Electricity: Changes in Northern Society

An Integrated Science Learning Unit for Yukon Students

March 2012

Acknowledgments

In 2008, the Yukon First Nation Education Advisory Committee proposed several goals and priorities for education in the Yukon. Central priorities included the development of curriculum and resources that integrate into curricula, First Nations content, perspectives, values, knowledge *and ways of teaching and learning.* This resource provides teachers with the support for providing learning experiences that allow for learning to be grounded in the heritage of northern students including culturally preferred learning styles rather than just learning about their heritage.

The development of this resource for teachers and students in the northern Yukon has been made possible through the granting agency Social Sciences and Humanities Research Council. Their support has ensured that northern students are provided with the opportunity to learn about their heritage through means responsive to their learning style preferences, especially when they study core curriculum areas such as science. The development of this resource has also been made possible through the support of the Tr'ondëk Hwëch'in community of Dawson City. The elders and community members have given their time and knowledge to ensure that their experiences can be recorded and incorporated into learning activities valuable for their community's children.

As well, the school community of Robert Service School, especially the teachers of the Intermediate grades is thanked for its support in the development of the learning activities outlined in this resource.

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Guiding Principles of the Unit

- Draw upon teaching orientations that are identified as culturally located practices.
- Affirm cultural competencies honored by the local community.
- Provide two-way learning experiences by integrating traditional knowledge, beliefs and values and contemporary scientific knowledge, processes and attitudes.
- Use traditional and contemporary cultural examples as contexts for student learning.
- Include the local community and its people in students' learning opportunities, especially in the use of narratives including local people.
- Foster Han language development where possible.
- Use diagnostic and formative assessment to inform planning and teaching and monitor student learning.
- Engage students by starting lessons by providing first-hand experiences for students or drawing upon common experience.
- When using story to engage students, use the interrupted-story-line as a vehicle to prompt consideration and first-hand investigations.
- Deliberately promote scientific attitudes of mind (curiosity, problem-solving, working to end) student through thoughtful independent consideration of questions and challenges posed.
- Move from the experiential, first-hand experiences to the psychological; that is, after providing concrete experiences assist students in making sense of experiences by using purposeful strategies to promote understanding such as role plays, illustrations and analogies.
- Assist students in their consolidation of ideas only as an extension of the initial experiential and psychological learning experiences.
- Provide opportunities for student-initiated and directed investigations.
- Provide opportunity for students to make connections among science and all other learning areas.
- Foster student independence, creativity and curiosity by providing opportunity for students' ideas and questions and follow-up opportunities for problem-solving and investigation.
- Provide students the opportunity to make connections between what they are learning and career opportunities specific to the local context.

Conceptual Ideas and Progression

The recommended sequence for supporting student conceptual development of the phenomenon of electricity is suggested below. For the most part, the activities and the conceptual and skill development embedded within the activities are sequential. Lower elementary experiences and ideas primarily focus on experiencing and communicating these experiences. Upper elementary experiences focus on understanding and investigating these experiences and appreciating applications of this understanding to their students' everyday world.

Electricity

In this study, students gain a basic understanding of how electricity works. They explore the characteristics of static and current electricity. Students discover the characteristics of conductors, insulators, switches, batteries, light bulbs, and electromagnets. Students test, design, construct, and evaluate various combinations of circuits, switches, batteries and bulbs. Students examine the production and transmission of electricity in the Yukon.

Vocabulary

atom, electron, static electricity and current electricity, electrical current, closed and open circuit, conductor, insulator, battery, magnetism, parallel circuit, series circuit, switch, voltage, geothermal, nuclear, tidal, solar, wind power, biomass power, coal, gas, fossil fuels, hydro, hydro-electric dams, renewable, non-renewable, consumption, conservation, electrocution, direct current, bulb, positive, negative, electrical energy.

. It is suggested teachers address the following key ideas:

- There are many things we use every day that depend on electricity to work.

- The things we use electricity for can be categorized into groups such as heating, lighting and operating machines.
- Life in our community would be very difficult without electricity.
- Life was very different before electricity arrived in our community.

