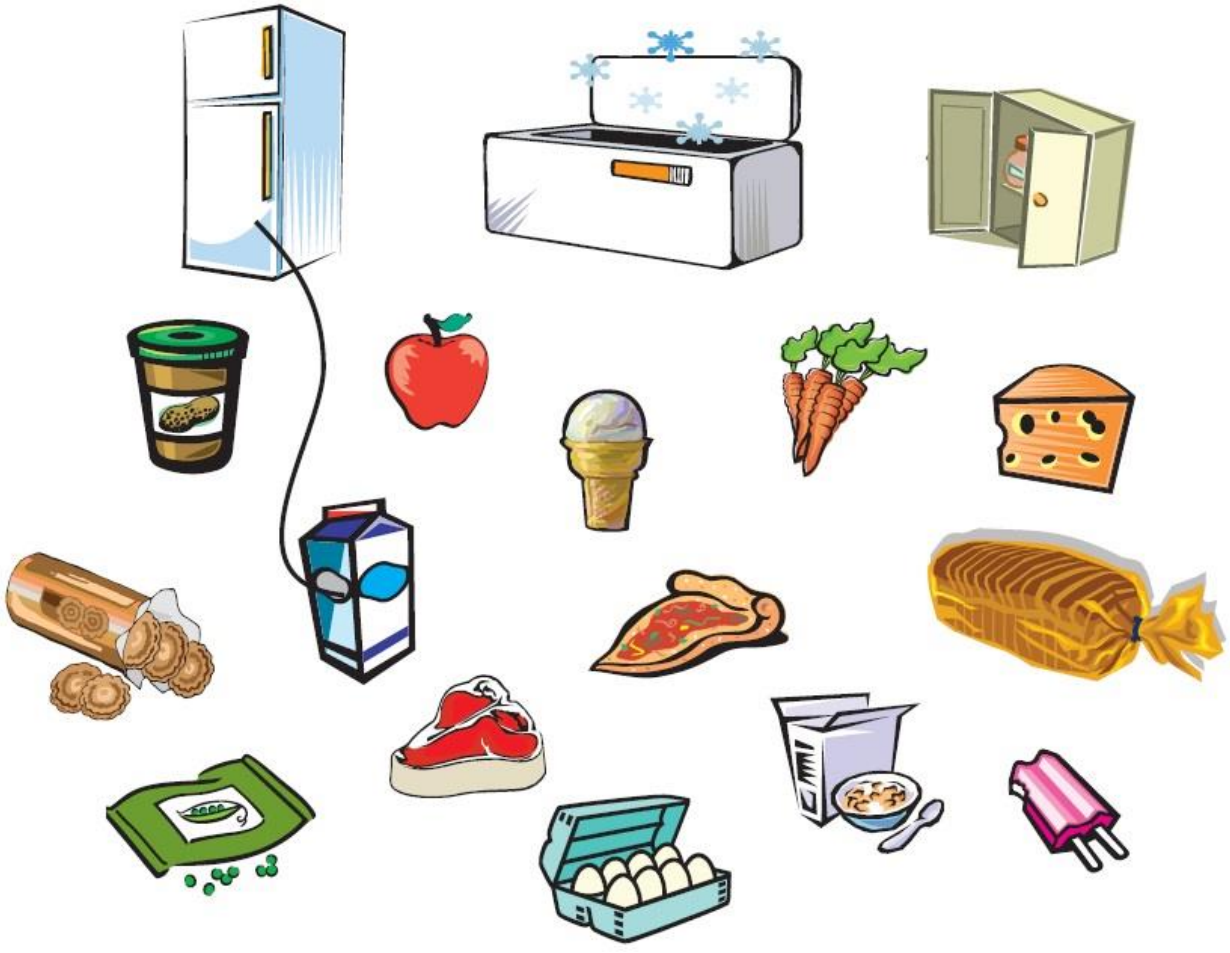
Tornadoes are fast, violent swirling winds. In this demonstration, the spinning of the bottles and funnel-shaped opening causes the water to take the shape of a tornado. The hole in the bottle allows for the appearance of the tornado's tail—the most dangerous part of the tornado.

Keep Cold Food Cold

Canadian Food Inspection Agency

After shopping, quickly put away the groceries that need to be put in the fridge or freezer. Keeping food cold slows down the growth of harmful bacteria that could make you sick.

Help put the groceries away by drawing a line from each food to its proper storage place in the fridge, freezer or cupboard.



Create Oobleck!

Aboriginal Affairs and Northern Development Canada

Become a mad scientist in your own home!

Did you know that you can change matter? Think about what happens when salt is added to an icy road on a cold winter day. It makes the snow and ice melt faster.

This transformative process is called a PHYSICAL CHANGE.

Try to make Oobleck. What, you say? Oobleck! Do you remember the Dr. Seuss book *Bartholomew and the Oobleck*? This oobleck recipe will allow you to create this strange substance, and witness the changes between solid and liquid that occurs.

What you need:

You need 1 cup cornstarch, a bowl, a glass of water, a plastic container (like an old, empty yogurt tub), food coloring (optional) and newspaper to cover the table.

NOTE: This recipe can be very messy, but it's loads of fun. Wear old clothes and cover the surface you are working on.

What you do:

1. Put a cup of cornstarch in the bowl.

2. Slowly stir in small amounts of water until the mixture is thick like syrup. Add a few drops of food coloring, if you choose.

3. Squeeze the gooey mixture between your fingers. What happens? Can you shape it into a ball? Hold the ball on your flat palm. Watch what happens. What happens when you pour the mixture into another container?

Fact or Fiction: the Air Quality Health Index

Environment Canada

1. There is an Air Quality Health Index that is like the UV index, only it tells us about the health risk from air pollution for that day.

2. Air pollution is an issue for cities. People who live in rural areas are not affected.

3. The AQHI is based on the risks of common air pollutants that harm human health.

4. A common air pollutant that harms human health is: dust.

5. The AQHI is part of the forecast.

6. Air pollution makes asthma symptoms worse.

7. For AQHI, the lower the number, the greater the health risk associated with the air quality. (An AQHI of 2 is worse than an AQHI of 10.)

8. A common air pollutant that harms human health is: oxygen.

9. Weather does not affect air quality.

10. For high UV you cover up and add sunscreen; for high AQHI you change your plans.

11. Children are the least sensitive to the adverse health effects of air pollution.

12. High UV radiation makes more ground-level ozone, which is a pollutant.

13. The shape of the land can allow pollutants to be trapped in basins and valleys.

14. Strong winds allow pollutants to build up over an area.

15. Running your gas-powered lawnmower for 1 hour is equal to driving a new car between 320 and 480 kilometres.

16. Some people are more sensitive to air pollution.

17. Blue is used to show a very high health risk from air quality.

18. Air pollution is a problem throughout the seasons.

19. A full bus takes 40 to 60 cars off the road.

All About Echolocation

Fisheries and Oceans Canada

Background:

The term echolocation refers to an ability that toothed whales have that lets them locate and make out objects by listening for echoes. Toothed whales echolocate by producing clicking sounds and then receiving and interpreting the resulting echo. Beluga whales rely on these echoes to navigate, communicate, locate breathing holes, and hunt in dark or murky waters. In this activity, one student will play the beluga whale and the others will act as food.

What you will need:

- Blindfold
- Large open space

Let's get started!

You will need a lot of space for this activity, preferably an outdoor space, the school gymnasium or a large clear room.

Object of the game:

Not to get caught by the "whale" (the person who is "it")

Rules:

1. One person is chosen to be the whale; he/she is blindfolded and stands in the centre of the room.

2. All the other students act as food and can stand, sit or lie down anywhere in the room.

3. The whale counts to 10 and shouts "Echo!" and all the others students shout "Location!"

4. The person who shouts "Echo!" has to try and catch one of the persons who shouts "Location".

5. The whale can shout “Echo!” as much as possible. Once he/she catches a person, then that person is now "it" and so on…

6. Try shouting loudly or whispering. Try having only one side of the room answering the whale. Does it make a difference?

Talk about it!

1. Is it easier to track food using your eyes or your ears?

2. What happened when the food was quieter or louder?

3. What other animals might use echolocation to find food?

4. What would be different in a real ocean situation?

5. What do you think happens to whales if there is a lot of noise in the ocean?

Connect the Dots and Label and the Laboratory Equipment

Aboriginal Affairs and Northern Development Canada

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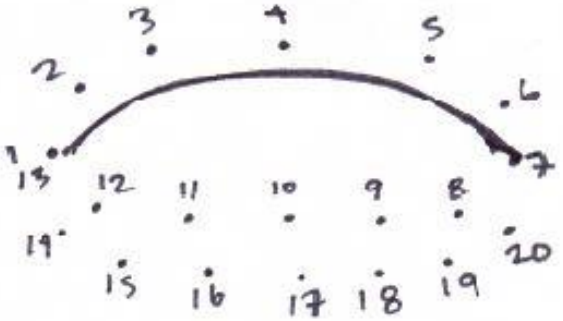

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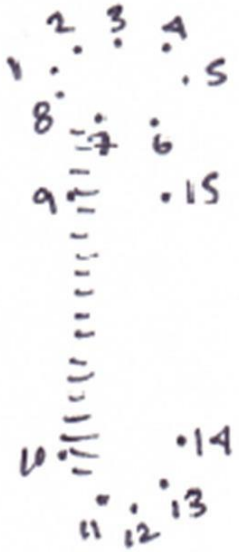

