

Guide to Cub Scout Personal Achievement Badges

*"Do not discount what you can
learn from touch and from
careful observation."*

DGM

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Cub Scout Earth

Objective: Anything connecting with our planet's soil and geology including exploration, environment, leisure pursuits, or experiments.

Here are three ideas to help you start creating your own adventures:

- Have you ever seen an animal track in the soil? What tracks of different wild animals might you see in your area? Go on a hike with your family in an area where you may see these animal tracks. Make plaster casts and show your Pack. Identify what animal made the track you found. (page 6)
- Go on a local, urban hike and look for signs of pollution on the ground. What are the effects of this pollution on wildlife? Organize a service project for your Pack to help clean up a conservation area, local wetland, creek, or waterfront. (page 11)
- What is Leave-No-Trace camping? On your next Cub adventure, help your Pack learn about and practice Leave-No-Trace. How successful were you at leaving absolutely no trace? (page 15)

Cub Scout Air

Objective: I will explore the environment, nature, research and/or leisure pursuits as they relate to the air.

Here are three ideas to help you start creating your own adventures:

- Try making a tornado in a bottle. What do you need? What do you learn about real tornadoes? Demonstrate for your family or Pack and share your results. (page 20)
- How do hot air balloons work? Why does hot air rise? Perform an experiment that you can safely do to show how hot air makes something rise. Demonstrate for your family or Pack and share your results. (page 24)
- How are clouds classified? How many different types of clouds are there? Investigate for your family or Pack and share your results. (page 27)

Cub Scout Water

Objective: Anything connecting with water including exploration, environment, leisure pursuits, or experiments.

Here are five ideas to help you start creating your own adventures:

- Go on hikes with your family to three different natural habitats. What are the water sources for each of these habitats? How does water affect the animal life in each of these habitats? Learn the characteristics and properties of water and present them to your Pack. (page 32)
- Salt water? Fresh water? What can live in each? Have you heard of the Dead Sea? What happens when you float in the Dead Sea? Perform an experiment that compares the relative abundance of freshwater and saltwater on the Earth. (page 37)
- Investigate the impacts of oil pollution on aquatic ecosystems. Perform an experiment that demonstrates how an oil spill poses a serious threat to fresh water and marine environments. What are the consequences of oil spills for species of aquatic wildlife? (page 40)
- Create a tasty, healthy staghorn sumac lemonade for a hot summer day. Will you add some honey or sugar? What would be the most refreshing taste? (page 47)
- Ever go fishing for panfish in Ontario? Discover four (4) different methods to catch panfish and learn how to identify four (4) common species of panfish found in Ontario along with the bait required to catch them. (page 50)

Cub Scout Home

Objective: I will explore what it means to be a helpful contributing member of my home.

Here is one idea to help you start creating your own adventure:

- Make two different birdfeeders for your backyard for the winter. Watch for the birds to come and eat. Identify what birds are visiting your feeder and make a yearly list. Compare your list to other Cubs in your Pack. (page 64)

Cub Scout Science

Objective: Learning and experimenting critically and empirically.

Here are four ideas to help you start creating your own adventures:

- Conduct an experiment to learn about how clouds form. Report your conclusions to your Pack. (page 71)
- Conduct an experiment to learn about the water-holding capacity of two different soils by measuring their percolation rates. Report your conclusions to your Pack. (page 75)
- Conduct an experiment to create an electrical circuit to see how it works. Report your conclusions to your Pack. (page 80)
- Become a rockhound! Find out what kinds of rocks there are in your area. Learn the three different types of rocks and where you would find them. Gather samples and learn to identify what each type of rock is. Present your rocks to your Pack. (page 85)

Cub Scout Canada

Objective: I will explore what it means to be a helpful, contributing citizen of Canada.

Here is one idea to help you start creating your own adventure:

- Certain plants and animals are the provincial or territorial symbols of Canada. Learn the official bird and flower of each of Canada's ten provinces and three territories. Identify the capital city of each of Canada's provinces and territories. Plan to go on a hike with your Pack to locate Ontario's provincial flower. (page 91)

Cub Scout Space

Objective: Anything connecting with outer space including exploration, leisure pursuits, or experiments.

Here are three ideas to help you start creating your own adventures:

- Set yourself a goal of learning to identify a number of things in the night sky, including planets, certain stars, and constellations. Report all your findings to your Pack. When looking at the stars, make up your own constellation and a story behind it. (page 97)
- Watch the Moon every night for a month. Record what you see with drawings. Report all your findings to your Pack. (page 105)
- Teach a younger sibling or a Beaver Scout how to find the Big Dipper in the night sky. (page 109)

©Cub Scout Earth - Adventure 1

Name: _____

Find a trail or path that you can walk with easy access that leads into a good, representative habitat for wildlife. Typically, a shady forest or a marsh/pond provide the best opportunities for seeing tracks and provides the right conditions for making tracks. If you need help with tracks, the best book to use as a resource is a Peterson Field Guide book called "A Field Guide to Animal Tracks" by Olaus J. Murie. Typically, some animal tracks that you will locate include: rabbits, squirrels, deer, raccoons, skunks, and turkeys.

How to Make a Plaster Cast of an Animal Track

What You Need: box of plaster of Paris (found at hardware/craft stores)
2-L bottle of water
plastic bowl/container for mixing the plaster
wooden spoon for mixing the plaster
Cool Whip/margarine container
back pack
measuring cup

IMPORTANT POINT: The ratio for mixing plaster of Paris and water is 2:1.
So, mix 2 cups of dry plaster to 1 cup of water.

Before you head out:

- The first thing to get ready is a mold. Take the top of a Cool Whip/margarine container and cut off about 5.0 cm from the top of the Cool Whip container, cutting all the way around. You do not need to keep the bottom of the plastic container or the lid.
- Fill a 2-L bottle with water. You may need to carry an extra water bottle if there isn't a water source nearby.
- DO NOT pre-mix the plaster of Paris. You mix it when you find a track.

Once you are out in the field:

Look for tracks on wet ground and soft mud. The best place to look is where animals go to drink water. The bank of a creek, stream, river, pond, or lake is a great place to start. Sandbars are good places too. The edges of mud puddles should not be overlooked.

Once you have found a good clean track that you want to keep, gently clear away any debris around the track. Remove any leaves, small stones or twigs without disturbing the track. Plaster sets up quite quickly, so do not stir it up until you have located the tracks and set down the mold.

What You Do:

1. Locate a track that you want to make a cast of. The plastic mold you cut can be set down on the ground with the lip (top edge) of the container set slightly and carefully into the dirt around the track. This will be the form for the plaster of Paris. It makes a nice round shape and is a good size for most tracks. Set the mold over the track of your choice. Centre the animal track in the middle of the mold.
2. Now, mix the plaster of Paris and water in a plastic bowl/container. Measure and mix 2 parts of plaster with one part water. Make a soft mixture. Add and mix the water and plaster of Paris until you have a decent amount of smooth, but not too runny, plaster that's kind of like pancake batter.

Tip: You do not want air bubbles in the plaster of Paris so do not whip it up. Just gently stir it to keep the air bubbles out.

3. Now, gently spoon the plaster mixture into the mold and over the track. You will put in enough spoonfuls so that the plaster of Paris fills the mold to the top. You can smooth out the top if you want with the flat surface of the back of the wooden spoon. Once mixed, work quickly. This plaster thing you have just made is called a cast. It needs to harden for at least 30 minutes. An hour is better. Even after an hour, the cast will still be soft and will easily break if handled roughly. This is a good time to look for more tracks.

4. You can let it sit overnight if it's in a place where it will be protected. When the time is up, it is time to remove the cast. Start removing the mud/dirt about 10 cm outside of the cast. Next dig away the mud below the cast. Carefully lift up the cast. If there is any resistance, stop. Dig out some more mud. Do not try to pry the cast out with a spoon or a stick. It will crack. Lift it out gently with your hands.

Wrap the cast in newspaper to protect it on the trip home. It is still very fragile. It will be for about two more days. When plaster is drying it feels warm to the touch. The cast will be ready to clean after it feels cool to the touch.

5. Once the casts are dry and hardened, give them a gentle scrub to remove any remaining dirt and debris. You can use an old toothbrush to help clean off any remaining mud.

Some pointers about using plaster of Paris:

- Once you mix it, you have about 6-10 minutes to work with it, so do not mix until you're ready to pour!
- Clay soil does not work well for making molds of tracks. Clay soils have a lot of water and give more resistance, potentially breaking the cast. Loose sandy soil is the best.

Present your casts to you Pack. Have them guess what animal made the track.

Animal Tracks Reference Guide

See if you can match your animal track casts to one of these common animals:



dog 6.0-10.0 cm



coyote 6.0 cm



red fox 5.0 cm



domestic cat 3.0-4.0 cm



opossum 3.0-4.0 cm



raccoon 6.0-10.0 cm



gray squirrel 3.0-4.0 cm



white-footed mouse <1.0 cm



striped skunk 5.0 cm



muskrat 3.0-6.0 cm



porcupine 7.0-8.0 cm



eastern cottontail
2.5 cm-8.5 cm



white-tailed deer 6.0-7.5 cm



American red squirrel 2.0-2.5 cm



weasel 2.5 cm



Wild Turkey 10.0 cm



Great Blue Heron 12.0 cm



Ruffed Grouse 5.0 cm

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Maintaining a Healthy Environment

Name: _____

The amount of litter that ends up spoiling the beauty of the natural environment is not surprising considering the amount of waste humans produce. Glass bottles, plastic packaging, tin cans, newspaper, cardboard, and other types of garbage litter urban and rural landscapes everywhere. Sometimes the wind blows trash from overloaded garbage cans and litters the environment. Naturally, litter can last for a long time depending on the disintegration of the garbage. For example, aluminum cans do not disintegrate, and some plastics take decades to break down.

Litter can be very harmful to wildlife. Discarded fishing lines can trap the legs, wings, or neck of waterfowl or shorebirds. A fishhook may get stuck in a bird's throat. Water birds suffer lead poisoning when they accidentally swallow small lead fishing weights. Broken glass can cut the feet of foxes, coyotes and unbroken bottles present a hazard to various small animals. Lizards often crawl inside bottles or cans to bask warm interior, to seek protection or search for food; but they may find it difficult to squeeze out again and can die of overheating. Small mammals in search of food often get their heads caught in the openings of jars. Replacing lids on bottles and jars before discarding can help prevent animals from becoming entrapped. Birds, fish, and mammals may be ensnared by plastic six-pack holders. This can be prevented this by cutting up the plastic rings so that they do not become traps.

1. Why it is important for all living things to have a healthy environment?

2. What happens to plants and animals when part of their environment is not healthy?

3. What can we do at home to help keep our environment healthy?

Present your answers to your Pack. Talk to your leader about organizing a clean-up of a local wetland, conservation area, creek, or waterfront. Make sure you get permission from all landowners.

Answers:

1. Why it is important for all living things to have a healthy environment?

A healthy environment is vital because it provides the essential resources for survival, clean air, water, food, and shelter, while supporting biodiversity, regulating climate, and preventing disease. Because all living things are intimately connected to nature, environmental degradation such as pollution, climate change, and loss of biodiversity threatens the health and existence of all.

2. What happens to plants and animals when part of their environment is not healthy?

- *Nature relies on complex relationships, such as pollinators (bees, birds) that are necessary for food production. Even if only one organism is affected, there is a disruption in the natural flow of the complex food chains and food webs that are balanced by nature.*
- *Forests and wetlands regulate climate, clean air, and manage water cycles, which are foundational for life.*
- *When the environment that plants and animals live in is not healthy, the four necessities for survival are threatened; food, water, shelter, and space.*

3. What can we do at home to help keep our environment healthy?

Keeping the environment healthy at home involves adopting habits that reduce waste, conserve energy and water, and minimize pollution. Small, daily changes add up to a significant positive impact. Here are practical things you can do at home, categorized by action:

1. **Reduce Waste** (The 3 R's & More)

- *Refuse and Reduce: Say no to single-use plastics, freebies, and unnecessary gadgets. Buy items with minimal packaging.*

- Reuse and Repair: Fix broken items, borrow tools instead of buying new ones, and repurpose old clothes into rags.
- Recycle Properly: Learn proper guidelines for recycling.
- Compost: Turn food scraps and yard waste into nutrient-rich soil instead of sending them to landfills.

2. Conserve Energy

- Lighting & Electronics: Switch to LED light bulbs, turn off lights when leaving a room, and unplug electronics not in use to stop "vampire power" draw.
- Appliances & HVAC: Use energy-efficient (Energy Star) appliances, wash laundry in cold water, and air-dry clothes on a rack instead of using a dryer.
- Temperature Control: Seal cracks around doors and windows to prevent air leaks, and use a programmable thermostat.

3. Save Water

- Fix Leaks: Repair dripping faucets and toilets immediately.
- Efficient Usage: Take shorter showers, turn off the tap while brushing teeth, and only run full loads in the dishwasher or washing machine.
- Collect Rainwater: Use rain barrels to water plants.

4. Eco-Friendly Lifestyle Choices

- Clean Green: Use non-toxic, natural cleaning products or make your own using ingredients like vinegar and baking soda to keep chemicals out of waterways.
- Eat Sustainably: Reduce food waste by planning meals, eat more plant-based meals, and buy local produce.
- Green the Garden: Plant native species, trees, or pollinator-friendly plants, and avoid chemical pesticides.

By implementing these, you not only protect the planet but often save money and improve indoor air quality.

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Name: _____

Leave-No-Trace Camping

Scouts Canada's Leave-No-Trace (LNT) camping is an ethical framework designed to minimize human impact on natural areas. Scouters and youth in all sections practice minimum impact outdoor skills so that the natural world remains as pristine as possible for future generations. Leave-No-Trace camping is built upon seven core principles.

1. What are the seven core principles of leave-no-trace camping?

- _____
- _____
- _____
- _____
- _____
- _____
- _____

2. What famous person said "Leave nothing but your thanks." with regards to camping?

3. Your Pack decides to go on a canoe trip on the French River and the leader puts you in charge of planning the trip. Name three (3) things that you would do to plan ahead for the trip.

- _____
- _____
- _____

4. What does the saying "pack it in, pack it out" mean?

5. Why is it best to carry water to your campsite and be at least 60 m (200 feet) away from a stream or lake when washing dishes?