- A battery is a source of electricity
- An electrical circuit requires and energy source, a means of carrying the electricity and a component that will use the electricity.
- A bulb contains a filament and resists electrical current causing friction which causes the filament to glow to produce light.
- A switch can be placed in a circuit to open and close the circuit.
- We can make modifications to an electrical circuit to make electric motors and electromagnets which assist us in our daily lives.
- Insulators and conductors influence an electric current.
- Electricity can flow in circuits that are arranged in series or in parallel.
- Heating appliances are similar in that they form heat because of resistance.
- In our town the major source of electricity is the local power generator is run by burning diesel fuel
- Before the diesel generator there were wind turbines.
- The town's electricity lines among households are arranged in series and in parallel.
- There have been many changes in our community because of the arrival of electricity.
- There are safety concerns associated with electricity.
- We need to make wise decisions about energy use in our community.
- Lightning and thunder are associated with static electricity.
- There are other forms of static electricity and it is the result of the accumulation of excess charge caused by movement of electrons - a negatively charged particle
- The presence of excess electrons produces a net negative charge, and the lack of electrons produces a net positive charge
- Unlike electric charges attract, and like charges repel

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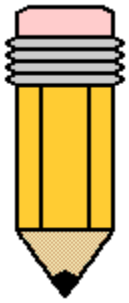
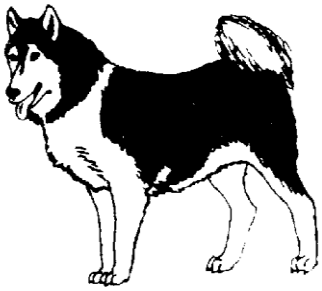
http://www.moonraker.com.au/techni/lightning.jpg

What Things Need Electricity? How do you Know?





What Things Need Electricity?

Draw pictures of things that need electricity to work.

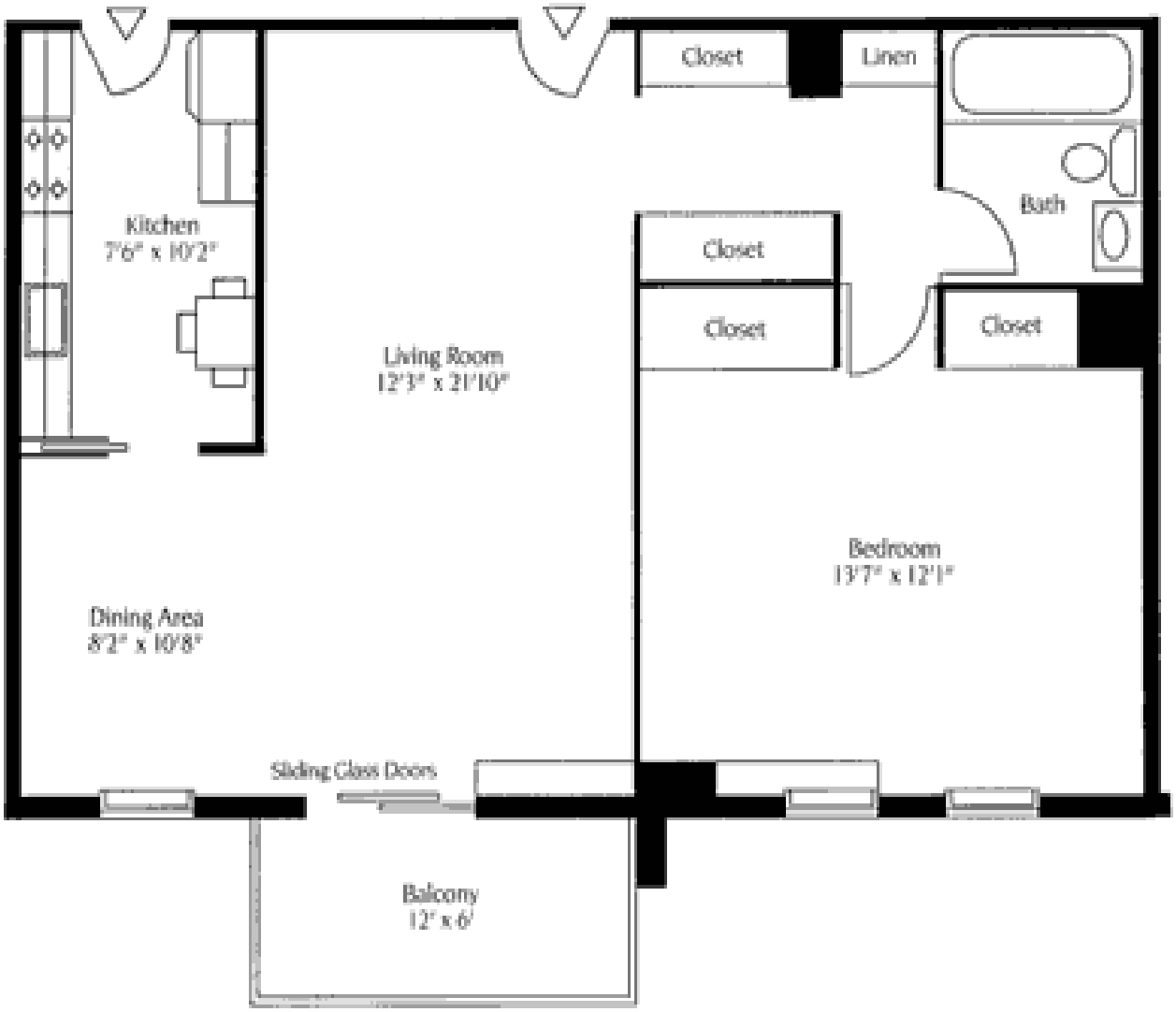
Draw pictures of things that do not need electricity to work.