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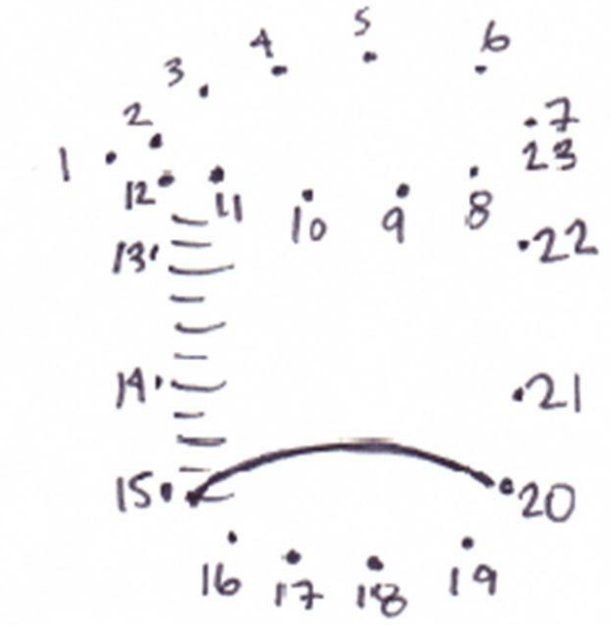
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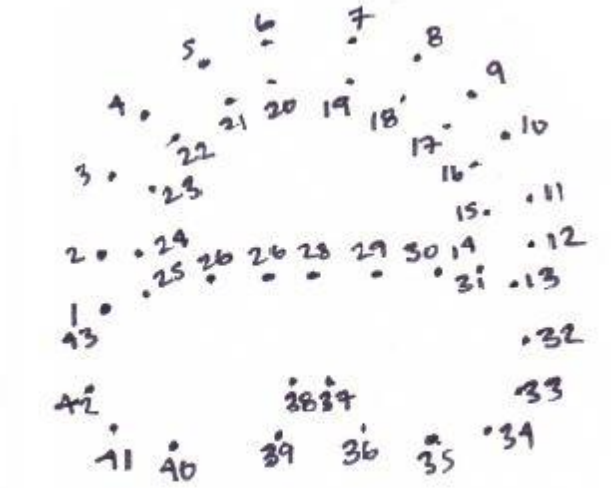

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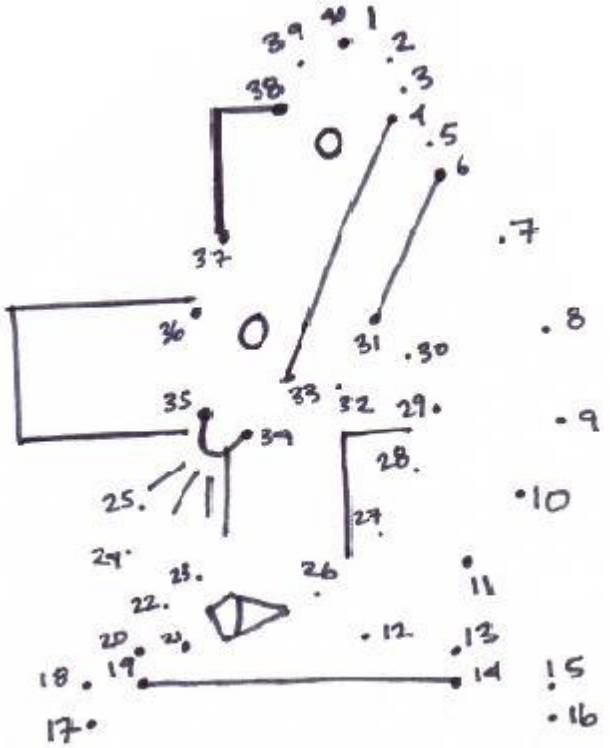


G.

Label the Chemistry Lab Equipment:

ERLENMEYER FLASK

BEAKER

PETRI DISH

TEST TUBE

RUBBER GLOVES

GOGGLES

MICROSCOPE

Staying Cool in Space

Canadian Space Agency

Background

Working in space takes a great amount of effort. During the first spacewalks or Extravehicular Activities (EVA), astronauts relayed how warm it gets while wearing a spacesuit that has a mass of over 100 kilograms!

To help the spacewalkers stay cool during an EVA, researchers developed the Liquid Cooling-and-Ventilation Garment. The garment is a one-piece body suit with a zippered-front. Its soft nylon lining is covered with an additional layer of Spandex™ and a network of plastic tubing that surrounds the body. This tubing is used for cooling and ventilating the suit. A set of tubes is used to circulate cool liquid, while another set of tubes is used to transport sweat, carbon dioxide, and any other contaminants into the Primary Life Support System to purify the atmosphere within the suit.

The Activity

Students will use plastic tubing and water to lower their body temperature.

The Objective

This activity teaches students about an astronaut's challenge of working in space and the need for researchers to devise solutions for real-life problems. Students will have the opportunity to experience how an astronaut regulates his body temperature while working in space.

Materials

- two buckets
- 3 metres of aquarium tubing
- water
- ice to fill a bucket to the halfway point
- kitchen size plastic garbage bags (one per student)

Method

Understanding Heat Retention

1. Give each student a plastic bag. Students should roll up one shirt sleeve.

2. Ask the students to place their bare arms in the plastic bag. Wrap the bag around the arm (but not too tightly). For a period of two minutes, they should wave their covered arms.

3. After this time period, ask the students to observe the sensation in the arm once they remove these bags. The following discussion should explain how the suit, like the plastic, retains body heat, and why their arms suddenly felt cooler with the removal of the bags. (Warm air in the bag was released and moisture from perspiration on the arms began to evaporate to create a cooling effect.)

4. You can now segue into the next part of the exercise. Students will understand how to circumvent the problem of heat retention within the suit.

A “Cool System”

1. Set up a bucket of water and ice on a desk.

2. Set up the empty bucket on the floor.

3. Ask a student volunteer to sit on a chair in front of the desk and the ice water

4. Wrap the tubing around the student's bare arm and place one end of the tube in the ice water and the other end of the tube in the empty bucket.

5. Start a siphon flow from the ice water to the empty bucket. Ask the student to describe the sensation for the rest of the class.

More Activities to Stimulate Interest and Learning

- Devise a method that will eliminate the need for the siphons and buckets of water in this experiment. How can you ensure that water can be continuously circulated?

- Set up teams to design and construct liquid cooling garments. Each team can choose their base garment (e.g. long underwear, thermal undershirt, running tights, bodysuit). They can also decide on how much tubing to apply for maximum cooling and how it can most effectively be networked and attached to the suit.

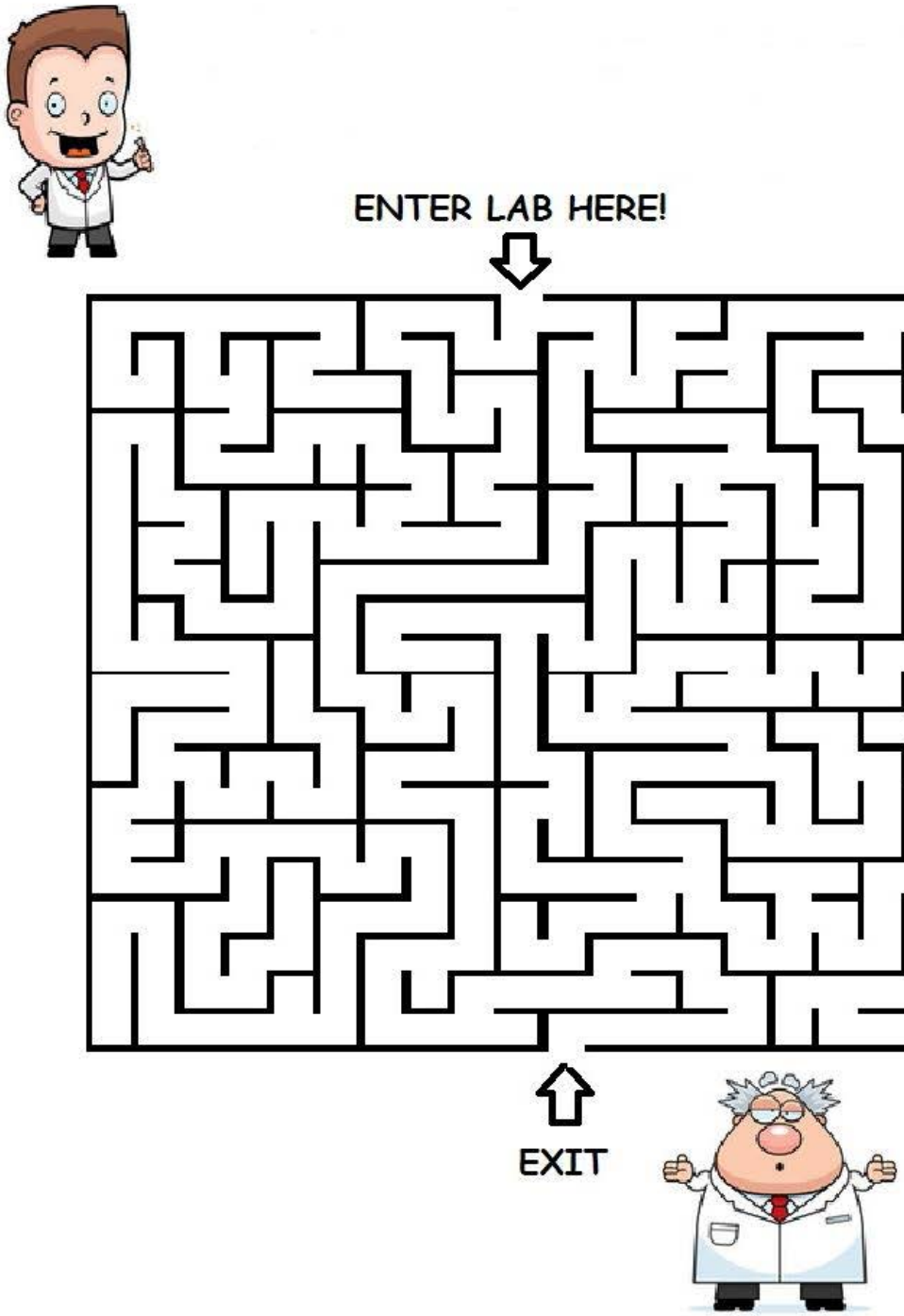
- Devise a method to compare and test the effectiveness of each of the suits. Which was most effective? Which was least effective? Why?