6. What does the saying "the best campsites are found, not made" mean?

7. When camping, always bring a stove instead of planning to cook on a fire. Name two (2) negative impacts that a campfire can have.

- _____
- _____

8. It is possible to following all the rules of leave-no-trace and actually "leave-no-trace"?

Answers:

1. The seven principles of leave no trace are:

- *plan ahead and prepare;*
- *travel and camp on durables surfaces;*
- *dispose of waste properly;*
- *leave what you find;*
- *minimize campfire impacts;*
- *respect wildlife;*
- *be considerate of other visitors.*

2. Who said “Leave nothing but your thanks.” with regards to camping?

Robert Baden-Powell

3. Your Pack decides to go on a canoe trip on the French River and the leader puts you in charge of planning the trip. Name three (3) things that you would do to plan ahead for the trip.

- *plan the route; locations for camp sites, rapids, time restrictions;*
- *make sure you are the one with the map;*
- *plan a menu: how many people;*
- *repackage food to create less waste;*
- *location for nearest hospital;*
- *check weather reports;*
- *check for fire burn restrictions;*
- *check local regulations about camping.*

4. What does the saying “pack it in, pack it out” mean?

Repackage food/supplies to create less waste on the trail when you go and then pack out all trash, leftover food, and litter when you leave.

5. Why is it best to carry water to your campsite and be at least 70 m (200 feet) away from a stream or lake when washing dishes?

Try to camp at least 70 m/200 ft. from water sources. Certain ingredients (phosphates and nitrates) in soaps/detergents are not biodegradable, leading to long-term accumulation in ecosystems potentially killing plants and fish. Also, animals need to access water to drink and your presence may scare them off or cause conflict.

6. What does the saying “the best campsites are found, not made” mean?

It is best to camp in designated campsites or ones that have been used before to minimize impact. Avoid building structures, cutting trees or digging trenches. If there are no designated or previously used campsites, camp on gravel, bare dirt, snow or dry grass to minimize your impact.

7. When camping, always bring a stove instead of planning to cook on a fire. Name two (2) negative impacts that campfires can have.

Campfires:

- *damage the soil;*
- *can lead to excessive firewood harvesting;*
- *could cause a forest fire.*

8. It is possible to following all the rules of leave-no-trace and actually “leave-no-trace”?

It is impossible not to leave tiny traces wherever we go. However, it is important to consider progress, not perfection. The principles of leave no trace simply guide us to leave as little impact as we can. The idea behind the principles is to leave nature as unchanged by our presence as possible, so that future generations can enjoy it too. In essence, the purpose of leave no trace is to keep the wilderness wild.

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Name: _____

A tornado is a violently spinning column of air hanging below a thundercloud. The funnel-shaped columns of tornadoes contain winds that may be whirling up to 500 km/h. The average funnel cloud varies from 30 to 60 m in diameter, and travels at speeds of 30 to 50 km/h. The majority of tornadoes occur in North America, especially in Oklahoma, Kansas, and Missouri. In these regions, cold, arctic air reaches south, meeting dry desert air from the west, and moist tropical air from the Gulf of Mexico. The interaction of these three different air masses is ideal for creating a tornado.

Tornado in a Bottle Activity

This method creates a strong, repeatable vortex and is great for demonstrating how a tornado's funnel works.

What You Need:

- two identical clear plastic bottles (1 or 2-liter bottles work best);
- water;
- a "tornado connector tube" (available online or at teacher supply stores), or a metal washer and strong, waterproof tape like duct tape;
- food coloring (optional, makes the tornado easier to see);
- glitter or small plastic items like Lego blocks (optional, simulates debris).

* A "tornado connector tube" can be found at:

<https://www.amazon.ca/s?k=Tornado+Tube++Assorted+Colors+%282Pack%29&linkCode=gs3&linkId=8eaa0b258d8b8fc7b68c98a69548c523&tag=arrayofsunli0f-20>

What You Do:

1. Prepare the bottles: Fill one bottle about two-thirds to three-quarters full of water.
2. Add enhancements: Add a few drops of food coloring and a pinch of glitter (or other small items) to the water.
3. Connect the bottles:
 1. With a connector: Screw the tornado connector onto the top of the water-filled bottle, then screw the empty bottle onto the other side of the connector.
 2. With tape/washer: Place the washer on top of the opening of the water-filled bottle. Place the second (empty) bottle upside down on top of the washer, aligning the openings. Use a generous amount of duct tape to secure the two bottles together, ensuring an airtight and watertight seal.
4. Create the tornado: Flip the connected bottles so the water-filled bottle is on top. Hold the bottles in the middle and quickly move the top bottle in a circular motion for about 10-15 seconds.
5. Observe: Stop spinning the bottles and watch as the water forms a funnel-shaped vortex and drains into the bottom bottle. The glitter will swirl around the center of the vortex like debris.

Conclusions:

1. Why do more tornadoes occur in the United States than in Canada?

2. What is a vortex?

3. Explain what happened in the bottle after you stopped spinning the bottle.

Answers:

1. Why do tornadoes only occur in the United States and not Canada?

Central North America witnesses more tornadoes than anywhere else on Earth. Each year, 10 times as many twisters barrel through the United States compared with Canada, which is second on the list. The U.S. has more tornadoes than any other country because it has an enormous flat inner core that warms easily to force moisture-laden air upward quickly. However, in Canada, tornadoes occur most frequently in two areas - from southern Alberta across southern Saskatchewan and southern Manitoba to northwestern Ontario, and from southern Ontario across southern Quebec to New Brunswick.

2. What is a vortex?

A vortex is a region in a fluid (liquid or gas) where the flow revolves around an axis line, creating a whirling or spiral motion. Characterized by high velocity rotation near the centre and decreasing pressure, vortices are common in nature, appearing as tornadoes, whirlpools, smoke rings, and hurricanes.

3. Explain what happened in the bottles after you stopped spinning the bottle.

The tornado effect is caused by centripetal force. When you spin the bottle, the water is forced toward the outside walls, creating a low-pressure area in the center. The surrounding water is pulled inward and downward into this low-pressure area by gravity, forming a funnel or vortex, much like a real-life tornado is formed by swirling air currents during a thunderstorm.

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Make a Hot-Air Balloon

Name: _____

Have you ever seen a hot-air balloon soaring over a field? Now you can make and fly your own hot-air balloon. This will give you a chance to observe some properties of air.

Purpose: To "simulate" the making and flying of a hot air balloon.

What You Need: 1 lightweight small kitchen garbage bag thread
stopwatch extension cord
scissors tape
hairdryer (with variable speeds)

What You Do:

1. Gather all materials. You may need help from your mother, father, brother, sister. Make sure to check your bag for rips or tears. This is your balloon.
2. Tape 4 pieces of thread (each about 10 cm long) to the opening of the balloon. These are called tether lines and are used to hold onto the balloon.
3. To launch your balloon. Have one person hold the balloon over the hair dryer while other people hold the four tether lines, keeping the mouth of the balloon open. Turn on the hair dryer to the highest, hottest setting and fill the balloon with hot air.
4. As the balloon inflates with hot air, the person holding the bag over the dryer can let go, leaving all of the tension on the tether lines. Turn the hair dryer off and place it on the floor.
5. When the balloon is fully inflated, release the tether lines at the same time. Use the stopwatch. Time how long your balloon stays in the air.
6. Record your flight time.

Conclusions:

1. How long did your "balloon" stay in the air? _____

2. How can you make your "balloon" fly higher?

3. How can you increase the amount of time your "balloon" stays in the air?

4. Do weather conditions affect an air balloon's flight? How?

5. Why do you think the "balloon" flies?

Answers

2. How can you make your balloon fly higher?

To make your hot air balloon fly higher, you can increase the temperature of the air inside the bag (use a higher setting), which makes the air less dense and boosts buoyancy. Reducing total weight and finding making artificial air currents in the room can also help the balloon ascend further.

3. How can you increase the amount of time your balloon stays in the air?

To increase the amount of time your balloon stays in the air, you must focus on maximizing lift. Because the balloon relies on the hot air to remain buoyant, the duration is ultimately determined by the temperature of the air.

Also, try this experiment outside. Cold air provides better lift because the temperature difference between the inside and outside of the balloon is greater.

4. Do weather conditions affect a hot air balloon's flight? How?

Yes, weather conditions entirely dictate hot air balloon flights, with wind speed/direction, precipitation, visibility, and temperature being critical factors. Ideal flights require calm winds (under 10 mph), clear skies, and stable air, as strong winds, storms, rain, or low clouds cause cancellations due to safety, control, and visibility risks.

5. Why do you think the balloon flies?

The balloon flies due to a scientific principle called buoyancy, which is essentially the same reason a cork floats in water. Hot air is less dense than cold air. When the hair dryer is turned on, it heats the air inside the garbage bag (the "envelope"). Hot air molecules move faster and spread out, making the air inside less dense (lighter) than the cooler, denser air outside.

Name: _____

Classifying Clouds

Clouds are condensation forms that develop above the ground, usually by the lifting and chilling of moist air. Although clouds seem to appear in many varieties, they can be categorized in three general types and are recognized as falling into three altitude classes:

1. cumulus (piled or heaped up) - has vertical development, appearing puffed up and billowy, with flat, even bases. They usually appear in groups, developing in a dry, clear, summer sky. May cause precipitation. Found below 2000 metres.



2. stratus (spread out or stretched in layers) - they form in seemingly endless layers that have no shape or form because they are flat. May cause precipitation. Found below 2000 metres.



3. cirrus (curly) - composed of ice crystals that form thin filaments, wispy puffs, or translucent veils. Found below 8000 metres.



Purpose: To learn to identify three (3) main types of clouds according to altitude, shape, and potential for precipitation.

What You Need: pencil

What You Do:

1. For four (4) days, classify and record the clouds that you see in the morning before school and in the afternoon after school. Use the descriptions provided on the three main types of clouds.
2. Give your classifications to your Leader when they are complete. Discuss your results with your Pack.

Observations:

	Time	Type of Cloud
Day 1	morning	
	afternoon	
Day 2	morning	
	afternoon	
Day 3	morning	
	afternoon	
Day 4	morning	
	afternoon	

Conclusions:

1. Which of the three different types of clouds did you see the most during the four days you observed?

2. What are the three (3) general characteristics for classifying clouds.

- ---
- ---
- ---

3. Why is it important that two observers agree on what they see when collecting data and drawing conclusions?

4. When a jet aircraft flies overhead on a clear day, you can see a trail of water vapour called a contrail (condensation trail) left behind. Which type of cloud does this resemble?

5. Sometimes you can have a cumulonimbus cloud, or, a nimbostratus cloud. They appear dark in the sky. What does the term "nimbo" or "nimbus" mean when attached to the word "cloud"?



nimbostratus cloud

Answers

1. Which of the three different types of clouds did you see the most during the four days you observed?

During a high-pressure system (bright, sunny days), you will most likely see cirrus and cumulus clouds. During a low pressure system (dark, gloomy days), you will most likely see stratus, nimbostratus, or cumulonimbus clouds.

2. What are the three (3) general characteristics for classifying clouds.

Height (altitude), shape, and whether they produce precipitation.

3. Why is it important that two observers agree on what they see when collecting data and drawing conclusions?

The more you can agree on the observations and conclusions that you make, the more accurate your findings will be.

4. When a jet aircraft flies overhead on a clear day, you can see a trail of water vapour called a contrail (condensation trail) left behind. Which type of cloud does this resemble?

A cirrus cloud.

5. Sometimes you can have a cumulonimbus cloud, or, a nimbostratus cloud. They appear dark in the sky. What does the term “nimbo” or “nimbus” mean when attached to the word “cloud”?

"Nimbus", is the Latin word for rain. The vast majority of precipitation occurs from nimbo-formed clouds and therefore these clouds are generally the thickest.

cumulonimbus - large, dark clouds

nimbostratus - true rain clouds; dark and wet looking

©Cub Scout Water - Adventure 1

Water - A Natural Resource

Name: _____

Go on hikes with your family or other Cub Scouts to three different natural aquatic habitats. Visit a local creek/stream, marsh, and pond. Name each of aquatic habitats you visited and name the specific water source(s) for each one.

Creek/Stream Name: _____

Water Source:

Marsh Name: _____

Water Source:

Pond Name: _____

Water Source:

After you have visited the three aquatic habitats and answered the three questions, read the following information on "Characteristics of Water" and "The Importance of Water to Animal Life." Learn as much of it as you possibly can (and even do more research if you want), and then ask your leader if you can teach the members of your Pack all that you have learned. Discuss with them your findings about the three aquatic habitats and talk about the "Characteristics of Water" and "The Importance of Water to Animal Life."

Characteristics of Water

Water is the most common liquid on Earth. Even so, it is a very unusual substance. Its amazing properties include:

- All living things are made of cells; water makes up to 85% of cells.
- Water is called the universal solvent because it dissolves more substances than any other liquid. This dissolving ability of water allows for the transport of essential gases and nutrients.
- Capillary action enables water to slowly move up the vascular tissues of plants and it slowly moves through tiny spaces between soil particles so that plant roots can absorb it.
- Unlike most other substances, water in its solid state is less dense than water in its liquid state. That's why ice floats. Without this property of water, freshwater aquatic life in temperate zones of the Earth could not exist.
- Water has a high specific heat capacity (it can release heat slowly), which helps a body of water maintain a stable temperature, making it much easier for aquatic organisms to survive. Likewise, plants contain a lot of water, and the water inside their tissues maintains a constant internal temperature despite the fluctuations of the air temperatures of their environments.

The Importance of Water to Animal Life

Unlike humans, animals do not have large quantities of stored water in their bodies, which means that they have to regulate their water intake carefully. While the camel can store and lose up to 180 L of water, not every animal is so lucky. While humans require relatively clean and pure drinking water, animals are much less fussy. Most animals gain the majority of their water from the food they eat, rather than consuming water by itself.