What do you look for to find out if something needs electricity to work?

Objects in the Home that Need Electricity

Draw these things in the house that need electricity.

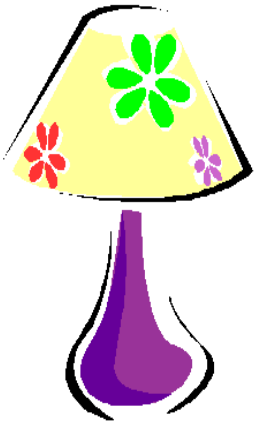
Kettle	Computer	Toaster	Socks
Light	Jacket	Stereo	Oven
Lamp	Fridge	PS3	Bread
CD player	Telephone	Knife	Milk
Chair	Table	Camera	Shoes



Which One Doesn't Belong?

Below are three sets of household items. Which one does not belong in each set? Explain to someone why it doesn't.

1. Group One

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2. Group Two



3. Group Three



Things I Enjoy Doing

My Favorite thing to do at Home	My Favorite thing to do at School
My Favorite thing to do in my Town	**My Favorite thing to do in the World**

Part of a Day in the Dark Season without Electricity

1. I wake up when I hear the radio playing.
2. I turn on my bedroom light.
3. I go to the toilet and flush the toilet.
4. I wash my hands in hot water.
5. I turn on the television.
6. I go to the kitchen and plug in the kettle.
7. I take a piece of bread and put it in the toaster.
8. I put hot chocolate in a tea-cup.
9. I put water in the cup.
10. I stir the water to make a drink.
11. I butter the bread and put jam on it.
12. I talk to my family.
13. I begin to watch television.
14. I eat my bread and drink my hot chocolate.
15. I go to the bathroom and brush my teeth.
16. I get dressed for school.
17. I say good-bye to my family and walk to school.
18. My brother's friend gives me a ride to school on the skidoo.
19. I go in the school and go to my classroom.
20. We drink hot soup in the classroom and have crackers and cheese.
21. We listen to O Canada and the announcements on the school intercom.
22. We do our morning journal writing.
23. We learn some mathematics.
24. We read a story together as a class.
25. We go to the gym to play soccer.
26. We watch a video on the large animals in our area.
27. An elder comes to our classroom and talks to us about hunting long ago.
28. We ask questions and then draw a picture and write a story about what the elder tells us.
29. We get a ride home for lunch in the truck with my mother.
30. We have macaroni and cheese and bannock for lunch.
31. I listen to the radio with my family.
32. I help wash the dishes.
33. I walk back to school.
34. We go to the computer room and look at pictures of large animals and hunting.
35. We write a story about hunting today.
36. At our classroom we take turns reading our stories to others.
37. We go to language lessons and learn native terms for local animals
38. I go home after school and ……

What Did our Elders do Before Electricity?

Life Today	Life Long Ago
	
	
	
	
	

Life in the Blackstone: *The following is an account of life from the early 1900s in the Upper Blackstone area which the Dempster Highway travels through today by Annie and Joe Henry.*

In those days in the fall we would go up to the Blackstone River, north of Dawson, area to hunt caribou. It would take a long time to get from Klondike Valley to Blackstone. We would camp near the river. If there were no caribou, we would even have to catch ground hogs.

The trees were very small in that area so the log homes we would build were small Everything had to be done by hand. That was the way it was. We had to cut wood. We would make small dome shaped homes to live in too. We would cut willow and make into a frame like a dome and then put caribou hides on top. Snow and moss would be put around sides to keep warm inside. There was a hole in the top to let smoke out. Inside there were no beds. You would sleep on the ground. Maybe spruce boughs would be put on floor. Candles would be used for light. We would cook by wood fire.

Life without Electricity: *The following story is an adaptation of an interview with Thomas Selamio about life on the arctic coast.*

At first all we had for light and cooking was the oil lamp, the qulliq. In the dark season we sometimes had the moon for light when cooking, but still, even with the moon, it was so important to have the qulliq. It was very important to us.

If we were working inside and needed to see well, we could light more of the qulliq to get more light. The qulliq had a wick of cotton flower in it and by lighting more of it we got more light. We could take a stick and dip it in the oil of the qulliq and light the stick. Then we could carry the stick and use it to look for things..