- Who else might benefit from these liquid cooling garments?

Maze

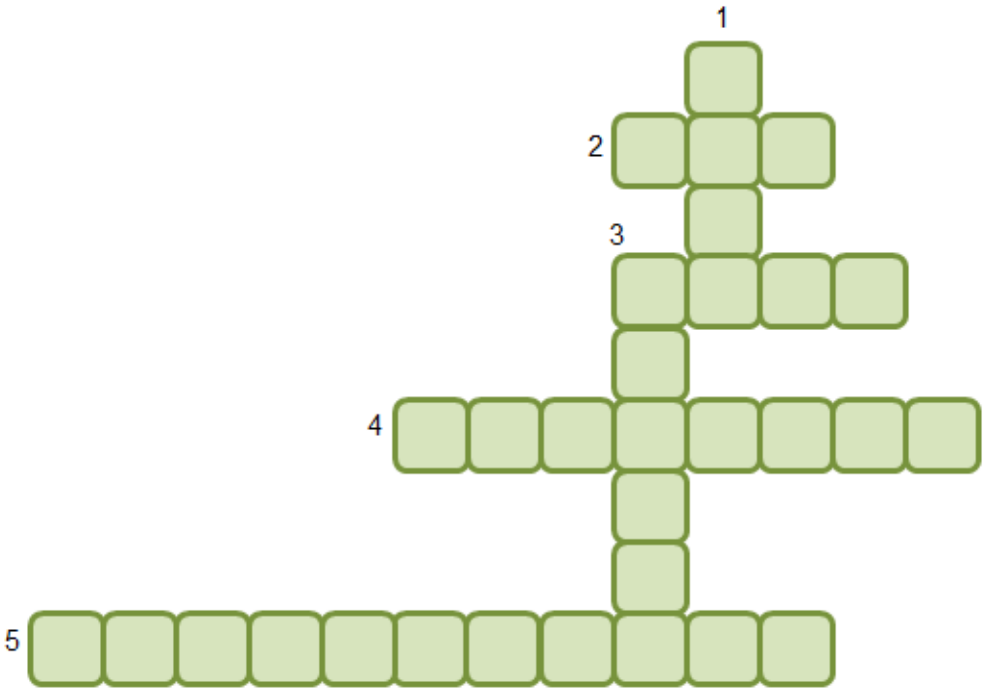
Aboriginal Affairs and Northern Development Canada

Hey there Mad Scientist! We need your help! Martin, the Chief Scientist for the Canadian High Arctic Research Station (CHARS), needs to give Donald some field samples on the other side of the lab. Can you help Martin find his way through the lab?



Don’t Move Firewood!

Canadian Food Inspection Agency



Across

2. What kind of trees do emerald ash borers like? Hint: Check out its middle name!

3. Many harmful insects like to hide under what part of a tree? Hint: It's the sound a dog makes!

4. What should you not move? Hint: Your parents use it to make a campfire.

5. Invasive species are damaging Canada's what? Hint: It's all around us.

Down

1. Many invasive species come to Canada from this continent. Hint: This continent has the biggest population!

3. The Asian long-horned and emerald ash borer are both examples of this type of insect.

Did you Know?

... Invasive species include harmful insects that damage Canada's environment. They do this by killing native trees and plants.

... Invasive species are often spread by people moving firewood.

... The emerald ash borer and the Asian long-horned beetle are two of Canada's worst invasive species. They like to hide under the bark of trees or logs where you can't see them.

Make sure your family doesn't take firewood from your home when they go camping. You could be accidentally taking harmful insects with you! Help protect our forests. Tell your parents to buy firewood close to where they plan to burn it.

Intermediate Level Activities

Best suited for ages 11 to 15

Indoor Air Word Search

Health Canada

Find these hidden words related to indoor air pollutants! The words could be up, down, left or right so look carefully! Then use the leftover letters to spell out the Secret.

ASTHMA	DUST	MITES	SMOKE
BARBEQUES	FRESH AIR	MOULD	SNEEZING
CARBON	HEALTH	NITROGEN DIOXIDE	STOVE
MONOXIDE	HOME	POLLEN	TOBACCO
COMBUSTION	INDOOR AIR	POLLUTION	VENTILATION
COUGHING	IRRITATION	SMOG	WHEEZING

Secret: _ _ _ _ _ _ _ _ _ _ _ _

What's Up, Doc? Understanding Good Health

National Research Council Canada

Practically everyone becomes ill... sooner or later. Few people have perfect health. In fact, it is possible for you to be slightly ill and be totally unaware of your condition. This means that contagious diseases can be passed from one unsuspecting person to another.

One way to characterize diseases is to group them according to their principle cause. For example,

1. Diseases which are genetically inherited.

2. Diseases which are related to dietary deficiencies.

3. Diseases which are induced by environmental conditions (physical and chemical).

4. Diseases which are caused by viruses and bacteria.

Your Personal Doctor-on-call

Each of us has within our bodies the best medical team ever assembled – on-call 24 hours-a-day, 7 days-a-week. This is the body's natural immune system. Like all medical teams, this team works best when it is properly nourished and well rested. Look after your body and it will look after you!

A strong immune system is the body's first, and best, line of defence in preventing and recovering from diseases that you might acquire.

Vaccinations are simply a method of "teaching" your immune system to recognize harmful and dangerous viruses and bacteria.

Creepy Things – Ugh!

Unseen and usually unnoticed are the microorganisms which inhabit every nook and cranny of our environment from the highest mountains to the depths of the deepest oceans.

The majority of these microorganisms are benign, meaning they are not harmful. In fact, many of them are beneficial; they are the primary recyclers of organic material in our environment. A few are pathogenic; that is, they cause disease.

I Feel Awful... Groan...

Sometimes, perhaps when you have a bad cough or sore throat, your doctor will take a small cotton ball and swab it (wipe it gently) on your tongue or cheek.
The cotton ball is sealed in a sterile bottle and then it is sent to a lab so that the cause of your sore throat can be determined.

What happens at the lab?

In this activity we will culture microorganisms just as the doctor's lab cultures the microorganisms on the cotton swab from your mouth.

Investigation

Students will be given an opportunity to probe their environment for microorganisms and to cultivate colonies of the microorganisms that they find there.
Note: It may take 2-3 weeks to cultivate visible colonies of microorganisms.

Materials Needed

1. 1 new potato
2. 5 or 6 small resealable plastic bags (or similar air-tight, sealable, transparent containers)
3. a supply of cotton swabs or cotton balls
4. marker pen
5. tongs

Procedure

Step 1

- To begin this activity you will need a few hard, new potatoes, free from bruises or mold.

Step 2

- Wash the skins thoroughly in hot soapy water to remove soil and loose debris on the outer surface of the potato.

Step 3

- Select one potato and cut off 6 or 7 thin slices (about 5mm thick).

Step 4

- Select a fresh, clean cotton swab (or cotton ball). Do not allow it to touch anything except the item to be tested. For the first test, swab the surface of a shoe sole, then as quickly as possible proceed to step 5.

Step 5

- Rub the cotton swab (or cotton ball) over the surface of the potato. This will inoculate the cut surface of the potato slice with the bacteria that you have collected on the cotton swab. Try to do this as quickly as possible to minimize the possibly of contaminating your samples with airborne bacteria.

Step 6

- Once a sample has been inoculated, quickly seal it into the plastic bag. Label the bag for identification.
- Repeat the process for several other items. These might include a doorknob, the palm of your hand, your breath, the floor, the sides of a pen or pencil, or other objects of your choice.

Step 7

- Set up your samples in a warm undisturbed location where you can make regular observations.

Observations and Conclusions

1. Make a chart in which to record your observations.

2. Make daily sketches showing the appearance of each potato sample once the microorganisms appear to be growing. (You may want to use a magnifying glass to examine the sealed potato slices).

3. Each of your samples likely contains numerous kinds of bacteria. Based on your observations which source appeared to have the most active kinds of bacteria?

4. What conclusions can you draw about the apparent abundance of bacteria in your environment?

Discussion

1. List some of the ways our body protects us from illnesses that might be caused by contact with the microorganisms in our environment. Hint: Think about the

body's natural defences against infections, such as tears, saliva, certain blood cells, stomach secretions, and skin.

2. Suggest some ways we can help our natural defences keep us healthy. Hint: Think about things like proper hand washing, personal hygiene, rest, nutritious diet, etc.

3. Did you know that scientists at Canada's National Research Council are exploring ways we can use natural compounds that are found in many of the foods we eat to treat and prevent diseases?