Water is considered to be the source of life. It is important for all life because of the following reasons:

- Water is vital body fluid which is essential for regulating the processes such as digestion, transport of nutrients and excretion. It transports the products of digestion to the place of requirement of the body.
- Water regulates the body temperature by sweating and evaporation.
- Water is a medium for all metabolic reactions in the body. All metabolic reactions in the body take place with water present.
- Water provides habitat for various animals in the form of ponds and rivers, sea, etc.
- Water is an essential part of foodstuff. It makes the food soft and palatable.
- Water helps in the excretion of waste product in the form of urine and feces.
- Water provides shape to the body cells and essential for cell nutrition.
- During the period of hibernation, metabolic water keeps an animal alive.
- Water helps in hearing by the ears, and vision by the eyes.
- Water acts as a cushion for tissue cells and the nervous system and it protects the various vital organs against shock and injury.
- Water provides lubrication to the cartilage that rests between bones preventing wear on the ends of the bone and restricting range of motion in a joint.

Conclusions:

1. Should you drink water straight from a creek or stream? Why?

2. You are out camping in Ontario and get lost in the woods. You have learned to pay close attention to and follow flowing water. Why?

3. Nearly half of Canadians rate fresh water as the country's most important natural resource, even more important than oil and gas. Why?

Answers:

- *Creeks and streams get their water from a combination of precipitation (rain/snowmelt), groundwater seepage (springs), and surface runoff. They begin at headwaters (usually a lake), accumulating water as it flows downhill, often sustained between rains by groundwater.*
- *Ponds are primarily filled and maintained by groundwater (springs, seepage, water tables), surface runoff from rain, and inflow streams.*
- *Marshes are frequently found adjacent to a lake that acts as its primary source of water. They can also be supplemented by surface water, including rivers, streams, runoff, precipitation, and groundwater. They remain wet year-round or seasonally due to these combined sources.*

1. Should you drink water straight from a creek or stream? Why?

Never drink water from a natural source that you haven't purified, even if the water looks clean. Water in a stream, river or lake may look clean, but it can still be filled with bacteria, viruses, and parasites that can result in waterborne diseases, such as cryptosporidiosis or giardiasis.

2. You are out camping in Ontario and get lost in the woods. You have learned to pay close attention to and follow flowing water. Why?

In Ontario, all streams and creeks flow south. If you find a stream or creek, start walking south (in the direction the water is flowing). By following this route, you will eventually come to a town, and in the best-case scenario – Lake Ontario.

3. Nearly half of Canadians rate fresh water as the country's most important natural resource, even more important than oil and gas. Why?

Canada possesses roughly 20% of the world's freshwater, making it a vital, sacred, and heavily utilized resource for drinking, energy, industry, and ecosystems. Despite this abundance, it is unevenly distributed, faces pollution, and is threatened by climate change, requiring sustainable management to protect its long-term future.

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Name: _____

Comparing the Abundance of Freshwater & Saltwater on the Earth

Purpose: To visualize the relative abundance of freshwater and saltwater on the Earth.

What You Need:	10-litre pail	small bowl
	250 mL measuring cup	2 small glasses
	tablespoon	tap water
	masking tape	pencil or pen

What You Do:

1. Fill the 10-litre pail. This water represents all the water on Earth. Remove 250 mL of water and place it in the small bowl. This represents all the freshwater in the world, and the remaining water in the pail now represents all the saltwater in the world. Label the pail "saltwater" and the small bowl "freshwater".
2. From the bowl of freshwater, remove 4 tablespoons and place them in one of the small glasses. The remaining freshwater in the bowl now represents all the freshwater that is stored in icecaps and glaciers and not available for use. Label the small bowl "ice caps & glaciers".
3. Remove 2 tablespoons of freshwater from the small glass and put it in the other small glass. This represents all the freshwater that is stored underground. The remaining 2 tablespoons in the first small glass now represents all the water found in the atmosphere, soil, plants, animals, lakes, and rivers. Label the 1st small glass "underground" and the 2nd small glass atmosphere, soil, plants, animals, lakes, and rivers.

Conclusions:

1. In what state of water is most fresh water found?

2. Where is most of the liquid fresh water on land located?

3. Define the term "salinity".

4. Why is it easy to float in the Dead Sea?

5. How might the greater density of salt water help ocean creatures?

Answers

1. In what form is most fresh water formed?

About 75% of the planet's fresh water supply is in its solid state (ice).

2. Where is most of the liquid fresh water on land located?

Most fresh water (97%) occurs below the surface of the land as groundwater.

3. Define the term "salinity".

The amount of salts dissolved in a liquid.

4. Why is it easy to float in the Dead Sea?

Because of its extremely high salt concentration (nearly 10x saltier than the ocean), the Dead Sea is incredibly dense, making it impossible to sink and causing your body to float effortlessly on the surface.

5. How might the greater density of salt water help ocean creatures?

This will help ocean creatures float.

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Name: _____

The Impacts of Oil Pollution on Aquatic Ecosystems

Oil spills pose serious threats to fresh water and marine environments. They affect surface resources and a wide range of subsurface organisms that are linked in complex food chains that includes human food resources. Spilled oil can harm the environment in several ways, including the physical damages that directly impact wildlife and their habitats (such as coating birds or mammals with a layer of oil), and the toxicity of the oil itself, which can poison exposed organisms. The severity of an oil spill's impact depends on a variety of factors, including the physical properties of the oil, whether oils are petroleum-based or nonpetroleum-based, and the ultimate fate of the spilled oil.

The marine environment is made up of complex interrelations between plant and animal species and their physical environment. Harm to the physical environment will often lead to harm for one or more species in a food chain, which may lead to damage for other species further up the chain. Where an organism spends most of its time, in open water, near coastal areas, or on the shoreline, will determine the effect an oil spill is likely to have on that organism.

In open water, marine organisms such as fish and whales have the ability to swim away from a spill by going deeper in the water or further out to sea, reducing the likelihood that they will be harmed by even a major spill. Marine animals that generally live closer to shore, such as turtles, seals, and dolphins, risk contamination by oil that washes onto beaches or by consuming oil-contaminated prey. In shallow waters, oil may harm sea grasses and kelp beds that are used for food, shelter, and nesting sites by many different species.

Crude oil, the kind that sometimes gets spilled from ships at sea, is thicker and blacker than the cooking oil used in this experiment. It is also much heavier than the natural oils found on an animal's fur or feathers. Birds that dive from the air into the water to catch fish, can get covered with the sticky, heavy oil and then cannot fly. The animals can be poisoned as they try to clean themselves by preening their feathers or licking their fur.

The Impacts of Oil Pollution on Birds & Mammals

One of the more difficult aspects of oil spill response is the rescue of oiled birds and mammals. An oil spill can harm birds and mammals by direct physical contact, toxic contamination, and destruction of food sources.

- Physical contact - When fur or feathers come into contact with oil, they get matted down. This matting causes fur and feathers to lose their insulating properties, placing animals at risk of freezing to death. As the complex structure of the feathers that allows birds to float becomes damaged, the risk of drowning increases for birds.
- Toxic contamination - Some species are susceptible to the toxic effects of inhaled oil. Oil vapors can cause damage to an animal's central nervous system, liver, and lungs. Animals are also at risk from ingesting oil, which can reduce the animal's ability to eat or digest its food by damaging cells in the intestinal tract. Some studies show that there can be long-term reproductive problems in animals that have been exposed to oil.
- Destruction of food resources - Even species that are not directly in contact with oil can be harmed by a spill. Predators that consume contaminated prey can be exposed to oil through ingestion. Because oil contamination gives fish and other animals unpleasant tastes and smells, predators will sometimes refuse to eat their prey and may begin to starve. Sometimes, a local population of prey organisms is destroyed, leaving no food resources for predators.

Rescuing Birds & Mammals From Oil Spills

When an oil spill occurs, birds and marine mammals are often injured or killed by oil that pollutes their habitat. Without human intervention, many distressed birds and animals have no chance of survival. Much has been learned about the care and treatment of oiled birds and animals through experience with recent oil spill incidents. First, the need for immediate response is essential for rescuing birds and marine mammals. Second, personnel training is needed. The rehabilitation of oiled wildlife is a complex medical and technical procedure, and volunteers must be properly trained.

2. What happens to the oil in Step 3?

3. Where is the detergent in Step 3?

4. Bird feathers have a natural coating of oil on them, like a protective cover. This makes the feathers waterproof and keeps the birds warm and dry while they enter the water. What happens when the water becomes polluted with detergent?

5. What are the consequences of oil spills for other species of aquatic wildlife such as:

- fish

- marine mammals

6. How could an oil spill affect the success of birds nesting near the water?

Answers:

1. What happens to the oil in the water in Step 2? Why do you think this happens?

The oil formed a separate layer on top of the water. This is because oil is lighter than water and it floats. As a result, the layer of oil acts like a barrier between the water's surface and the air above. Insects and other tiny animals that get their oxygen at the surface, can't break through the oil barrier so they suffocate. Animals that eat water plants that are covered in oil can get very sick.

2. What happens to the oil in Step 3?

When the detergent was added to the oil, the oil broke up into tiny droplets surrounded by detergent particles. Some of the oil may have even sunk to the bottom.

3. Where is the detergent in Step 3?

The detergent connected the oil and water, causing them to mix together so that the oil and water no longer formed separate layers.

4. Bird feathers have a natural coating of oil on them, like a protective cover. This makes the feathers waterproof and keeps the birds warm and dry while they enter the water. What happens when the water becomes polluted with detergent?

The coating of oil on a bird's feathers is broken up into droplets, and water can get through to the feathers. If the feathers get soaked, the bird becomes cold and very wet. Wet feathers also make the bird much heavier – it can sink and drown. Marine mammals may also lose their natural waterproofing, in which case they become cold and wet and may die.

5. What are the consequences of oil spills for other species of aquatic wildlife such as:

- *fish - Respiratory & Internal Damage: Oil can coat gills, leading to asphyxiation. It also causes liver damage, fin erosion, skin sores, and cancer.*
- *marine mammals - Insulation Loss & Hypothermia: For fur-bearing mammals like sea otters and fur seals, oil mats their fur, destroying its insulating ability and leading to fatal hypothermia.*

6. How could an oil spill affect the success of birds nesting near the water?

An oil spill can devastate birds nesting near water through a combination of direct toxicity, physical impairment, habitat destruction, and food chain contamination, ultimately leading to drastically reduced hatching success, chick mortality, and nest abandonment.

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Name: _____

Create a Tasty, Healthy Drink for a Hot Summer Day

Staghorn sumac (*Rhus typhina*) is a thicket-forming shrub commonly found growing throughout southern Ontario. A very refreshing cold-infused beverage (lemonade) can be made by soaking, not boiling, its red berry clusters in water for 1-24 hours to extract a tangy, citrus-like flavor. Summer is the perfect time to make homemade staghorn sumac lemonade. It is a tart, refreshing drink that any age and skill level can make.

Staghorn sumac berries are high in malic acid (a natural acid found in fruits) and vitamin C. The seeds contain bitter alkaloids that are extracted by hot water, so it is important to use only cold water when making an infusion.

There is no question how this shrub got its name. The stout branches are covered with fine hairs that resemble deer antlers in velvet. The hairy branches and fuzzy fruit distinguish it from everything else.

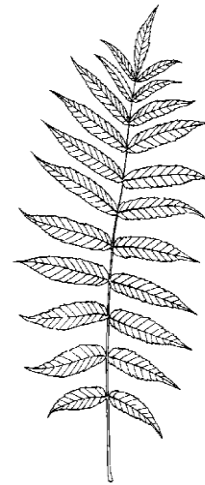
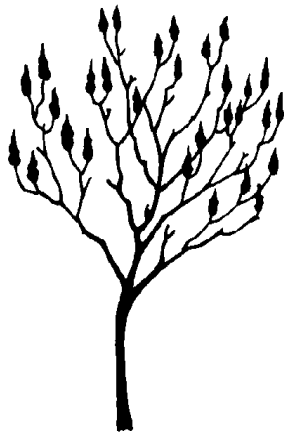
How to Identify Staghorn Sumac

It is next to impossible to misidentify this shrub. All parts of the shrub are readily identifiable and unlike any other tree or shrub.

Habitat: Staghorn sumac is commonly found in dry, sunny, rocky soils, roadsides, and disturbed areas. *You will never find one shrub growing by itself.* They reproduce by underground runners or roots called rhizomes that grow horizontally at or just below the soil surface. These roots can travel long distances, becoming intertwined, just under the surface, shooting up new shrubs several feet from the parent shrub. *You simply cannot pull one out of the ground.*

Form: A shrub that looks like deer antlers, often forming dense, spreading thickets. Most heights average between 2-3 m, although it can reach 6-8 m.

Leaf: a compound leaf with 11-31 serrated, lance-shaped leaflets up to 46 cm long. *The leaves turn vivid red/orange in autumn.*



Twigs/Branches: Densely covered in soft, dark, velvety hairs, green the first year, turning brown the second, the hairs persisting for several years. *When broken, the twig/branch releases a milky, white, sticky sap.*

Fruit: Distinctive, upright, cone-shaped, fuzzy deep red clusters (also called drupes) at the branch tips that often last through winter.



How to Prepare Your Staghorn Sumac Lemonade

The berries, or drupes, are ready to be collected when they have turned a deep red colour. This usually happens between midsummer to early fall. To tell if the berries are ripe, give them a taste test right in the field. If the berries taste lemony and sour, then they are ready to be collected.

- Step 1: Collect firm, bright red, sticky clusters in late summer/early autumn. Avoid moldy, brown, or washed-out clusters. Do not wash the berries beforehand, as this removes the flavor. Remove stems if desired.
- Step 2: Rub the berries apart into a large bowl. Use cold water for the best flavor; hot water can release bitter alkaloids. Soak 1 cup of berries in 4-5 cups of water.
- Step 3: Let the mixture sit for 1-2 hours for a light flavor, or overnight in the refrigerator for maximum intensity.
- Step 4: Use a fine mesh strainer or cheesecloth to remove fine, irritating hairs.
- Step 5: Sweeten with honey, or sugar to taste and enjoy over ice. Keep in the refrigerator; it will last for up to a week.
- Step 6: Encourage other members of your Pack to make staghorn sumac lemonade.

Important Safety Note

A small percentage of people are emergency-room allergic to what is considered "safe sumacs". Anyone who has experienced severe allergic reactions (requiring medical attention) to poison ivy, poison sumac, poison oak, cashews, or mangoes should stay clear of staghorn sumac as well since all these plants belong to Family Anacardiaceae (cashew family).

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Name: _____

Fishing for Panfish in Ontario

Studies have shown that recreational fishing is a major outdoor activity, and plays an important part in natural resource-based tourism of Ontario.