Note: Dispose of the samples in a sealed plastic garbage bag. DO NOT open the resealable plastic bags.

Extended Activities

1. Ask your parents/guardians or teacher to help you make a list of the diseases for which you have been given a vaccination.

2. Make a list of diseases which fall in each of the following categories:

    i. Diseases which are genetically inherited.

    ii. Diseases which are related to dietary deficiencies.

    iii. Diseases which are induced by environmental conditions (physical and chemical).

    iv. Diseases which are caused by viruses and bacteria.

3. Design an experiment to test the effectiveness of various kinds of household cleaning and anti-bacterial agents. You might test various kinds of soap, mouthwash, toothpaste, and hand cleaners.

Biodiversity Quiz

Agriculture and Agri-Food Canada

Biodiversity refers to the variety of life on Earth. It is a record of the differences among all living things and how they interact with the environment as well as each other. Agricultural biodiversity affects farming, the environment and Canada's economy.

Agriculture and Agri-Food Canada maintains the largest collections of fungi, insects and plants in Canada. The identification of pests and weeds, along with their natural enemies, is an essential step in protecting our agricultural resources and the environment.

Take the quiz and test your knowledge of Canada's agricultural biodiversity!

Part 1 – Discover our treasures

1. Taxonomy is…

    A. the science of classifying organisms
    B. the method used to figure out your taxes
    C. the study of ecology
    D. the techniques used by taxidermists

2. The Canadian National Collection of Insects, Arachnids and Nematodes in Ottawa, Ontario contains how many specimens?

    A. 1 million
    B. 10 million
    C. 16 million
    D. 160 million

3. The oldest insects in Agriculture and Agri-Food Canada's insect collection are:

    A. 6 months old
    B. 50 years old
    C. 400 years old
    D. 75 million years old

4. Agriculture and Agri-Food Canada has a large mycology collection and our mycologists study fungi. Which of the following are fungi:

    A. mushrooms
    B. yeasts
    C. moulds
    D. all of the above

5. While there are about a million different kinds of fungi, what percentage has been identified by scientists?

    A. 10%
    B. 20%
    C. 90%
    D. 100%

Part 2 - Enter our vaults

Agriculture and Agri-Food Canada has plant and seed collections. These are similar to libraries because every plant and seed has been named, catalogued and cross-referenced. Staff identify, collect, preserve and share seeds and plant parts with scientists all over the world.

1. In Canada's genebanks, genetic plant material is stored as:

    A. seeds
    B. live plants
    C. tissue culture
    D. all of the above

2. Who can use a genebank?

    A. Anyone who is wearing jeans
    B. Anyone in the world with a valid use
    C. Only scientists or plant breeders
    D. Only farmers

3. What type of scientist would work at a genebank?

    A. Botanist
    B. Taxonomist
    C. Geneticist
    D. All of the above

4. The lifespan of a seed varies from a few years to centuries. To maintain optimum preservation, the genebank keeps a storage facility in Saskatchewan at what temperature.

    A. 30° Celsius
    B. 4° Celsius
    C. -20° Celsius
    D. -70° Celsius

5. Some countries are often responsible for a specific plant variety. Canada is responsible for the world collection of:

    A. Barley and oat
    B. Wheat and rye
    C. Tomato and cucumber
    D. Apple and pear

Part 3 - Farmers and biodiversity

Because Canadian agriculture is relatively new, most of our crops originated from areas outside of Canada. Canadian crop breeders adapt plant varieties so they can grow in our cold climate. Over the years, scientists have boosted biodiversity greatly by developing new crops for domestic use and export markets.

1. Crops that are native to Canada are:

    A. strawberry, blueberry and cranberry
    B. tomato, potato and corn
    C. wheat, rye and oats
    D. apple, pear and peach

2. Which crop is grown in every province in Canada?

    A. Apples
    B. Strawberries
    C. Potatoes
    D. All of the above

3. How many years does it usually take to develop a new tree fruit variety such as apple, pear or peach?

    A. 5 years
    B. 10 years
    C. 25 years
    D. 50 years

4. Since 1901 our Shelterbelt Centre in Saskatchewan has distributed how many trees to Canadian farmers on the prairies?

    A. 60 thousand
    B. 600 thousand
    C. 6 million
    D. 600 million

Collecting Algae

National Research Council Canada

Some consider algae to be a "slimy nuisance" or just "pond scum." But look closer and you'll see that algae (singular "alga") represent one of the most diverse forms of life on Earth, coming in a near infinite variety of shapes, sizes and geometric designs. The term "algae" is used to describe primitive plant-like organisms and is often given to unrelated groups that use photosynthesis or appear similar in shape or form. Algae are the base of the food chain — they convert nutrients to organic matter that other organisms eat.

Purpose
Discover what native species of algae grow in your backyard.

Materials and Equipment

- 1 small microscope
- 1 dip net (common at pet food supply stores) or a fine-mesh kitchen strainer
- 1 pair scissors
- A pond or marsh near you home or school

Instructions

1. Use the net or strainer to carefully collect algae from the water's surface. Be sure to look in all habitats in the water such as the edge of stones, aquatic plants and floating objects. A small sample can harbour a myriad of life forms, including aquatic micro-animals.

2. Algae often form mats on the water's surface. If necessary, use the scissors to obtain a small sample easily.

3. If the material you collect is muddy, let it sit for a few hours before observing it.

4. Spread your sample thinly on a slide and place a cover slip on top. Most algal forms are easily seen at a magnification of 10x or 15x.

5. To photograph algae, use a simple compact digital camera, which can capture a clear image when held up to the eyepiece lens of the microscope.

6. Do not keep algal samples for more than a few days as grazing micro-animals can decimate them. Also, their chemistry will change and, unless you refrigerate them, truly foul odors can develop.

(This activity was submitted by science teacher Michael Léveillé of St-Laurent Academy Elementary and Junior High in Ottawa.)

Word Search

Aboriginal Affairs and Northern Development Canada

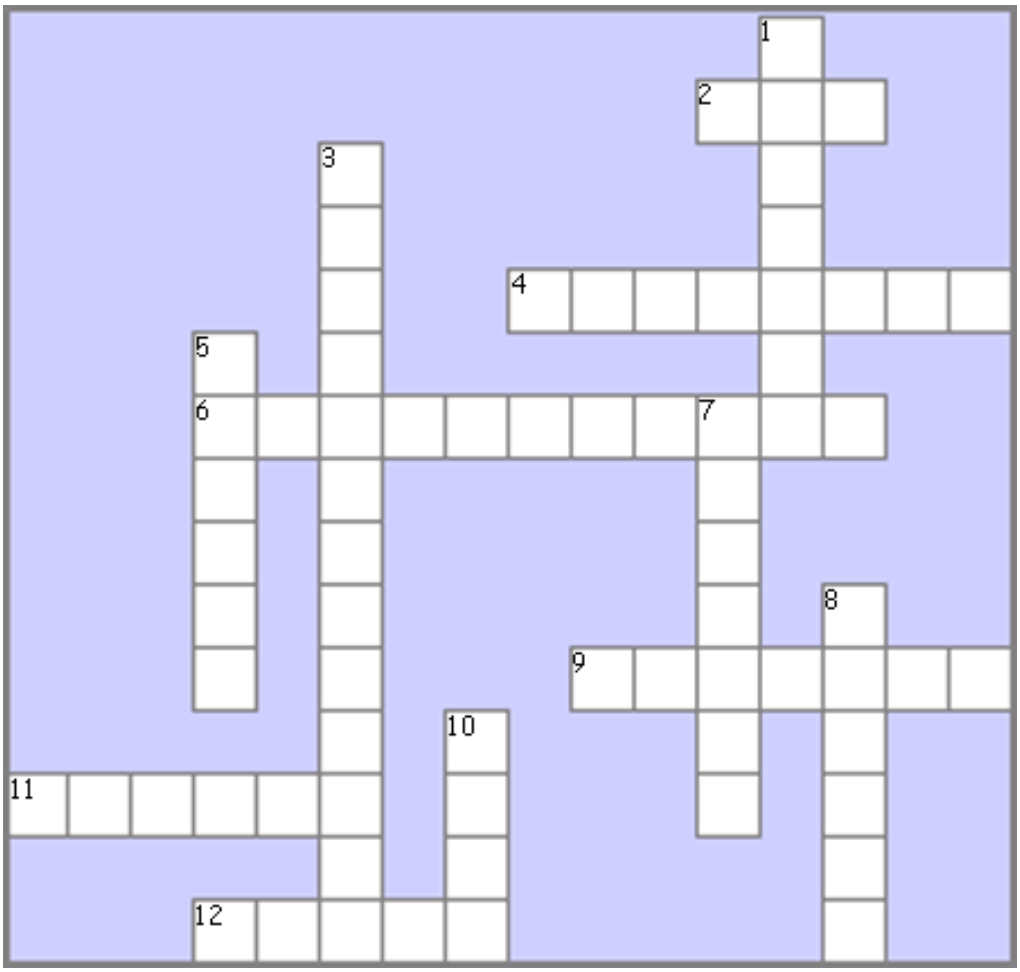
Try to find all the words in the list at the bottom of the page! If you don't understand a word, ask your parents or a teacher what the word means and they can help you learn the words!