The following lists the top five (5) reasons why people like to fish:

- for relaxation;
- to get away;
- to enjoy nature;
- for family togetherness;
- for challenge and excitement.

Ontario Fishing License & Outdoors Card

All Canadian residents between 18 and 65 are required to possess a fishing licence in Ontario, whereas residents under 18 and over 65 are not. Ontario fishing fees vary depending on the licence duration and types of fishing (conservation versus sport). Sport licenses cost a little more. Conservation licences are practical if you plan to release the majority of the fish you catch.

Ontario fishing licences are categorized two ways:

- sportfishing - this license allows anglers to retain and possess the maximum number of fish allowed per zone.
- conservation - this license has a limit to the number of fish retained and possessed by an angler based on the angling zone being fished and species.

To fish in Ontario, you also need a valid Outdoors Card. The Outdoors Card is a plastic, wallet-sized identification card issued by the ministry that allows you to fish. You are required to carry your fishing license and your outdoors card with you at all times while fishing.

Four Methods of Fishing

There are basically four different methods for catching fish. They include:

1. still fishing - is a simple, stationary method where the bait or lure is cast out and allowed to remain in one spot, rather than being actively retrieved. It can be done from the shore, in a boat, or on a dock to catch different fish (usually panfish) using sinkers or bobbers to control depth. Live bait (like small minnows, worms, and leeches) or plastics like PowerBaits can be used. This method is ideal for beginners due to its patient, low-movement nature.
2. cast-and-retrieve - is a method of using a fishing rod, reel, and line to throw bait or a lure into the water, usually aiming for a specific, fish-holding location. It involves quickly flicking/swinging the rod forward towards the water, with the lagging inertia of the tackle bending the rod backward (i.e. "loading" the rod), and then using the "springing" (elastic rebound) of the rod to "hurl" and rapidly sling the line forward, which in turn will launch the lure or weight. The main idea for all casting is to control the line so it can release in a forward motion, being carried by the lure or weight. After the line has finished unwinding, you need to engage the reel and regain tension on the line by turning the handle of the reel repeatedly to slowly retrieve the line.
3. trolling - is a method that involves dragging a baited hook or lure on a significant amount of line behind a slowly moving boat to catch fish. It is highly effective for covering large areas of water to locate fish at various depths. Trolling is arguably one of the most effective ways to catch fish. The two primary reasons are because you can cover a lot of water to locate the fish, and you can fish significantly deeper than with other techniques.
4. jigging - is a method that involves using a weighted, lure-tipped hook called a jig, whereby the rod tip is repeatedly lifted and lowered to make the lure jump or hop under water. Initially, line is let out to allow the bait to sink to the bottom. The rod is then repeatedly lifted sharply to attract fish throughout the water column. The repeated action of the "jerking" motion of the rod mimics injured or dying prey.

The Three Types of Reels You Can Use to Fish

Cast-and-retrieve (or simply casting) techniques are ideal. You can cover a lot of water and explore beneath the surface. Cast-and-retrieve techniques work with spinners, spoons, crankbaits, jigs, and any weighted lure that can carry the line. There are three different types of reels that can be used for casting, depending on your level of experience.



Spincast Reel



Spinning Reel



Baitcasting Reel

Spincast Reel

A spincast reel (also known as a close-faced reel) is an entry level fishing reel designed for new or young anglers because it is easy to use. It is different from other reels because it has a cover (or cone) that shelters the spool and fishing line. The spincast reel sits on top of the rod, similar to the baitcasting reel, whereas the spinning reel hangs below the rod. To use a spincast reel, ensure you have 2-4 feet of line hanging from the rod tip. Hold the rod with the reel facing up, placing your thumb on the push button. Press and hold the button, bring the rod back over your shoulder, and release the button when the rod is pointing forward towards your target (roughly 12-1 o'clock) to let the line out. After casting, turn the handle to engage the line. Use the drag adjustment knob (plus/minus) on top to tighten or loosen tension, allowing larger fish to pull out line without breaking it. If the line tangles, unscrew the front cone to remove tangled line from the spool.

Spinning Reel

With spin casting, the process is very simple but requires some practice, expertise, and timing to get it right. The spinning reel sits below the rod, unlike the spincast reel and the baitcasting reel. Flip the bail (the pivoting, half-circle metal arm that controls the line) to an open position while holding the line against the grip. You can use your forefinger or two pointer fingers to secure the line against the rod. Make an overhead cast and release the line towards the end of your forward motion. After the lure lands, turn the handle to flip the bail down and reel to regain tension. Many reels will engage and flip the bail automatically when you reel forward.

Baitcasting Reel

Casting with this type of reel is more technically advanced than with a spinning reel and requires a lot more practice and expertise to become perfect. "Baitcasters" are excellent for situations that require precision. When you can hit small targets, it makes you a better angler in places with overhanging branches, logs, and other obstacles. The baitcasting reel sits on top of the rod, similar to the spincast reel. To cast this setup, first adjust the tension knob on your reel. It should have enough tension to drop the lure without freely spooling and uncoiling the line loosely. To make your cast, hold the button while making a forward motion. Allow the lure to fly while continuing to hold the button. Use your thumb to lightly contact the spool while the lure is flying. This prevents excess line (a "bird's nest") from escaping and tangling. Release the button as the lure hits the water to stop your cast.

The Two Types of Rods You Can Use to Fish

A spinning rod is the most common type of fishing rod for any level of angler. This type of fishing rod requires anglers to use a spinning reel that sits below the rod providing stability and power. With a spinning rod, anglers can choose between a wide variety of different lengths, actions (flexibility) and power to match their target species. Most spinning rod handles are made of cork or EVA foam.

A casting rod is a bit more durable compared to a spinning rod. The most popular reel to use on a casting rod is a baitcasting reel, but if you are a beginner or inexperienced angler, using a spincast reel is a good choice. With this type of fishing rod, both the baitcasting reel and spincasting reel sit on top of the rod. A casting rod features small line guides and a trigger grip handle for enhanced accuracy, control, and power.

Fishing for Panfish

Panfish, such as yellow perch, pumpkinseed, rock bass, and crappie, are popular fish to catch because they are abundant, easy for beginners to locate and catch, and offer fast-paced action often requiring just a simple hook, bobber, and live bait. They are widely distributed in most waters, making them easily accessible. Because panfish school in large numbers, they can often be caught quickly, leading to a fun, "fast-paced" experience, offering a surprisingly strong fight on light tackle. They provide a high-quality, delicious white meat considered by some to be the best-tasting freshwater fish, with a mild, sweet flavor perfect for frying. Best of all, you do not need a boat to catch them, as they frequent docks, shorelines, and vegetation.

How to Catch Panfish

Generally, fish tend to hit a bait only as aggressively as they need to overtake it. Most panfish species have small mouths necessitating the use of tiny, lightweight lures, or small live bait. Jigging for panfish with a slow falling plastic grub, or using a slip bobber to keep the bait (worm) suspended just above the bottom is highly effective. A small, fast spinnerbait, on the other hand, will attract a crappie or perch. Pumpkinseeds and rock bass will scrutinize and peck at a slow-retrieved crankbait. Speed up and the hits get more aggressive, which leads to more hook-ups. Get a bait moving and you can stimulate panfish to respond with assertive attacks.

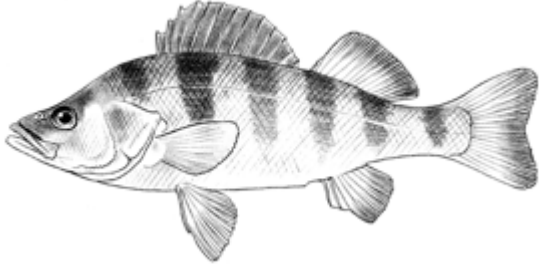
In Ontario, panfish generally have year-round open seasons. Regulations vary significantly by the Fisheries Management Zone (FMZ) you are fishing in and the type of fishing license you possess. Depending on your age, a valid Outdoors Card and fishing licence are required. Common limits for panfish range between 30-300 fish per day.

If you are fishing for panfish, follows these guidelines:

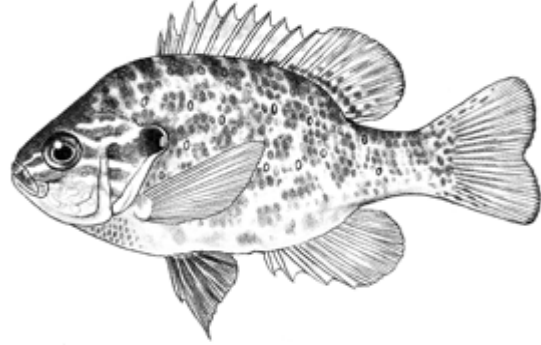
- use barbless hooks;
- keep fish in the water as much as possible, especially during hot weather;
- use wet hands or gloves and avoid touching gills or eyes.

Four Popular Panfish in Ontario

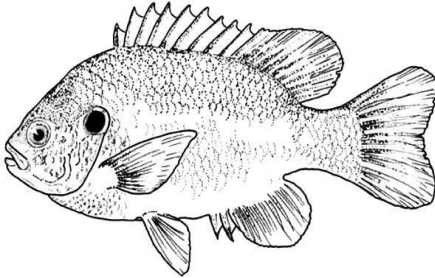
yellow perch



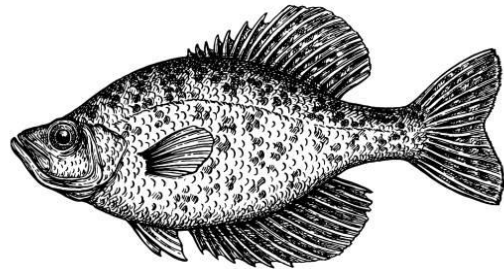
pumpkinseed



rock bass



crappie



1. Part of being a responsible angler is knowing how to identify the fish you catch. List two (2) identification features of the above four listed panfish.

yellow perch

- _____

pumpkinseed

- _____

rock bass

- _____

crappie

- _____

Where to Catch Panfish

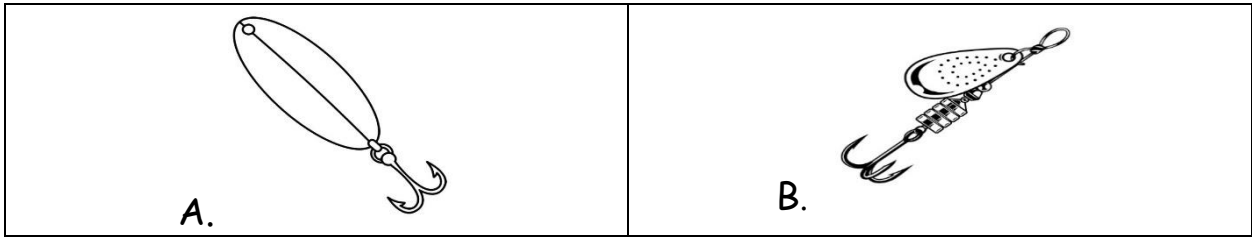
Because fish can be selective with what they eat (feeding on one type of food for over a long period of time), anglers try to figure out what fish are eating on a particular day so they can offer a lure that represents the same kind of food. In doing so, understanding what natural food sources are present and the varying depths at which fish feed is very important, as each lure is designed to fish at a specific depth in the water. Lures for panfish are typically small and classified as either sinking (for open-water feeders), or jigging (for bottom feeders). On occasion, small, surface (floating) lures can be used, especially for rock bass. Each type of lure mentioned imitates a natural food source for fish in the water.

Several factors can contribute to the use of these lures. Cloud cover, water clarity, time of day, water colour, water surface condition, depth of water, presentation, and method of retrieval all contribute to the effective use of a lure.

Obviously, you want to present the fish with a lure that best represents the natural conditions that suits the fish's feeding requirements. Most panfish species have small mouths necessitating the use of tiny, lightweight lures, or small live bait. Panfish will typically feed throughout the day but early morning and late evening usually see the best action and biggest fish. The pumpkinseed and rock bass generally prefer shallow, weedy bays, while yellow perch are more likely to occupy slightly deeper, more open waters along ledges and drop-offs. Look for crappies in warm, clear, weedy lakes, often schooling around structures like fallen trees, weed lines, and docks. Most panfish species have a tendency to school, or at least swim in small groups. Where you find one, expect to find more.

Types of Artificial Lures for Panfish

2.

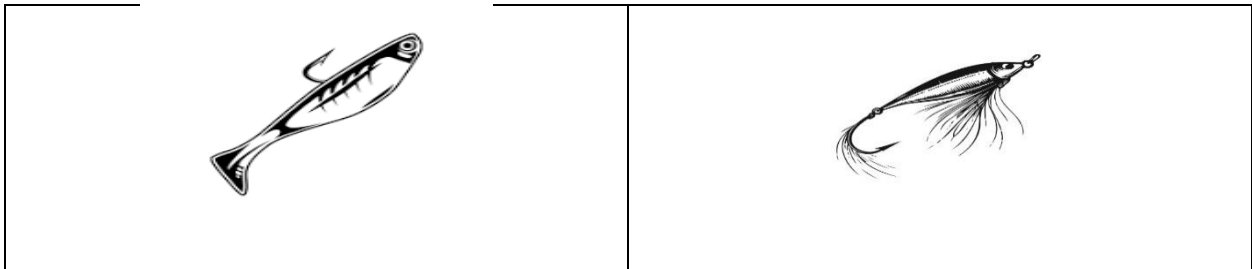


Both the two lures shown above are made of metal, are thin, and very shiny.

- a. Lure A is not perfectly flat so when it moves through the water, it wobbles from side to side. What might a hungry fish think this lure is?