R V S G D H A N S H V E K W T C A H J T
K C E N V C I X R V B U G O Y H H B E N
L J H Z K W H Y C Q R R Q N A C Q W S E
E C E I T P Z N E V I T A N R E T L A M
Q E R O S W M A T V I G C A F U T R M N
X U H Q S J Y R K P Z Y E K Q T I T O O
H S K S A K G B A L V S C X Y S I Y N R
E T J R M W O R O C E G T T F K G D I I
Y N F A O G L Y T R I Q J E C O O M T V
A E U H I T O N F D W T V S L P M C O N
K M G C B E M A Q P F P C O D M Q H R E
X I M Z E U O T C V O O N R A W N J E J
H R V Q M O T O G R L H M T A L F C O Z
Z E U A K E N B D E C N A N E T N I A M
G P F F R J E Y Z E O D N Z S E O B F B
H X O K L I H E T H P L Y N I G C G I S
A E Z L C X O S D N D P O C T F I S E N
C S E J A S D Z N Q B F S G Y Q S M L V
U D L I J R M F I P T B X Z Y U R L D W
P Q Q M Y Q O Y W Z R A L O S U U J P X

CHARS
Field
Environment
Experiments
Entomology
Wind
Biomass
Science
Research
Monitor
Arctic
Botany
Hydro
Geology
Technology
Maintenance
Data
Polar
Alternative
Solar

Canadian Skies Crossword Puzzle

National Research Council Canada



Across

2. A yellow dwarf star at the centre of our solar system, it accounts for 99.8% of our solar system's mass.

4. This describes the motion of spinning on an axis or centre, like a top.

6. These people rely on electromagnetic radiation detected by different types of telescopes to determine the location, composition, temperature, motions and magnetism of celestial objects.

9. This planet is the home of some of the fastest windstorms anywhere in the Solar System, with winds often reaching speeds of 2000 km/h.

11. Every December, meteors appear to spray out of this constellation. This event is called the "Geminid meteor shower."

12. This planet is named after the Roman goddess of love and beauty.

Down

1. This planet weights more than twice as much as all the other planets of our solar system combined.

3. An area in the sky where people have looked up and seen a pattern that is helpful in finding our way around the night sky.

5. The Milky Way a spiral disk containing several hundred billion stars is one of these.

7. An event in which the shadow of one celestial body falls on another celestial body.

8. This beautiful light show of red and green glowing overhead is caused by the interaction of solar materials with the Earth's atmosphere.

10. This planet was named after the Roman god of war, due to its blood-red colour.

Energy-Smart Choices

Natural Resources Canada

All the underlined words in these fun facts are hidden in the puzzle. Can you find them?

Did you Know?

Composting is a way to recycle, and it's good for planet Earth.

You can do something good for the environment and lessen the negative effects of climate change by planting a tree or conserving water.

Energy efficiency and cars:

- Ask you parents if they carpool.
- No idling, please it uses more fossil fuel.
- Hybrid cars help with energy conservation.

I	D	L	I	N	G	B	H	Z	D	L	G	J	R
C	O	N	S	E	R	V	A	T	I	O	N	M	O
E	U	T	C	A	R	P	O	O	L	J	F	G	E
X	N	I	G	P	J	E	F	D	D	Y	F	F	U
Y	X	V	L	N	A	X	U	O	G	K	F	D	V
T	E	L	I	R	I	R	A	R	S	I	M	D	J
R	T	Q	T	R	E	T	E	Z	C	S	D	E	J
E	A	H	Q	C	O	N	S	I	Y	O	I	L	U
E	M	L	Y	D	E	N	E	O	D	F	C	L	P
Z	I	C	F	F	A	N	M	K	P	S	S	V	Y
C	L	R	H	I	C	I	Z	E	K	M	D	V	X
E	C	I	B	Y	B	K	F	F	N	J	O	L	S
J	E	N	O	X	V	R	K	I	R	T	Q	C	G
H	Y	B	R	I	D	O	Z	R	E	T	A	W	Y

Secondary Level Activities

Best suited for ages 16+

Atomic Energy Math

National Research Council Canada

Complete the math problems using **atomic numbers**.

a. Cl + O + Ne = _____

b. H + Ac + K = _____

c. K + N + I + Fe = _____

d. Sn + O + B = _____

Complete the math problems using **atomic mass** (rounded to the nearest one).

e. H + He + Li = _____

f. O + F + Ne = _____

g. Si + S + Ar = _____

h. Be + C + Al = _____

Complete the math problem using **atomic numbers**.

i. ____ + _____ + _____ = 30

j. ____ + _____ + _____ = 40

k. ____ + _____ + _____ = 50

Investigation: Determining the Best Protection from UV

Environment Canada

Materials

- UV meter(s)
- pencil and pad
- three (3) different types of fabric (e.g. cotton, synthetic, silk) in the same colour
- three (3) different colours of fabric of the same type and weight (e.g. black, white, and red cotton)
- three (3) pairs of sunglasses
- several leaves and/or types of shade (e.g., buildings, tree(s), umbrella)
- calculator

Method

1. Choose a day when the UV Index is forecast to be 6 or greater.

2. Identify variables and assign to groups, each with their own UV meter.

3. Make predictions about which materials or shade give the best protection against UV.

4. Put the samples in a random order.

5. Take a UV reading with the UV meter in direct sunlight and record the value.

6. Place each sample, one at a time, on the UV meter over the sensor. Ensure that the sensor is completely covered. Do not touch the sensor with your fingers. To sample types of shade, move the UV meter from direct sunlight to the designated shaded area before taking the reading.

7. Wait a minute for the UV meter to adjust between samples.

8. Calculate the percentage of UV transmitted through each type of fabric sunglasses or shade compared to the full sun reading.

UV transmitted (%) = (reading under sample ÷ full sun reading) x 100%
UV reduction (%) = 100% - UV transmitted

Questions

- Which fabrics give the best protection against UV?
- Which sunglasses give the best protection against UV?
- What type of leaf or shade gives the best protection against UV?
- Why is it important to change only one variable at a time?
- Why should the samples be in a random order?
- How would variable cloudiness affect the results?

Explanation

The more of the sky that is blocked by trees and other objects, the lower the amount of UV.

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. Sunglasses show approximately how well a pair of sunglasses protects 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.

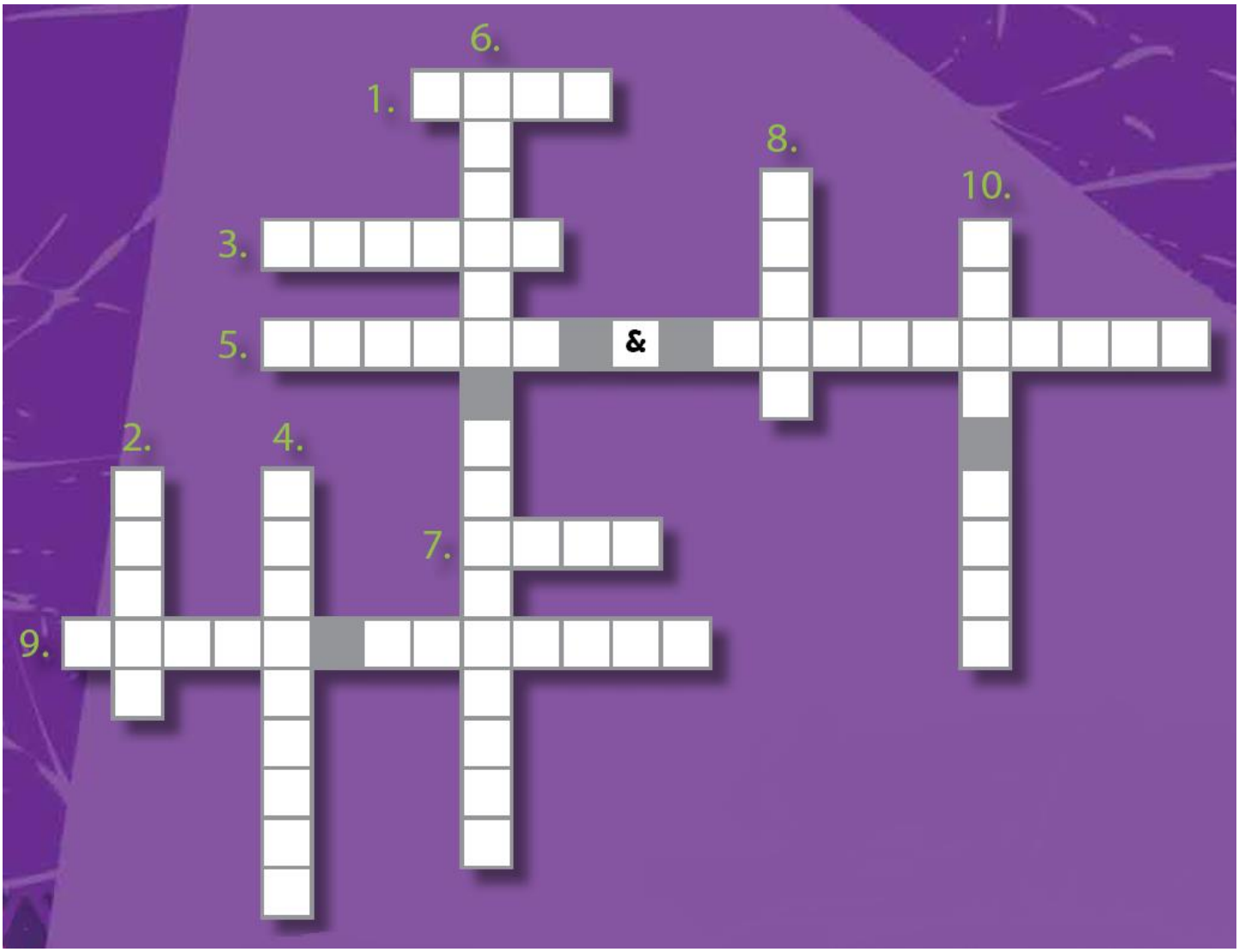
Pesticides – What's Bugging You?

Health Canada

Pesticides are substances used to prevent, destroy or repel pests. However sometimes pesticides can be very harmful to people and pets, especially if they are not used correctly. It's important to store pesticides properly and follow the instructions carefully.

Crossword

Fill in the answers to the questions across and down.



Across

1. If pesticides are not used properly you could get what?

3. Cabinets should be this when pesticides are stored in them?

5. What foods need to be washed to remove all traces of pesticides?

7. Pesticides can be harmful to people and these.

9. If you wear this you may not need as much bug spray.

Down

2. Common name for a chemical that is harmful to your health.

4. Term used to describe chemicals that kill insects.

6. When you put this on, keep it away from your eyes and mouth.

8. When you come inside make sure you take off or wipe these.

10. What should you do if an area has been recently sprayed with pesticides?

Tsunami Quiz

Natural Resources Canada

Complete each question.

1. A tsunami is always triggered by an earthquake.
   a. True
   b. False

2. Where did Canada's worst tsunami disaster occur?
   a. East Coast
   b. West Coast

3. The word tsunami is Japanese for:
   a. Giant tidal wave
   b. Harbour wave
   c. Small wave
   d. Ocean current

4. A tsunami is always triggered by a natural disturbance.
   a. True
   b. False

5. The 1929 Grand Banks of Newfoundland tsunami was generated by:
   a. An earthquake
   b. Volcano
   c. Landslide
   d. A meteor impact

6. Historically, the most common trigger of tsunamis in Canada has been landslides.
   a. True
   b. False

7. A tsunami is related to tides. That is why it is called a giant tidal wave.
   a. True
   b. False

8. An earthquake in the ocean will automatically trigger a tsunami.
   a. True
   b. False

9. We can find geological evidence of past tsunamis in Canada.
    a. True
    b. False

10. The worst Canadian tsunami disaster occurred off the coast of Newfoundland.
    a. True
    b. False

11. Which part of Canada can be most affected by a tsunami?
    a. Rivers
    b. Streams
    c. Lakes
    d. Coasts

12. A tsunami can be prevented.
    a. True
    b. False

13. It is possible to predict how far inland a tsunami wave will reach.
    a. True
    b. False

14. There are many signs that a tsunami will hit an area when it is approaching a coast.
    a. True
    b. False

15. Tsunamis are triggered by what?
    a. Earthquakes
    b. Volcanic eruptions
    c. Undersea landslides
    d. All of the above

16. Tsunami waves usually reach heights of up to _____ metres.
    a. 5
    b. 15
    c. 30
    d. 60

17. Ships far out at sea can detect tsunamis easily and radio ahead with warnings.
    a. True
    b. False

18. Tsunamis travel radially outward from its epicentre.
    a. True
    b. False

19. Quickly advancing front waves of incoming tides, found in shallow estuaries, are called:
    a. Tidal waves
    b. Tidal bores
    c. Sea surges
    d. Seiches

20. The sea tide draining away from shore is a sign of an approaching tsunami.
    a. True
    b. False

Mapping Canada's Climate

Environment Canada

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
- 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.

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.

- 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.

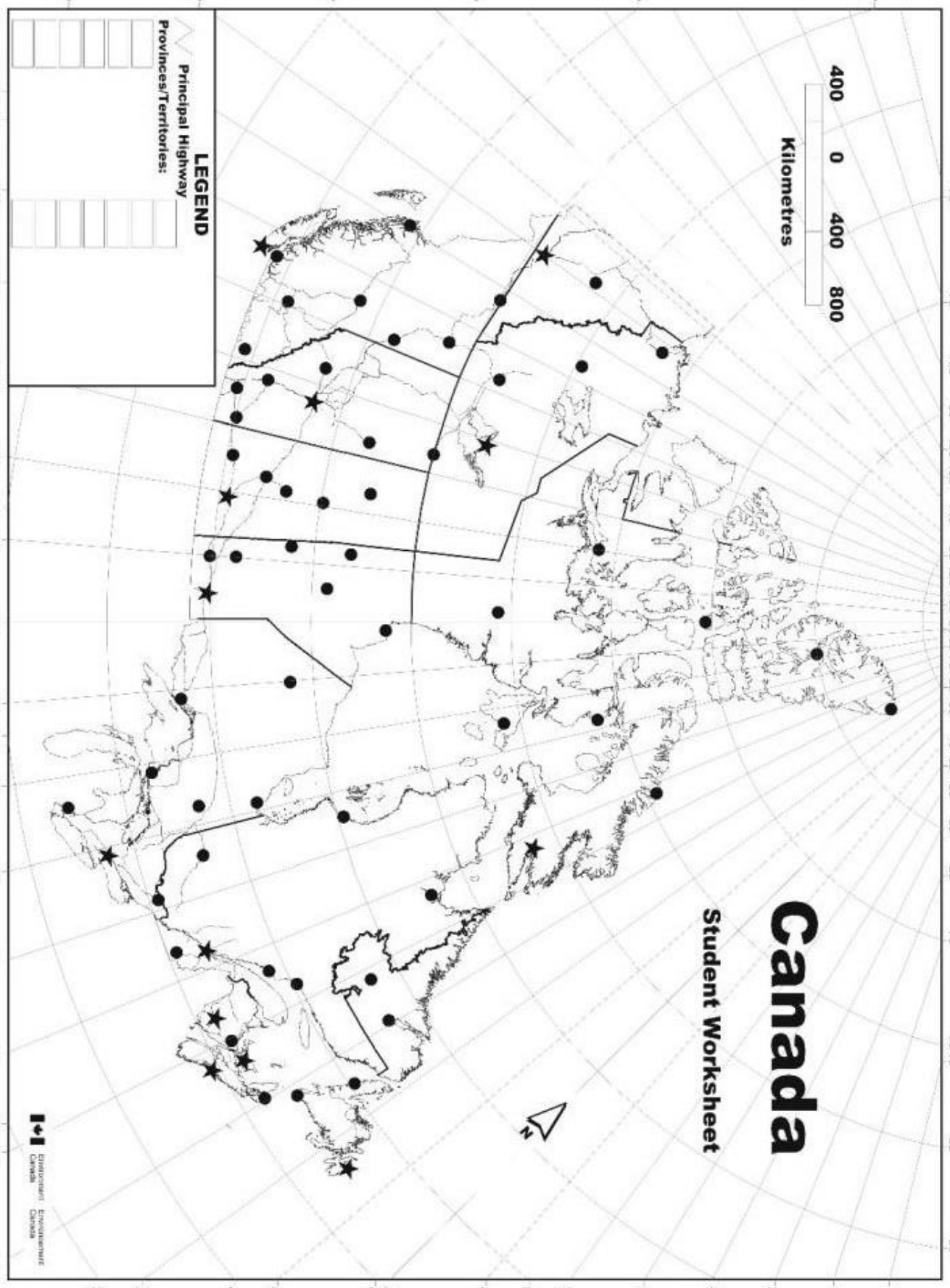
Tips: It will be easiest to begin with the 100 cm isohyet in the north and then work southward.

Climactic Information by Province and Territory

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
British Columbia	Cranbrook	26	148

Climactic Information by Province and Territory			
Province/Territory	**Community**	**Average High Temperature July (°C)**	**Average Annual Snowfall (cm)**
	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
	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

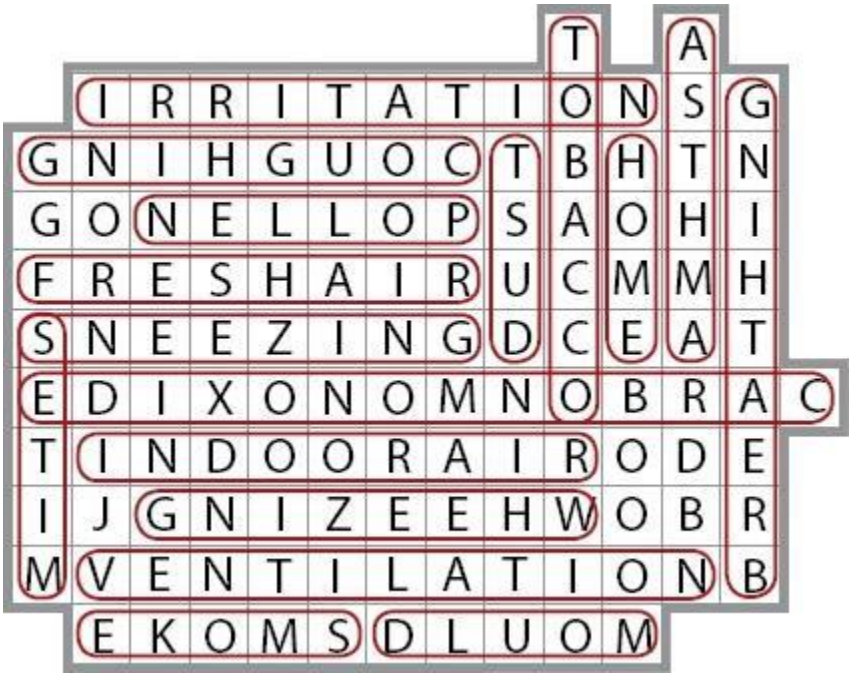
Climactic Information by Province and Territory			
Province/Territory	**Community**	**Average High Temperature July (°C)**	**Average Annual Snowfall (cm)**
	Thunder Bay	24	196
	Timmins	24	352
	Moosonee	22	225
	Sault Ste Marie	24	316
	Windsor	28	123
	Toronto	27	124
	Ottawa	26	222
Quebec	Kuujjuaq	17	271
	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