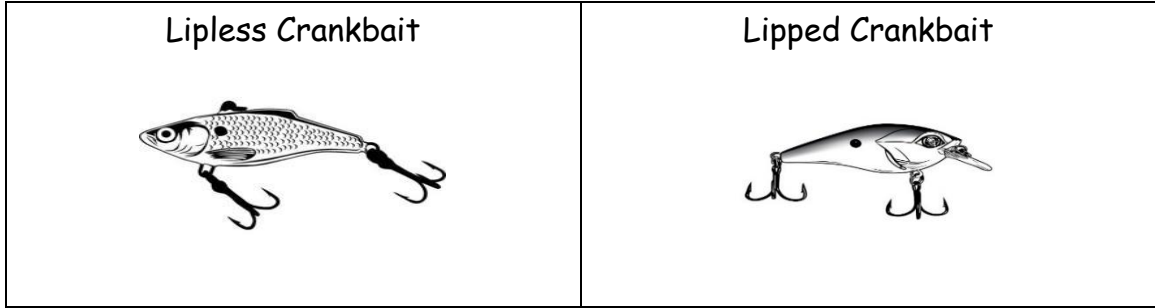
- b. Lure B is perfectly flat, and the blade spins quickly around as the lure is retrieved through the water. What might a hungry fish think this lure is?

3.



Both the two lures shown above are used for jigging. Jigging is a highly effective, active fishing technique that consists of a single hook with a lead or metal sinker molded onto it, often featuring soft plastic tails, feathers, or skirts. What might a hungry fish think these lures are?

4.



The two lures shown above are known as crankbaits. Lipless and lipped crankbaits are designed differently resulting in a different presentation to fish as they are retrieved through the water. Describe the design of each crankbait and how each one is used most effectively to catch fish.

Lipless _____

Lipped _____

5. Why is it important to use barbless hooks when fishing for panfish?

6. Of the four types of panfish you learned about, three (3) are very closely related, all belonging to the same family of fish. Which fish is not related to the other three fish?

7. Common limits for legally catching panfish in Ontario range between 30-300 fish per day. Why are you allowed to catch so many fish each day?

Live Bait

Fishing with live bait is one of the most productive ways to fish. The most common live baits used by anglers to catch panfish in Ontario are small minnows, worms, and leeches. Fishing with live bait in Ontario is allowed for licensed anglers but heavily regulated by Bait Management Zones (BMZs) with very strict regulations. Anglers can only use certain baits outlined within the Bait Management Zones.

Always check the rules for using live bait in the waterbody that you intend to fish.

How to Fillet a Fish

Filleting a fish involves using a sharp, flexible knife to cut behind the pectoral fin/gill plate at an angle down to the backbone, then slicing along the spine towards the tail to remove the filet. You cannot assume however, that every species of fish is filleted the same way. Moreover, every person has their own particular method for filleting a fish, and their method will vary from fish to fish. The best way to learn is to watch someone who knows what they are doing. Otherwise, google "how to fillet a fish".

How to Cook a Fish

Cooking a fish fillet generally involves high heat for a short time to achieve a tender, flaky texture with a golden exterior. To start, pat the fish completely dry with paper towels. Excess moisture causes steaming instead of searing, preventing a crispy crust. Use your favourite seasonings. The fish is done when it is white (opaque) throughout and flakes easily with a fork (internal temperature of 60°C (140°F-145°F)).

There are five (5) popular ways to cook your fish. Each method requires different ingredients, different heat, and different equipment.

- pan-seared (crispy);
- baked (easy/healthy);
- breaded;
- beer battered (restaurant style);
- barbequed.

Go Fishing!

Now that you have gained some knowledge for fishing for panfish in Ontario, find another Cub Scout, friend, or family member to go fishing with. There are several accessible places within the Durham region where you can fish. Visit Gagnon's Sporting Goods store at 385 Bloor St. W. in Oshawa. Here you will find all the fishing supplies that you will need for your fishing adventure. After your fishing adventure, present all your new-found knowledge (and fishing tales) to your Pack!



Answers:

1. Part of being a responsible angler is knowing how to identify the fish you catch. List two (2) identification features of the above four listed panfish.

yellow perch

- *golden-yellow to brassy-green sides;*
- *6–9 distinct dark vertical bars (or "saddles");*
- *two separate dorsal fins (the first being spiny);*
- *often have bright orange or red-tinged lower fins, especially during spawning.*

pumpkinseed

- *a distinct bright red or orange spot on the rear edge of their black gill flap;*
- *a very deep, laterally compressed, disk-like, "pumpkinseed" shape;*
- *a very small, distinct mouth that does not extend past the middle of the eye;*
- *olive-green back with speckled sides, and, specifically, wavy blue-green stripes across their cheeks;*
- *a vibrant, colourful, mosaic pattern on the body.*

rock bass

- *large, red, "googly" eyes;*
- *6 (sometimes 5-7) hard, sharp spines on the anal fin;*
- *olive-bronze, deep-bodied shape;*
- *rows of dark, square-shaped spots along their sides;*
- *deep, compressed body (like a sunfish).*

crappie

- *high-arched backs;*
- *"slab-sided" (thin and flat);*
- *large mouth with thin, paper-like lips;*
- ***black crappie:** have 7–8 dorsal fin spines, irregular dark spots;*
- ***white crappie:** have 5–6 dorsal fin spines, vertical bars.*

2. Both the two lures shown above are made of metal, are thin, and very shiny.
- a. Lure A is not perfectly flat so when it moves through the water, it wobbles from side to side. What might a hungry fish think this lure is?

A wounded fish.

- b. Lure B is perfectly flat, and the blade spins quickly around as the lure is retrieved through the water. What might a hungry fish think this lure is?

A young fish quickly trying to escape a predator.

3. Both the two lures shown above are used for jigging. Jigging is a highly effective, active fishing technique that consists of a single hook with a lead or metal sinker molded onto it, often featuring soft plastic tails, feathers, or skirts. What might a hungry fish think these lures are?

The repeated action of the "jerking" motion of the rod mimics injured or dying prey moving up and down the water column. This action entices panfish to strike.

4. Both the two lures shown above are known as crankbaits. Lipless and lipped crankbaits are designed differently resulting in a different presentation to fish as they are retrieved through the water. Describe the design of each crankbait and how each one is used most effectively to catch fish.

Lipless crankbaits are sinking, flat-sided lures that produce intense vibrations and noise via internal rattles, acting as a "search bait" to cover water quickly. They do not dive on their own but sink to a desired depth, allowing anglers to control their vertical position in the water column. They feature a tight, rapid wobble on a straight retrieve, which increases with speed.

Lipped crankbaits work by using a plastic or metal bill (lip) at the front to dive and create a wiggling action when retrieved, simulating a swimming baitfish. They dive on their own due to water pressure on the lip that forces the lure down. The length, angle, and shape of the lip determine how deep the lure dives (shallow, medium, or deep).

A steeper angle typically allows for faster, deeper diving. The lip forces the lure to wobble or wiggle, generating vibrations that attract fish. They are typically buoyant, floating when paused.

5. Why is it important to use barbless hooks when fishing for panfish?

Because you will not keep all the panfish you catch, using barbless hooks when fishing for panfish significantly improves fish survival rates by reducing deep-hooking (gut hooking) and damage to gills.

6. Of the four types of panfish you learned about, three (3) are very closely related, all belonging to the same family of fish. Which fish is not related to the other three fish?

The three most closely related are the pumpkinseed, rock bass, and crappie. They all belong to Family Centrarchidae (sunfish family). The yellow perch is not closely related. It belongs to the Family Percidae (perch family).

7. Common limits for legally catching panfish in Ontario range between 30-300 fish per day. Why are you allowed to catch so many fish each day?

In Ontario, there are liberal daily limits for panfish because they generally have high reproductive rates, fast growth rates, and widespread abundance. Managers prioritize managing these species through liberal daily catch and possession limits to control population density.

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Name: _____

Building a Birdfeeder for Your Backyard

Build a Winter Bird Feeder

Attracting birds in your backyard over the winter can be a lot of fun. Despite many species of birds migrate south in the winter, several other species typically remain behind. Sometimes, your backyard will provide the natural food and cover that birds prefer. But as the weather turns cold and natural food sources become scarce, our feathered friends are sure to appreciate access to an accessible food (and water) source. Being able to watch and study birds close-up adds immeasurably to our everyday lives and contributes to a sense of well-being.

During the winter months, your provision of food will help ensure birds make it through the winter. Once you begin to put out food, it is important to maintain the feeding, as birds become accustomed to this food source. Neglecting to put out food could result in birds dying, especially if temperatures become extremely cold. Birds require enough food to maintain their high metabolic rates which keep them warm. When spring rolls around, newly hatched insects and budding plants will attract many of the birds away from your feeder. At this time, their diet is now replaced by more valuable food sources offered by nature.

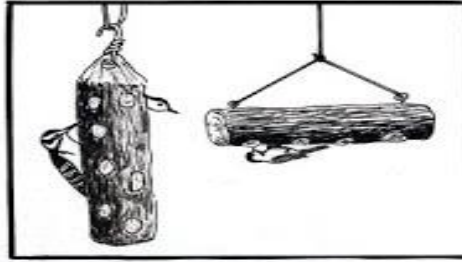
A simple bird feeder can make a Cub Scout's winter far more enjoyable. Obtain a pair of binoculars, a field guide for birds, and a Cub Scout can start keeping a list of all species recorded over the course of the winter. Keep this list on file and compare lists from year to year, always making notes of new species sighted. A Cub Scout's "yard list" could easily reach twenty species annually. Once they realize how easy it is as they become an experienced "birder", a Cub Scout can enjoy a walk through a conservation area or forested area and see how much bird activity exists throughout a winter.

Sample Winter Birds You Might See at Your Birdfeeder

<u>Species</u>	<u>Feeding Level</u>	<u>Preferred Food</u>
Blue Jay	ground, window, pole	sunflower seeds, peanuts
Black-capped Chickadee	window, pole	sunflower seeds
Northern Cardinal	ground, window, pole	sunflower seeds
Rufous-sided Towhee	ground, window, pole	sunflower seeds
House Sparrow	ground	all seeds
White-throated Sparrow	ground	all seeds
Evening Grosbeak	pole	sunflower seeds
American Goldfinch	hanging, pole	niger seeds
Pine Siskin	hanging, pole	niger seeds
Purple Finch	window, pole	sunflower seeds
House Finch	window, pole	sunflower seeds
Dark-eyed Junco	ground	millet, small seeds
Hairy Woodpecker	tree trunk	suet
Downy Woodpecker	tree trunk	suet
Red-breasted Nuthatch	pole, tree trunk	sunflower seeds
White-breasted Nuthatch	pole, tree trunk	sunflower seeds

1. Why is it important to put out a bird feeder only in the winter months?

2. Why is it important to put your bird feeder near a tree or bush?



Suet Log Feeder

This feeder will attract chickadees, nuthatches, woodpeckers, and Blue Jays from late September to March. The suet (animal fat) chunks can be easily cut and packed into the holes of your feeder. Birds become dependent on the high energy content of this food so be sure to add suet to your feeder often.

Materials: tree log approximately 10 cm across and 30 cm long (birch or maple)
 $\frac{3}{8}$ -inch diameter dowels, 10 cm long (4 to 6)
 $\frac{3}{8}$ -inch diameter drill bit
 $\frac{3}{4}$ -inch or 1 inch diameter drill bit
drill
eye-screw
15 cm piece of wire
hammer
suet

Obtain Suet

- Purchase beef fat trimmings from a local butcher. It is inexpensive, or the butcher might even give it to you at no charge.
- Save bacon and pork meat drippings to create your own suet. This will be softer than rendered beef fat but is still suitable for the birds.
- Buy lard at the grocery store. Lard is typically found shelved near the butter or margarine products.
- Buy vegetable shortening in place of animal fat. This is a preferred choice for many vegan or vegetarian birders who prefer not to use animal products, and it is still suitable for the birds. Vegetable shortening is typically found with baking supplies.

Preparation of Suet

Suet recipes do not need to be complicated in order to attract a range of hungry birds. Before offering the suet to the birds, however, it should be rendered to help it maintain its shape more easily.

To Render Suet

1. Chop the fat into small pieces or run it through a meat grinder. If you are getting the fat from a butcher, they may be willing to do this for you. Be sure all traces of meat are removed.
2. Heat the chopped fat on low until it is liquefied. Do not use higher temperatures to melt the suet more quickly, as this could lead to fires or scorching.
3. Strain the liquid fat through cheesecloth or a fine mesh to remove any particles or contaminants. The suet should be strained several times so it is as pure as possible.
4. Pour the fat into molds or containers and allow it to cool. The cakes can be chopped or cut to be fed to the birds, or you may choose to use containers that are the appropriate size to fit your suet feeders.

Once the suet is rendered, it can be fed to the birds as-is or you can choose to add simple ingredients to make it more appetizing to a wider range of birds.

Easy Suet Recipe

- 1 cup of rendered suet;
- 1 cup of chunky peanut butter;
- 3 cups of stone-ground cornmeal;
- $\frac{1}{2}$ cup of white or wheat flour.

Melt the suet and peanut butter together until they are smooth and liquid. Add the cornmeal and flour, mixing well. Allow the mixture to cool slightly to thicken and then pour it into molds or containers to use. Refrigerate or freeze suet until it is firm and you are ready to use it.

What Else You Can Add to Suet

While a simple bird suet recipe is useful, adding different ingredients to the mixture before it cools can make it more attractive to birds. Popular ingredients to customize a suet recipe include:

- chopped, unsalted nuts;
- dried fruit bits;
- birdseed;
- honey;
- kitchen scraps.

These are the easiest items to add to simple suet to make it even more tempting for your birds. Take the time to experiment with adding other ingredients to discover what your birds find most appetizing, and you will soon have plenty of suet-eaters at your backyard buffet.

Making the Log Feeder

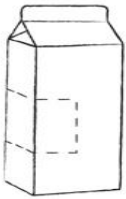
1. Obtain a log that is approximately 10 cm across and 30 cm long. The log does not have to be perfectly straight.
2. Starting at the top of the log using the 1-inch diameter drill bit, randomly drill 5-6 holes around the log that are evenly spaced apart. Drill the holes at least 2 cm deep.
3. With the $\frac{3}{8}$ -inch diameter drill bit, drill a perch hole $\frac{1}{4}$ -inch below the 1-inch holes that hold the suet. Drill the holes at least 2 cm deep. Insert the perches and tap with a hammer until snug. Perches should be at least 8 cm in length.
4. Attach eye-screw and wire to the top of the log.
5. Fill all 1-inch diameter holes with suet.
6. Hang it up near a tree or somewhere that birds have easy access to.

Milk Carton Feeder

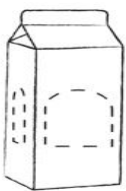
This feeder is a rewarding experience for a Cub Scout. It instills a positive attitude that the child is contributing to the welfare of wildlife. Most important, it helps Cub Scouts develop new skills, and encourages them to recycle items that would normally end up in the waste stream.

Materials: washed 2-litre waxed milk carton string
 permanent marker small nail or tack
 scissors bird seed

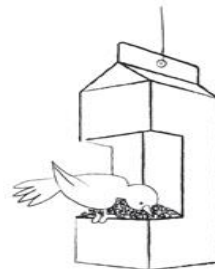
Gather your materials and then spread them out on your work area. This project can be done just about anywhere -- at the kitchen table, on a deck or patio.



Step 1: Using the marker, draw a shape on the milk carton where you want the entrance. Cut out the shape using the scissors. Make sure you leave about 5 cm of space at the bottom to collect the birdseed. Punch out a hole in the top of the carton using the nail or tack and tie the string through, leaving about 20 cm of slack for hanging it up.



Step 2: Fill the bottom with some birdseed, and hang it up near a tree or somewhere that birds have easy access to.



Answers:

1. Why is it important to put out a bird feeder only in the winter months?

Putting out bird feeders only in the winter is critical because food supplies are depleted and when snow and ice hit, food become inaccessible, making feeders a vital lifeline. In the Spring, natural food sources like insects and berries become abundant once again and the birds can then turn back to eating a natural protein and fat diet. Consistent feeding helps birds remain healthy and in better condition for the upcoming breeding season.

2. Why is it important to put your bird feeder near a tree or bush?

Putting a bird feeder near a tree or bush is essential for protecting birds from predators like cats and hawks, offering them a quick place to hide. Nearby trees or bushes provide an immediate escape route, helping them feel safe enough to use the feeder. Birds prefer to survey the area from a nearby branch before approaching a feeder, making them more comfortable, particularly in winter. Once birds obtain seeds from the feeder, the trees provide convenient, natural perches for birds to wait to crack open seeds.

For maximum security, place feeders within 10-15 feet of cover, allowing birds to feel safe while observing their surroundings.

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Name: _____

How Do Clouds Form?

What You Need:

2 four-litre wide-mouthed jars	chalk dust
warm water	2 rubber bands
2 large balloons	

What You Do:

1. Add 2-3 cm of warm water to each jar.
2. Cut the neck off the balloons, and stretch a balloon over each jar opening.
3. Allow the jars to sit for 10 minutes.
4. Lifting a section of the balloon, put a large pinch of chalk dust into one jar, and secure the balloon with a rubber band.
5. Gently push your fist down into the balloon so that your hand is in the jar for 10 seconds.
6. Lift your hand quickly.
7. Record your observations.
8. Repeat steps 6-7 with other jar, but do not add any chalk dust.

Observations:

Jar with chalk dust

Jar without chalk dust

Conclusions:

1. Explain the different results in the two jars.

2. How did pushing your fist into the jar help form the cloud?

3. How did quickly pulling your fist out of the jar help form the cloud?

4. Explain how a cloud formed in the jar.

5. What do you think would happen if you used cold water? Explain your answer.

Answers

1. Explain the different results in the two jars.

No cloud formed in the jar without chalk dust; water needed something to condense on.

2. How did pushing your fist into the jar help form the cloud?

The air pressure increased, warming the air.

3. How did quickly pulling your fist out of the jar help form the cloud?

It caused the air pressure to drop again, cooling the air so that the water vapour could condense around the chalk particles.

4. Explain how a cloud formed in the jar.

The air inside the jar became moist as the warm water evaporated. The chalk dust provided a substrate on which water molecules can form to make the cloud. Pushing your fist into the jar increased the pressure, which warmed the air. Pulling your fist out quickly caused the air pressure in the jar to drop suddenly and the air cools and condenses around the chalk particles.

5. What do you think would happen if you used cold water? Explain your answer.

The water will not evaporate and a cloud will not form.

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Name: _____

Water-Holding Capacity Comparison

Name: _____

Purpose: To compare the water-holding capacity of two soils by measuring percolation rates.

* Read the "Guide to Soil Selection" note to decide what types of soils you are collecting.

What You Need: 2 filter papers small measuring cup for baking
 2 rubber bands 2 large jars
 2 screens
 2 cans (same size) with both ends removed

What You Do:

1. Using a rubber band, secure a piece of filter paper to the base of each can.
2. Fill one can with Soil A and one can with Soil B, each approximately 2/3s full.
3. Place the cans on the screens over the mouths of the large jars.
4. Pour equal amounts of water into each can.
5. Measure:
 - a. how long it takes before water begins dripping into each jar
 - b. how long the water continues to drip into each jar
 - c. how much water eventually passes through each soil

Guide to Soil Selection

Soil is an important component of life that many of us take for granted. Without healthy soil, we cannot grow healthy food. Plants need thick, fluffy, nutrient rich soil to thrive. When you choose your two samples, do your best to choose two soils that are different. A lot will depend on where you get them. You can find samples in your garden, in a field, in a forest, or near water. If your soil is dark coloured, then it has a lot of organic material. If your soil is light coloured, then it has a lot of minerals in it. Here is a description of some common soil types


Typical "loam" soil is characterized by a balanced "loamy" texture that combines roughly 40% sand, 40% silt, and 20% clay. A specific loam soil is named for the type of particles that are present in the greatest amount, such as:

- Clay loam is a soil mixture that contains more clay than silt or sand. The particles of clay are very tiny and hold water very well. It feels sticky when wet.
- Silt loam is a soil mixture that contains more silt than clay or sand. It feels smooth, slippery, and soapy when wet.
- Sandy loam soil is a soil mixture that contains more sand than silt or clay. It is gritty and known for its light, crumbly texture.

The process by which water moves downward from the surface of a soil is called percolation. The speed at which water moves through the soil is called the soil's percolation rate. There are three (3) factors that affect a soil's percolation rate:

- particle size: fine particles slow the water down; large particles speed it up;
- structure & density: compacted, dense soils have fewer pores, slowing flow;
- initial moisture: how wet the soil is to start with.

Observations:

	Elapsed Time (minutes)	Duration of Dripping (minutes)	Amount of Water (mL)
Soil A			
Soil B			

Conclusions:

1. Which soil sample absorbed the most water? Why do you think so?

2. Why would the other soil sample be unable to absorb large amounts of water?

3. The continued action of percolating water is known as leaching. How can leaching be bad for a soil?

4. Try to identify the types of soil you sampled:
(is it a clay loam, silt loam, or sandy loam)

Soil A _____

Soil B _____

5. What type of soil would be best for growing plants in your garden?

Answers:

1. Which soil sample absorbed the most water? Why do you think so?

The soil sample that took the longest to percolate through. This soil would have the most clay in it.

2. Why would the other soil sample be unable to absorb large amounts of water?

This soil sample would take the shortest time to percolate. It is most likely a sandy loam because the particles of sand in the soil are large and easy for water to percolate through.

1. The continued action of percolating water is known as leaching. How can leaching be bad for a soil?

Leaching is the natural process where water, from rain or irrigation, moves downward through soil, dissolving and carrying away soil nutrients such as nitrogen and potassium. The nutrients percolate in deeper soil layers or groundwater, making them unavailable to the roots of plants.

2. Try to identify the types of soil you sampled:

Answers will vary.

5. What type of soil would be best for growing plants in your garden?

The best overall soil for most gardens is a loam soil, a balanced mixture of sand, silt, and clay. It offers the ideal combination of excellent drainage, moisture retention, nutrient availability, and good aeration. However, depending on the growth requirements of the plants, it is important to keep in mind that different plants thrive in different types of soils.

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Name: _____

Electrical Circuit Experiment

Name: _____

Purpose: To create a complete circuit.

What You Need:	2 strips of tin foil (15 cm x 1 cm)	half a potato
	2 paper clips	D cell battery
	2 clean pennies	clear tape
	tack	

What You Do:

1. Wrap the end of one foil strip around each penny, leaving half the penny uncovered. Secure the foil with a paper clip.
2. Insert the pennies into the potato about 1 cm apart. Make sure that the foil stays on the pennies.
3. Attach the other ends of the foil strips to the ends of the battery. Use tape to hold them firmly in place.
4. Use a tack to mark the position of the penny connected to the positive end of the battery.
5. Leave your set up overnight. The next day, remove the pennies from the potato. Examine the holes that they made. Record your observations.

Observations:

1. Do both holes look the same?

2. Describe what you see.

Conclusions:

3. There are typically four (4) parts to a circuit. Identify three (3) of the parts of the circuit you created.

- _____
- _____
- _____

4. Which part of this circuit is missing?

5. Is this an open circuit or a closed circuit? How do you know?

6. What would happen if we left one penny out of the potato?

7. You used two strips of tin foil to make this circuit. This is similar to the wires in an electrical cord. All electrical wires have two prongs on the plug. Why is this so?

8. Why are all the wires in the circuit of an electrical cord insulated?

9. Explain what is meant by a "short circuit"?

Answers:

1. Do both holes look the same?

No, one is green.

2. Describe what you see.

The electricity flowing through the circuit provided the energy for a chemical reaction in the penny which produced the green copper compound on the potato.

3. There are typically four (4) parts to a circuit. Identify three (3) of the parts of the circuit you created.

<i>source of electricity</i>	→	<i>battery</i>
<i>conductors</i>	→	<i>tin foil and potato</i>
<i>load</i>	→	<i>penny</i>

4. Which part of this circuit is missing?

The switch.

5. Is this an open circuit or a closed circuit? How do you know?

This is a closed circuit. The electricity flowing through the circuit provided the energy for a chemical reaction in the penny which produced the green copper compound on the potato.

6. What would happen if we left one penny out of the potato?

An open circuit would be created. The electricity could not flow through it, so there would be no chemical reaction in the potato.

7. You used two strips of tin foil to make this circuit. This is similar to the wires in an electrical cord. All electrical wires have two prongs on the plug. Why is this so?

The prongs each attach to a wire inside the cord. One wire carries electrons to the load; the other carries them back into a wire in the wall, which leads back to the power lines and back to the power plant, completing the circuit.

8. Why are all the wires in the circuit of an electrical cord insulated?

Electrical cords are insulated to protect them from touching one another and creating a short circuit. Insulation also protects us from electric shock when we touch the wires.

9. Explain what is meant by a “short circuit”?

Electrons always travel along the easiest path. If two wires touch, they form an easier path for the electrons to follow. The electricity will take the easier path, and the electricity will not make it to the load. As the electrons travel along the short circuit, they have nothing to use their electricity. A greater current flows through the circuit, making the wires hotter, which could eventually start a fire.

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Name: _____

Become a Rockhound!

A rock is a non-living, solid piece of the Earth's crust. Rocks form through a variety of different processes and they display a wide variety of shapes, textures, and colours. A rock can be a single mineral or a mixture of minerals.

A mineral is a non-living substance with a definite chemical composition and a crystalline shape. They are the building blocks of rocks. Each mineral has a specific chemical formula, often made up of elements such as silicon, oxygen, carbon, and iron. These elements combine in specific ways to form the distinct structures and properties of each mineral. The five most common minerals include: feldspar, quartz, silicate, halite (salt), diamond, and gold.

Each type of rock is named by the way it was made. There are three types of rocks: igneous, sedimentary, and metamorphic.

Igneous rocks - these are rocks that have formed by the process of cooling liquid rock. This liquid rock is called magma. Magma is hot, molten rock found below the Earth's surface. To turn to rock, the magma has to cool. The magma contains minerals, and when these minerals cool, the molecules in the minerals line up in a regular pattern to form crystals. The crystals in igneous rocks may vary in size, depending on the rate at which the magma cooled. If magma cools quickly, then the crystals have no time to form and are very tiny. If magma cools slowly, then large crystals form.

Sedimentary rocks - these are rocks formed from particles of other rocks. Rocks at the surface of the Earth get broken up by the weather, running water, people, or chemicals. These pieces of rock get carried away by a stream to a lake or ocean, and then settle to the bottom of the ocean. Layer upon layer builds up. In time, these pieces are pressed and cemented together to form sedimentary rock. Most sedimentary rocks are formed on the shallow sea floor near the shore.

Metamorphic rocks - these are rocks that were once igneous or sedimentary rocks that have been changed by great heat or pressure deep inside the Earth. Changes in metamorphic rocks occur while the rock is solid. The degree of change depends on the amount of heat and pressure exerted on it. It may undergo a change of the mineral grains, a change in the enlargement of crystals, or a change in the chemical composition. Each form of sedimentary and igneous rock has at least one metamorphic equivalent.

Metamorphic rocks are sometimes hard to identify since they often look like igneous rocks. But there is one trait that makes them easy to identify. When pressure is intense, minerals may align themselves in layers within the rock which results in alternating light and dark bands on the rock.

Common Examples of the Three Types of Rocks

Igneous Rock	Changes to	Metamorphic Rock
granite	→	gneiss
basalt	→	schist
gabbro	→	amphibolite

Sedimentary Rock	Changes to	Metamorphic Rock
sandstone	→	quartzite
shale	→	slate
limestone	→	marble

Where to Find Rocks & Minerals in Ontario

Ideally, all three types of rocks can be found just about anywhere in Ontario. It takes many, many years, but rocks can be moved around by natural forces such as water, wind, ice, gravity, and even people. Typically, though, there are places in Ontario where you are more likely to find these three types of rocks. They include:

Igneous rocks - these rocks are abundant across Ontario, particularly in the northern Canadian Shield region. Key locations include Bancroft, Parry Sound, Sudbury, and Thunder Bay.

Sedimentary rocks - these rocks are best found in areas where water, wind, or ice deposited sediments, such as riverbanks, beaches, lakebeds occur. Primarily areas in southern Ontario are along the Niagara Escarpment, the shores of Lake Huron (Manitoulin Island, Kettle Point), Lake Erie, and Lake Ontario.

Metamorphic rocks - these rocks are abundant across Ontario, particularly in the northern Canadian Shield region. Key locations include Bancroft, Madoc, and Haliburton Highlands.

What You Do:

Start rockhounding by researching your local geology and searching public lands, beaches, and riverbeds for "interesting" rocks. Focus on areas with high erosion, such as creek beds or gravel pits, or, large rock outcrops.

Collect as many different rocks as you can including igneous, sedimentary, and metamorphic when possible. If you can name the rock, that's a real bonus!!