Canada
Student Worksheet
Kilometres
400 0 400 800
LEGEND
Principal Highway
Provinces/Territories:
Environment Canada
Environnement Canada

Answer Key

Elementary Activities

Indoor Air Word Search



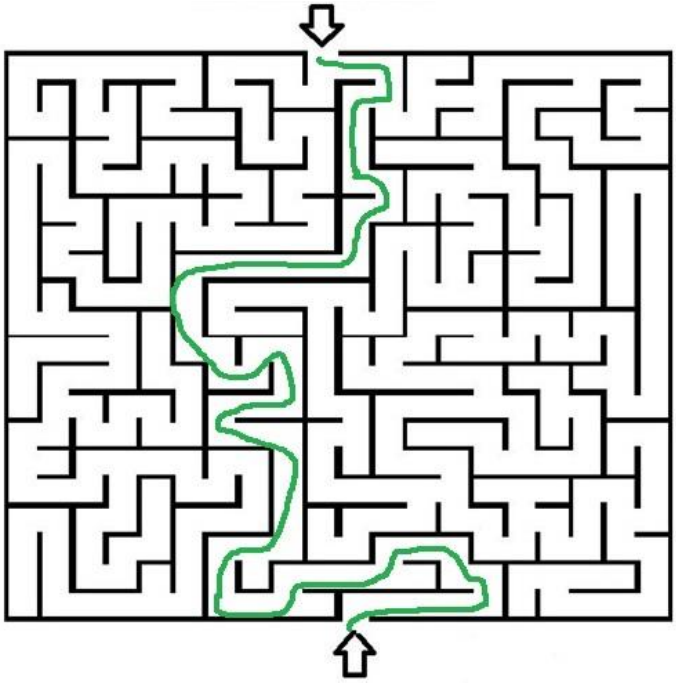
Fact or fiction: Air Quality Health Index

1. Fact
2. Fiction
3. Fact
4. Fact
5. Fact
6. Fact
7. Fiction
8. Fiction
9. Fiction
10. Fact
11. Fiction
12. Fact
13. Fact
14. Fiction
15. Fact
16. Fact
17. Fiction
18. Fact
19. Fact

Connect the Dots and Label the Laboratory Equipment

A. Petri dish
B. Test tube
C. Beaker
D. Erlenmeyer flask
E. Goggles
F. Microscope
G. Rubber gloves

Maze



Don't Move Firewood!

1. Asia
2. Ash
3. Bark/Beetle
4. Firewood
5. Environment

Intermediate Activities

Indoor Air Word Search

Secret: Breathe Easy

Biodiversity Quiz

Part 1 - Discover our treasures

1. Taxonomy is…
    - A. The science of classifying organisms. Agriculture and Agri-Food Canada scientists are world-class experts on identifying plants, insects, mites, nematodes, fungi, bacteria and plant viruses.

2. The Canadian National Collection of Insects, Arachnids and Nematodes in Ottawa, Ontario contains how many specimens?
    - C. 16 million. Although there are larger insect collections, ours is considered one of the best collections in the world in terms of size, different species and expertise of our staff. Our entomologists share information with scientists around the world.

3. The oldest insects in Agriculture and Agri-Food Canada's insect collection are:
    - D. 75 million years old. In addition to some extinct species, we also have a large collection of fossil insects that were preserved in tree amber. These fossils are mostly prehistoric flies, beetles and bees.

4. Agriculture and Agri-Food Canada has a large mycology collection and our mycologists study fungi. Which of the following are fungi:
    - D. All of the above….and much more including mildew, puffballs, morels and truffles. The grocery store offers a variety of edible mushrooms to eat. Yeast is needed to make bread, wine and beer. Good moulds are used to make delicious blue cheeses.

5. While there are about a million different kinds of fungi, what percentage has been identified by scientists?
    - A. 10%. As with insects, scientists around the world have just scratched the surface when it comes to naming all the microscopic organisms on our planet. There's still lots of work to do for budding scientists.

Part 2 - Enter our vaults

1. In Canada's genebanks, genetic plant material is stored as:
    - D. all of the above. Tissue culture means we can grow a whole plant from a small piece of plant material. This is done in a lab in a controlled, disease-free environment.

2. Who can use a genebank?
    - B. Anyone in the world with a valid use. Scientists from all over the world ask to borrow and trade packets of seeds and plants. The biggest users are plant breeders and researchers, but medical researchers and educators are also welcome.

3. What type of scientist would work at a genebank?

- D. All of the above. While lots of scientists work at these research centres, the technicians, managers, office workers and students make significant contributions as well.

4. The lifespan of a seed varies from a few years to centuries. To maintain optimum preservation, the genebank keeps a storage facility in Saskatchewan at what temperature.
    - C. - 20° Celsius. For long-term storage, seeds are preserved in special envelopes at -20°C in a large walk-in vault. Seeds are evaluated for viability and dried to optimum moisture content.

5. Some countries are often responsible for a specific plant variety. Canada is responsible for the world collection of:
    - A. Barley and oat. Barley and oats are extremely valuable crops both in Canada and around the world. Consumers around the world make oats into nutritious granola bars and use barley to make tasty beer.

Part 3 - Farmers and biodiversity

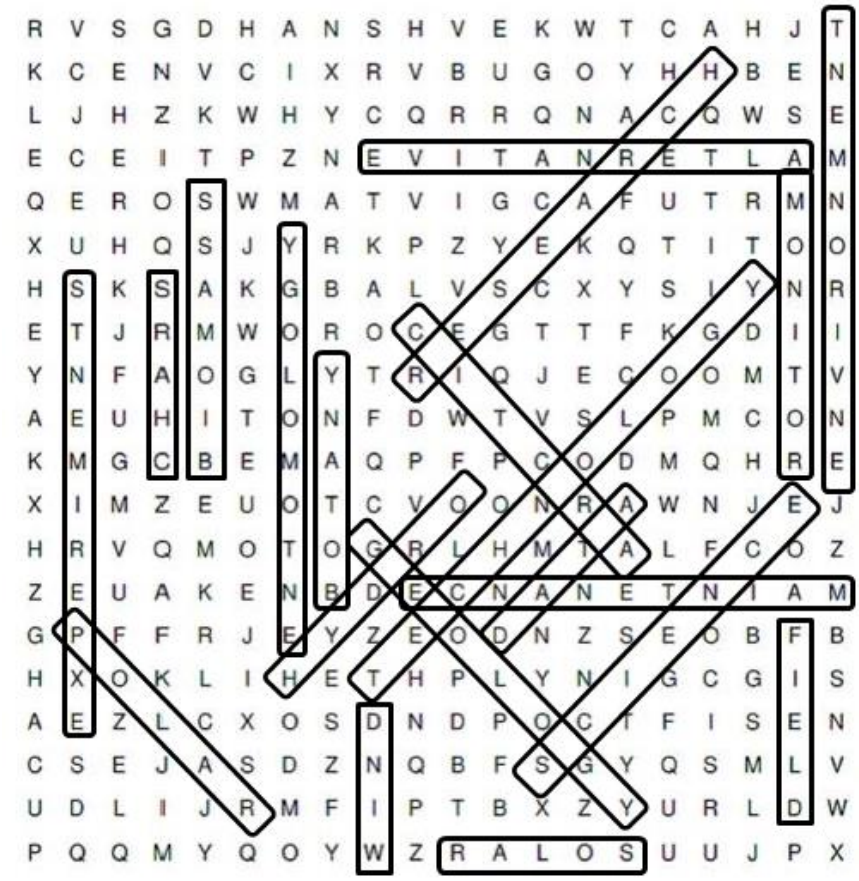
1. Crops that are native to Canada are:
    - A. Strawberry, blueberry and cranberry. Our Aboriginal Peoples found these sweet treats and they are still popular today as a healthy food source.

2. Which crop is grown in every province and territory in Canada?
    - D. All of the above. The Government of Canada has invested into crop research for farmers over the last 125 years. Our scientists need to develop crops that sprout, grow, mature and produce a bountiful crop in about 100 days.

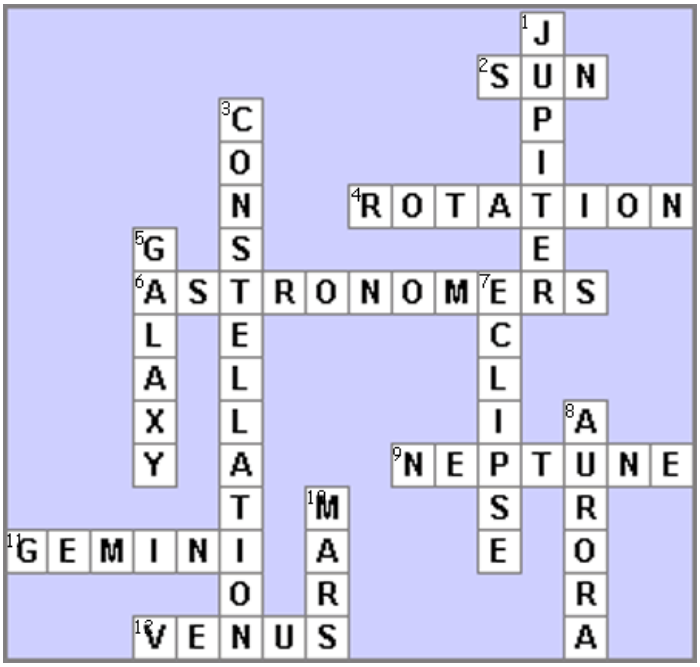
3. How many years does it usually take to develop a new tree fruit variety such as apple, pear or peach?
    - C. 25 years. New orchards are developed so they can resist pests, diseases and environmental stresses such as drought. Many trees are bred to be short so that fruit pickers don't hurt themselves climbing on high ladders.