Use the following seven (7) characteristics to help you identify each rock:

Characteristic	Igneous	Sedimentary	Metamorphic
Crystals	large and easily seen	none	small and not easily seen; line up in a straight line
Layering	not layered	layered	somewhat layered
Banding	not banded	banded	banded <u>or</u> not banded
Shininess	shiny surfaces	dull surface	shiny or dull surface
Fossils	no fossils	fossils <u>or</u> no fossils	no fossils
Texture	rough	usually smooth, or sometimes bumpy	rough <u>or</u> smooth
Color	mixture of white, black, and/or pink	dull reds or blacks, usually one color only	mixture of white and/or pink colors, <u>or</u> dull reds, browns, blacks, or grays (one only)

Conclusions:

1. Rocks and minerals are closely related, but they are not the same. How are they different?

2. Metamorphic and sedimentary rocks form in different ways. Name two (2) ways in which they may be similar.

- ---
- ---

3. Why do fossils appear in sedimentary rocks?

4. Why can't a fossil be found in an igneous or a metamorphic rock?

Rock Samples

Name of Rock	Type of Rock
obsidian	igneous
gypsum	sedimentary
porphyry	igneous
gneiss	igneous
diorite	metamorphic
lignite	sedimentary
slate	metamorphic
basalt	igneous
syenite	igneous
shale	sedimentary
limestone	sedimentary
feldspar	igneous
marble	metamorphic
conglomerate	sedimentary
biotite	igneous
quartz	igneous
dolomite	sedimentary
sandstone	sedimentary
gabbro	igneous
quartzite	metamorphic

Answers:

1. Rocks and minerals are closely related, but they are not the same. How are they different?

A rock has no definite composition. Therefore, a rock has no definite properties and therefore they cannot be grouped.

2. Metamorphic and sedimentary rocks form in different ways. Name two (2) ways in which they may be similar.

- *they both can have crystals*
- *they both may be the same colour*
- *they both could be banded*

3. Why do fossils appear in sedimentary rocks?

Plants or animals settle to the bottom of a waterbody. They remain trapped in the sediments and over a period of time, pieces of the plant or animal dissolve and are replaced by minerals. The weight of the sediments produces a fossil.

4. Why can't a fossil be found in an igneous or a metamorphic rock?

Once a fossil undergoes heat or pressure, it would be destroyed.

Name: _____

Official Birds & Flowers of Canada's Provinces and Territories

1. Canada is home to a wide variety of plants and birds. A select few have been recognized by each of Canada's ten provinces and three territories as their official bird and flower. On the map, identify each of these provinces and territories by writing the number of the province and territory from the list provided.



Canada's Ten Provinces

1. Alberta
2. British Columbia
3. Manitoba
4. New Brunswick
5. Newfoundland & Labrador
6. Nova Scotia
7. Ontario
8. Prince Edward Island
9. Quebec
10. Saskatchewan

Canada's Three Territories

11. Northwest Territory
12. Nunavut Territory
13. Yukon Territory

2. Fill in the chart below with each province and territory's provincial bird and flower.

Province	Bird	Flower
Alberta		
British Columbia		
Manitoba		
New Brunswick		
NFLD & Labrador		
Nova Scotia		
Ontario		
P. E. Island		
Quebec		
Saskatchewan		

Territory	Bird	Flower
Northwest		
Nunavut		
Yukon		

3. Identify the capital city of each of Canada's provinces and territories.

Province	Capital City
Alberta	
British Columbia	
Manitoba	
New Brunswick	
Newfoundland & Labrador	
Nova Scotia	
Ontario	
Prince Edward Island	
Quebec	
Saskatchewan	
Northwest Territory	
Nunavut	
Yukon Territory	

4. What province has *Canada's* largest population?

5. What province has *Canada's* smallest population?

6. a. What province has *Canada's* rarest animal?

b. What is this animal called?

7. What animal represents *Canada's* national symbol?

8. Name the three (3) Canadian provinces that were named after royalty.

• _____

• _____

• _____

Answers:

1.



2. Fill in the chart below with each province and territory's provincial bird and flower.

Province	Bird	Flower
Alberta	<i>Great Horned Owl</i>	<i>wild rose</i>
British Columbia	<i>Stellar's Jay</i>	<i>Pacific dogwood</i>
Manitoba	<i>Great Gray Owl</i>	<i>prairie crocus</i>
New Brunswick	<i>Black-capped Chickadee</i>	<i>purple violet</i>
NFLD & Labrador	<i>Atlantic Puffin</i>	<i>purple pitcher plant</i>
Nova Scotia	<i>Osprey</i>	<i>mayflower</i>
Ontario	<i>Common Loon</i>	<i>white trillium</i>
P. E. Island	<i>Blue jay</i>	<i>lady's slipper</i>
Quebec	<i>Snowy Owl</i>	<i>blue flag iris</i>
Saskatchewan	<i>Prairie Sharp-tailed Grouse</i>	<i>western red lily</i>

Territory	Bird	Flower
Northwest	<i>Gyr Falcon</i>	<i>mountain avens</i>
Nunavut	<i>Rock Ptarmigan</i>	<i>purple saxifrage</i>
Yukon	<i>Common Raven</i>	<i>fireweed</i>

3. Identify the capital city of each of Canada's provinces and territories.

Province	Capital City
Alberta	<i>Edmonton</i>
British Columbia	<i>Victoria</i>
Manitoba	<i>Winnipeg</i>
New Brunswick	<i>Fredericton</i>
Newfoundland & Labrador	<i>St. John's</i>
Nova Scotia	<i>Halifax</i>
Ontario	<i>Toronto</i>
Prince Edward Island	<i>Charlottetown</i>
Quebec	<i>Quebec City</i>
Saskatchewan	<i>Regina</i>
Northwest Territory	<i>Yellowknife</i>
Nunavut	<i>Iqaluit</i>
Yukon Territory	<i>Whitehorse</i>

4. What province has Canada's largest population? *Ontario*
5. What province has Canada's smallest population? *Prince Edward Island*
6. a. What province has Canada's rarest animal? *British Columbia*
b. What is this animal called? *Vancouver Island marmot*
7. What animal represents Canada's national symbol? *Beaver*
8. Name the three (3) Canadian provinces that were named after royalty.
Alberta, Prince Edward Island, New Brunswick

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Name: _____

The Night Sky

Set yourself a goal of learning to identify a number of celestial objects in the night sky, including planets, certain stars, and constellations. Watch the night sky every night for a month. Record what you see with drawings. Report all your findings to your Pack.

Planets

Scattered around the Sun are the planets, which move in various orderly ways. Although all the planets follow the same laws of motion, the planets themselves differ from each other in size, motion, composition, density, and temperature. No two are exactly alike, although some share a few similar features.

The Inner Planets - these four small planets have a solid, rocky composition. They are often called the terrestrial planets. They include Mercury, Venus, Earth, and Mars.

The Outer Planets - these four giant planets are made up of mainly gases (hydrogen and helium). They are often called the Jovian planets. They include Jupiter, Saturn, Uranus, and Neptune.

Pluto - no longer considered a full planet of the solar system (since August 2006).

Stars

Just as humans are born, grow up, and eventually die, scientific evidence shows that a star has its own life cycle, which span billions of years. A typical star is an enormous ball of hot gases that releases enormous amounts of light and heat energy.

Distances between stars are so great, that scientists have developed a new measurement, the light-year, to measure their distances from each other. A light-year is the distance that light can travel in a vacuum in one year. One light-year is equal to about 9.5×10^{12} km (about 6 trillion miles).

Individual stars are different. They differ in their mass, size, temperature, and luminosity (the amount of light they emit). A star's brightness to us on Earth may not be their actual brightness. Some stars that look dim are actually bright stars that are very far away.

The following table lists the 10 brightest stars in the night sky with their distances starting with the closet star to Earth.

The 10 Brightest Stars	Distance From Earth in Light-Years
Alpha Centauri	4
Sirius	9
Procyon	11
Vega	26
Arcturus	36
Capella	46
Aldebaran	68
Achernar	114
Betelgeuse	490
Rigel	900

It would take 150 000 years to get to Alpha Centauri in a spaceship!

Constellations

Stars seem to make shapes or patterns in the sky. Since ancient times, people have imagined that groups of stars form pictures of animals, people, things, gods, and goddesses. These picture groups of stars are called constellations. Although the individual stars look like they are close together, they are not. They are actually very far from each other and at different distances from Earth. Some constellations include Orion the Hunter, Queen Cassiopeia, The Pleiades, the Big Dipper, and the Little Dipper. These are easy to locate in the night sky.

Conclusions:

1. The planets are named after Roman gods or goddesses. Find out which planets are named after the following gods or goddesses.

a. Roman goddess of beauty and love _____

b. Roman god of the sea _____

c. Roman god of agriculture _____

d. Roman god of war _____

e. Roman god of the heavens _____

f. speedy messenger of the Roman gods _____

g. Roman god of the underworld _____

h. Roman king of the gods _____

2. Why is Pluto is no longer considered a full planet of the solar system?

3. What two (2) planets are visible most nights in the night sky?

• _____

• _____

4. Other than Earth, which planet offers the greatest possibility for humans to survive on? How do you know?

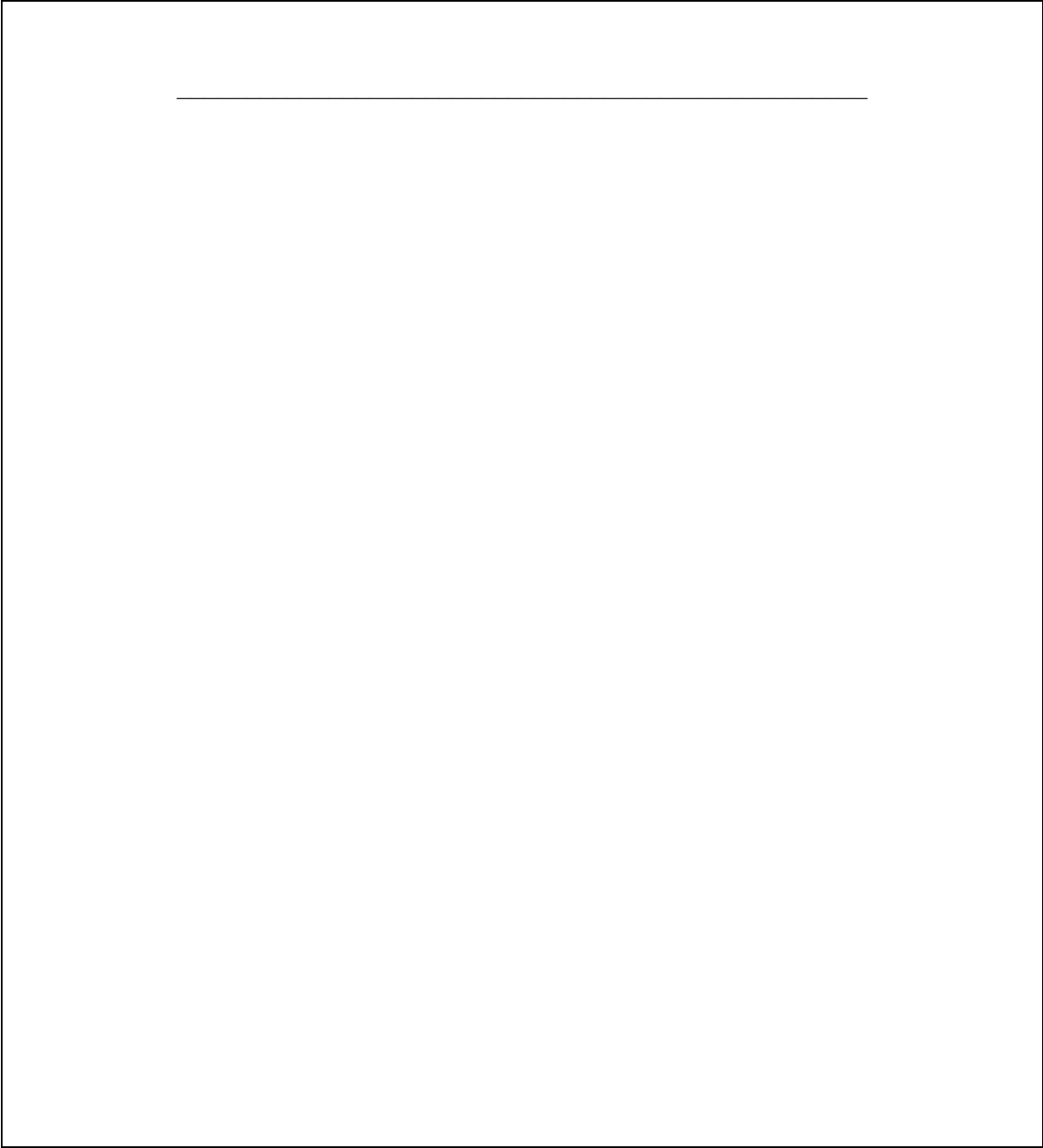
5. Venus is considered Earth's twin, yet we would probably not survive on Venus. Why?

6. Why do we see different constellations in the night sky at different times of the year?

7. In what constellation would you find Betelgeuse and Rigel? _____

8. Orion was in love with Diana, the goddess of the hunt. Her brother Apollo, God of the archery did not approve. He tricked Diana into shooting an arrow at a distant rock, which was actually the head of Orion, who was swimming in the water. Her arrow killed him. The god Jupiter gave Orion a place in the sky as a constellation.

On the next page, design a constellation of your own in the box provided and give it a name. Create a story to explain how your constellation got its name and how it got in the sky.



Answers:

1. The planets are named after Roman gods or goddesses. Find out which planets are named after the following gods or goddesses.

a.	<i>Roman goddess of beauty and love</i>	<i>Venus</i>
b.	<i>Roman god of the sea</i>	<i>Neptune</i>
c.	<i>Roman god of agriculture</i>	<i>Saturn</i>
d.	<i>Roman god of war</i>	<i>Mars</i>
e.	<i>Roman god of the heavens</i>	<i>Uranus</i>
f.	<i>speedy messenger of the Roman gods</i>	<i>Mercury</i>
g.	<i>Roman god of the underworld</i>	<i>Pluto</i>
h.	<i>Roman king of the gods</i>	<i>Jupiter</i>

2. Why is Pluto is no longer considered a full planet of the solar system?

Pluto has been reclassified as a “dwarf planet”, a new category for solar system bodies distinct from the eight “true” planets. Following a resolution of the International Astronomical Union (IAU), Pluto is no longer a full planet of the solar system because it doesn't meet the International Astronomical Union's (IAU) 2006 criteria. While Pluto orbits the Sun and is round, its small mass means its gravity isn't dominant enough to sweep its orbit clean of other objects as it shares its path in the Kuiper Belt with many other icy bodies. It has been reclassified as a dwarf planet.