4. Since 1901 our Shelterbelt Centre in Saskatchewan has distributed how many trees to Canadian farmers on the prairies?
    - D. 600 million trees. Trees are an excellent resource for farmers. Shelterbelts protect the land from wind and soil erosion. Trees also provide shade for livestock in the summer as well as create a habitat for birds and smaller critters.

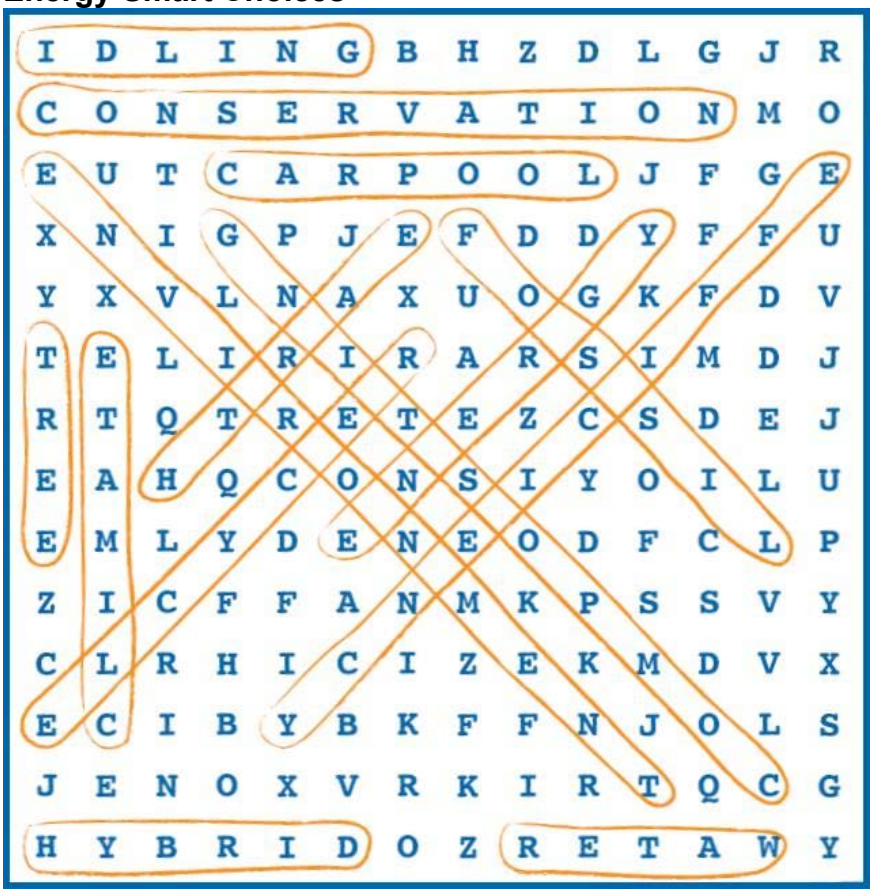
Word Search



Canadian Skies Crossword Puzzle



Energy-Smart Choices



Secondary Activities

Atomic Energy Math

a – 35, b – 109, c- 105, d – 63, e – 12, f – 55, g – 100, h – 48. Possible answers for i – Be + Mg + Si, j – B + P + Ca, k – Mn + Ne + P

Pesticides – What's Bugging You?

Across
1. SICK
3. LOCKED
5. FRU ITS & VEGETABLES
7. PETS
9. LIGHT COLOURS

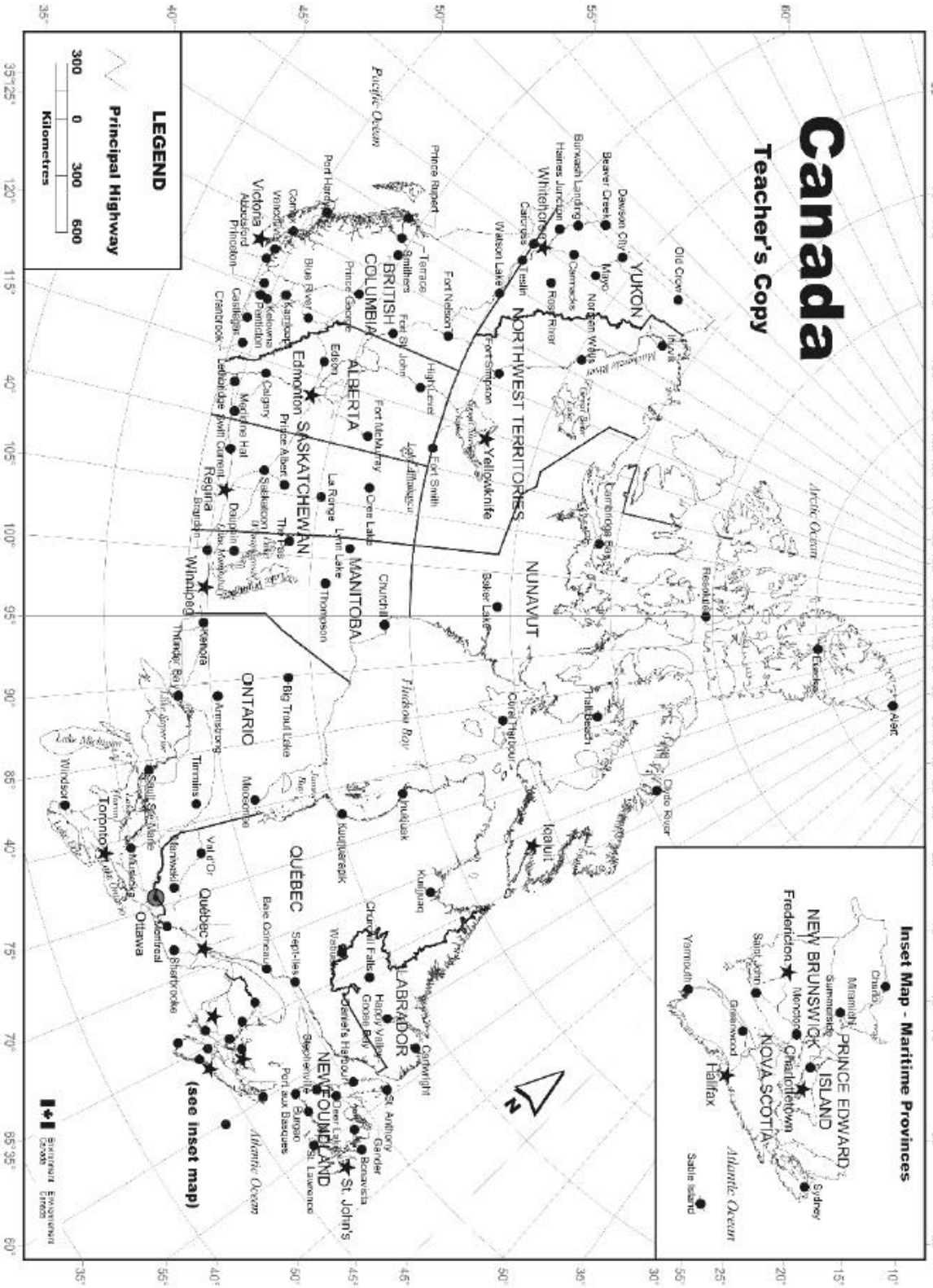
Down
2. TOXIC
4. PESTICIDE

6. INSECT REPELLENT
8. SHOES
10. STAY AWAY

Tsunami Quiz

1. b) False - A tsunami can be triggered by a landslide, earthquake, submarine landslide, meteorite impact, man-man explosion or even a structure failure such as a dam.
2. a) East Coast
3. b) Harbour Wave
4. b) False - Sometimes a tsunami can be triggered by a man-made explosion or a structure failure such as a dam collapse.
5. c) Landslide
6. a) True
7. b) False - A tsunami is not related to tides. Tides are caused by the gravitational pull from the moon.
8. b) False - The earthquake has to be strong enough to create a vertical movement in the water column.
9. a) True
10. a) True
11. d) Coasts
12. b) False - It is impossible to prevent an earthquake, meteorite impact or submarine landslide from causing a tsunami to form. However, we can mitigate or prevent the damage caused by tsunamis by relocating cities and building structures away from the coast.
13. a) True
14. b) False – The wave is not easily detected at sea. At the coast, a rapid and unexpected recession of water levels below the expected low tide can occur minutes before the shoreline is struck by a tsunami, and can be the only warning sign along coastlines that are located too far from the earthquake epicentre to have felt the shaking.
15. d) All of the Above
16. c) 30
17. b) False - The waves generated close to the epicentre are relatively small as the motion is absorbed through the entire depth of the water column and are not easily detected. In deep water the wavelength is great and amplitude is subdued.
18. a) True
19. b) Tidal Bores
20. a) True

Mapping Canada's Climate



Sample Snowfall isohyets