3. What two (2) planets are visible most nights in the night sky?

Venus is best seen in the west just after sunset or in the east before sunrise. As the brightest planet, it is visible to the naked eye for months at a time, moving closer to the Sun between these phases.

You can see Mars from Earth when it's opposite the Sun, usually appearing in the southern sky, occurring roughly every 26 months, making it brightest and visible all night. It will become more prominent in the evening sky through late 2026 as it approaches another favorable opposition in 2027. Look for a reddish star, often visible from sunset to sunrise, becoming especially bright and high in the sky.

4. Other than Earth, which planet offers the greatest possibility for humans to survive on? How do you know?

Mars

- *its day length is about 24 hours (this is important to photosynthesizing plants);*
- *its axis is tilted at a degree similar to Earth's (23.5°), causing seasons;*
- *its gravity is about 1/3 that of the Earth;*
- *its temperature - summer temperatures are similar to Earth; winter temperatures are well below 0° C.*

5. Venus is considered Earth's twin, yet we would probably not survive on Venus. Why?

We could not survive on Venus because it is much too hot and has a poisonous atmosphere, high atmospheric pressure at the surface, and no liquid water.

6. Why do we see different constellations in the night sky at different times of the year?

The night sky, as seen from the Earth, is always in the direction away from the Sun. During the course of a year, the Earth moves around the Sun. As a result, we look outwards at different constellations.

7. In what constellation would you find Betelgeuse and Rigel?

Orion

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Name: _____

The Moon

Watch the Moon every night for a month. Record what you see with drawings. Report all your findings to your Pack along with answers to the five (5) questions.

The Moon

A natural or artificial body that orbits a planet is called a satellite. Our Moon, also called Luna, is Earth's only natural satellite. The moon revolves around Earth from west to east in an elliptical orbit. Its period of revolution is $27 \frac{1}{2}$ days. The Moon is a light for the night. (The Moon itself does not emit light. The light we see is reflected light from the Sun).

The Moon has distinctive features and characteristics. It is 3 476 km in diameter (1/4 that of the Earth) and has an average distance of about 380 000 km from the Earth. The Moon's mass is very small, and as a result, it has low gravity (about 1/6 that of the Earth). With a weak gravity, the Moon cannot hold an atmosphere; therefore, the Moon lacks weather, clouds, rain, wind, and surface water. Astronauts carry air with them on the Moon and communicate through radio because the Moon has no air to carry sound.

The Moon's Effect on Tides

The surface of the Earth's oceans rise and fall twice daily in response to the gravitational attraction of the Moon. These regular changes in the ocean's surface, or tides, result in most shoreline areas having two daily high tides and two low tides as sea level rises and falls anywhere from a few centimetres to more than 15 metres.

The tides occur because of the movement of the Moon around the Earth, and to a lesser extent, the Earth around the Sun. Because the Moon is very close, the Moon exerts a force on Earth. Earth responds by moving toward the Moon. Any water that is on the side of Earth facing the Moon moves toward the Moon faster than Earth can. That creates a bulge.

On the other side of Earth not facing the Moon, Earth moves faster toward the Moon than can the waters on that side. That creates another bulge. These two bulges always point toward and away from the Moon, so as Earth rotates and the Moon's position changes, an observer at a particular shoreline location will see the rise and fall of tides twice daily.

Tides move in 12 hour and 25-minute cycles, so if it is low tide at 7:00 a.m., you know it will be low tide again at 7:25 p.m. High tide occurs halfway between (at about 3:12 p.m.). The Moon revolves around the Earth every 28 days in the same direction that the Earth rotates. Because the Moon rotates more quickly than the Earth, the time of the tides in a specific place is about 50 minutes later each day. Thus, an observer would experience a high tide at 1:00 p.m. on one day, and at 1:50 p.m. on the following day.

Conclusions:

1. What would it be like to play basketball on the Moon?

2. In 1969, Neil Armstrong was the first human to set foot on the Moon. Many photographs were taken of his footprints. Do you think the footprints left by Neil Armstrong are still there? How do you know?

3. Why does the Moon, and not any of the planets of the solar system, have an effect on the Earth?

4. Where in Canada can the highest tides be found? How high do they get?

5. Draw a picture of and label the 8 phases of the Moon.

Answers:

1. What would it be like to play basketball on the Moon?

If you threw the basketball, it would fall 6 times slower. You could also jump 6 times higher.

2. In 1969, Neil Armstrong was the first human to set foot on the Moon. Many photographs were taken of his footprints. Do you think the footprints left by Neil Armstrong are still there? How do you know?

Because the Moon has no atmosphere, erosion, or weather, the footprints are still there.

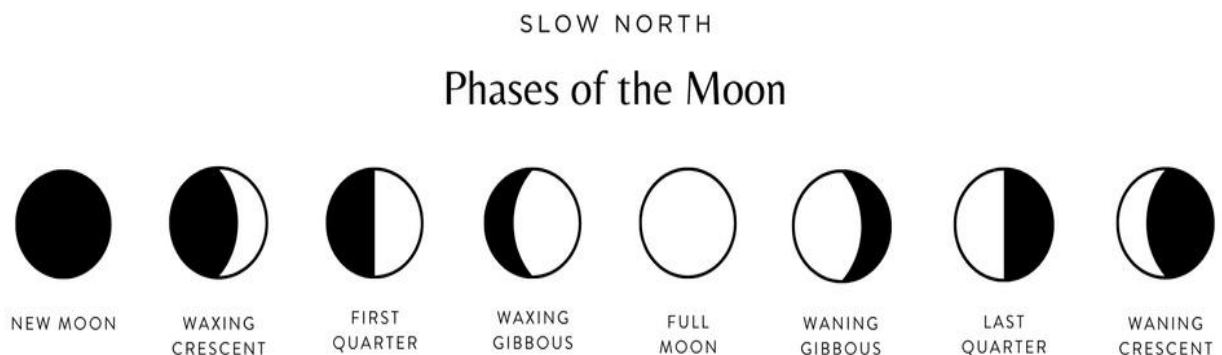
3. Why does the Moon, and not any of the planets of the solar system, have an effect on the Earth?

Despite their large size, in comparison, the Moon's mass is small, but it is so close that its force of gravity affects the Earth. Planets are too far away.

4. Where in Canada can the highest tides be found? How high do they get?

The highest tides in Canada are in the Bay of Fundy, which separates New Brunswick from Nova Scotia, reaching up to 16 metres (52+ feet) high.

5. Draw a picture of and label the 8 phases of the Moon.



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Name: _____

Finding the Big Dipper

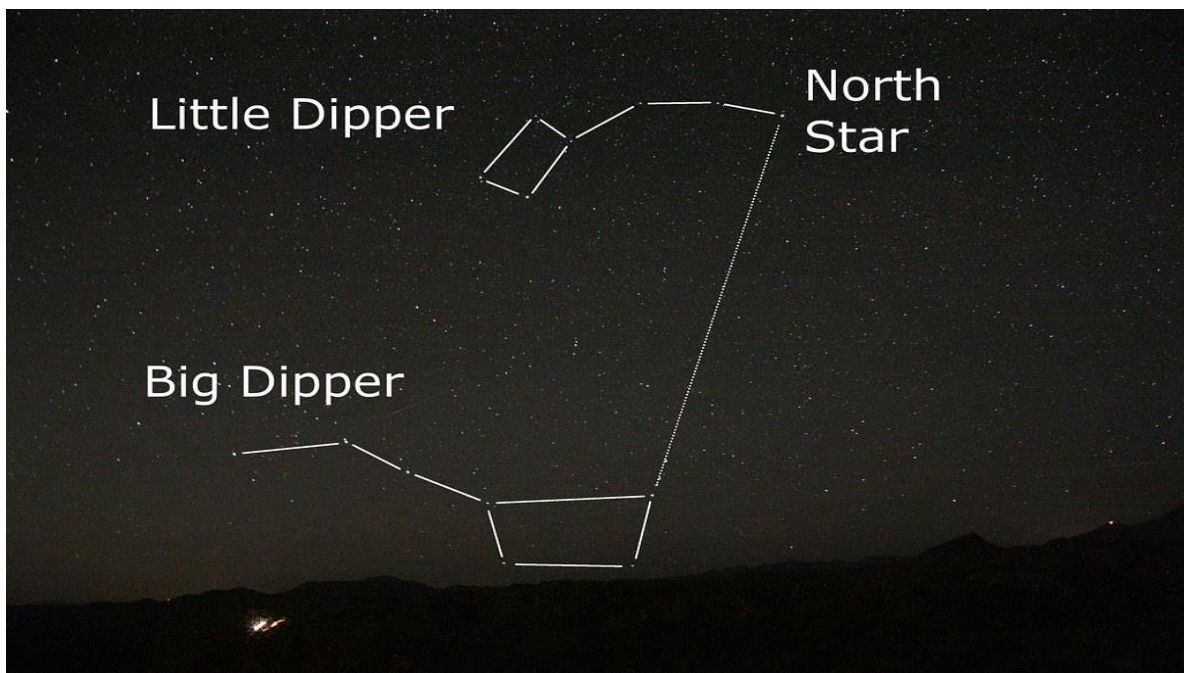
Purpose: To teach a younger sibling or a Beaver Scout how to find the Big Dipper in the sky.

Location: _____ **Date:** _____

Time: _____

What You Do:

1. On a clear night, choose a viewing spot as free as possible from obstacles such as trees or buildings. Record the date, location, and start time. Relax, and let your eyes become accustomed to the dark.
2. Locate the Big Dipper in the northern horizon. Observe the seven stars in the Big Dipper. Look closely at the second star from the end of the handle.



Conclusions:

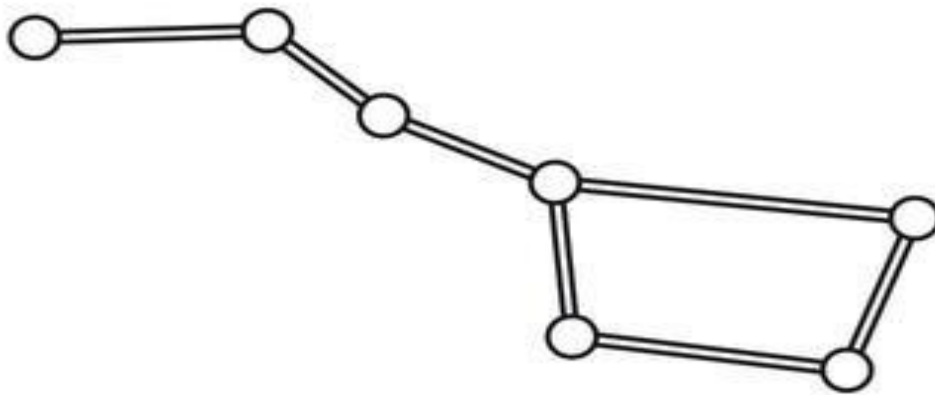
1. Why is the Big Dipper high in the sky in the spring/summer and lower, closer to the horizon in the fall/winter?

2. What did you notice about the second star from the end of the handle of the Big Dipper? You have to look very closely. What is this pattern called?

3. Two observers wish to view the Big Dipper from a medium-sized city and the other from 50 km outside the city. Which one would get the better view and why?

4. How could Polaris be useful to a person who is lost?

5. There are seven stars that make up the Big Dipper. Their names are: Dubhe, Merak, Phecda, Megrez, Alioth, Mizar, and Alkaid. Label each star in the following picture of the Big Dipper with the correct name.



Answers:

1. Why is the Big Dipper high in the sky in the spring/summer and lower, closer to the horizon in the fall/winter?

As Earth moves around the Sun, our vantage point changes, altering the position and orientation of the Dipper relative to the horizon at the same time of night.

2. What did you notice about the second star from the end of the handle of the Big Dipper? You have to look very closely. What is this pattern called?

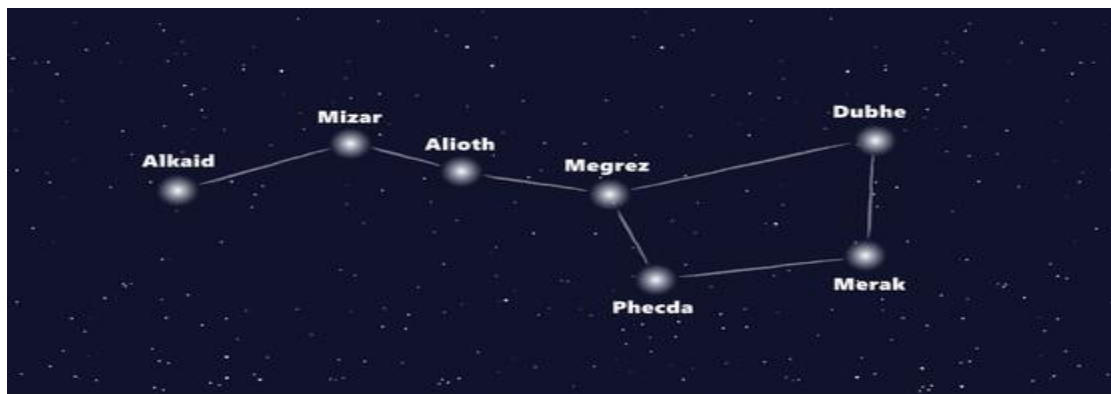
There is a smaller star located beside it. This pattern is called a binary star.

3. Two observers wish to view the Big Dipper from a medium-sized city and the other from 50 km outside the city. Which one would get the better view and why?

Generally, the viewer outside the city would have the advantage. It would be easier to find open ground clear of obstructions for viewing. In addition, there would be fewer lights that could drown out the fainter stars in the Big Dipper.

4. How could Polaris be useful to a person who is lost?

Polaris remains fixed in the sky directly above the North Pole. By locating it in the sky, a person can orientate themselves with north easily.



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