When we worked outside the we would have the qulliq near the entrance. Then the light from the qulliq would give light outside and we would be able to do work like fixing the toboggan.

Then when the kerosene lanterns and primus stoves came it was so different. We could light up the night because of the great light it gave off. We used to be amazed that there could be such bright light from the kerosene oil lamp. We took care of the lamp because the glass was so fragile. It was easy to break and it was very important to us. We used these things sparingly as we needed to conserve the fuel. The qulliq was still used.

http://www.dianefarrisgallery.com/artist/xiong/ex96/images/image08s.jpg

When Electricity Came: *The following story is an adaptation of an interview with Annie Peterloosie of Pond Inlet.*

We would always be excited when people came back to the camp from the town where the store was and it was here that special things would always come from. There was one time they brought a lantern back to the camp. It was so bright. I would look at it really closely for a long time and then when I would look away, I would see lots of black spots because I had looked at the light too closely. Or, sometimes you would get black soot on your face from the lantern because we would put our face so close to it.

Then, one time when I was still a child, I remember coming to the store. It was so bright inside and the light was hanging from the ceiling of the store. I was fascinated that there could be so much light and that it came from this object hanging from the roof.

The light was in the store and in the police station and the church mission. These were the only places that this light was found. The mission, police station and store all had wind generators. The wind would make or generate electricity and this would be used to make the lights go.

It was only when we moved to the houses provided by the government in the 1950s that we had lights like this from electricity.

By that time the electricity did not come from a wind generator. By then it came from fuel generators. I think sometimes that we should still be using wind generators.

How Things Have Changed: This is an adaptation of an interview with *Peter Tatigat Arnattiaq* of Igloolik

It was not easy living at the hunting camp. I recall there were many times we did not have enough food or fuel for cooking. Within our family, we used to help each other especially when we had to hunt in one location. We would help out the people that needed to be assisted in any way which included food to eat. Wherever we lived we found that it was very difficult to do it on our own. We were constantly faced with difficulty. Little do they realize today that even drinking water was hard to get. My late sister-in-law at one time tried to drink her own urine. There was no source of drinking water as it was difficult to make fire in order for them to melt ice. Of course she could not drink her urine as it tasted terrible. Thirst is something that is hard to endure.

When we moved to the community, life changed. The things that before were hard to come by like heat and shelter were now given freely to us. We were very thankful we were given all of this. It was not like we asked for it. In the beginning we would do things for each other. For example, when we were running short on ice for drinking water we would hitch up our dog team and go out to get some ice for drinking water. So after the community had been settled, they used to cut blocks of ice in the fall so that there would be some ice for the coming winter. We use to get some ice for the whole community. If we saw that a certain household needed ice for their drinking water we would take it upon ourselves to go and get some water for them. So this was the way we youngsters would do things in our time. If we felt that another household needed some more ice, we would go back and get some ice for that certain household.

Soon, those who were made to cut some ice blocks were earning a pay to do the cutting of blocks of ice. We had never been paid before for getting some ice for drinking water. Indeed, it never occurred to us for any type of cash payment when we were getting some ice for drinking water. Then it became expected that you would be paid. Soon, it was expected you would be able to be given ice or water. What was first given freely was now expected to be given. I began to not give so willingly when people expected it.

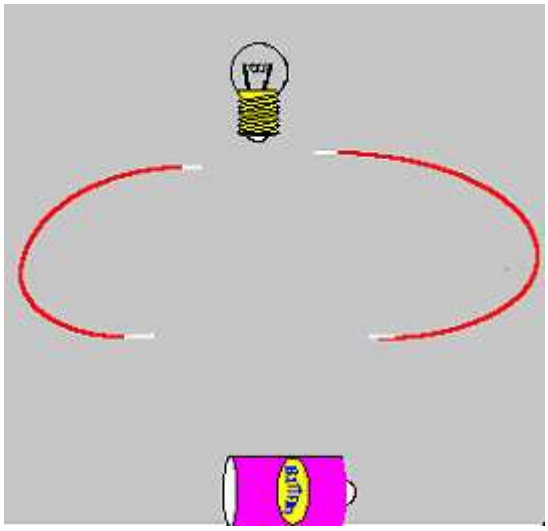
Now we are assisted with everything. All of the heat and light are provided for by the government.

In the space below, write and draw pictures to describe life long ago. In your picture, show at least 5 things used that did not need electricity.

In the space below, write and draw pictures to describe life today when people live in their homes or are camping. In your picture, show 5 things used that need electricity.

How do you connect the wires, battery and build to make the bulb go?

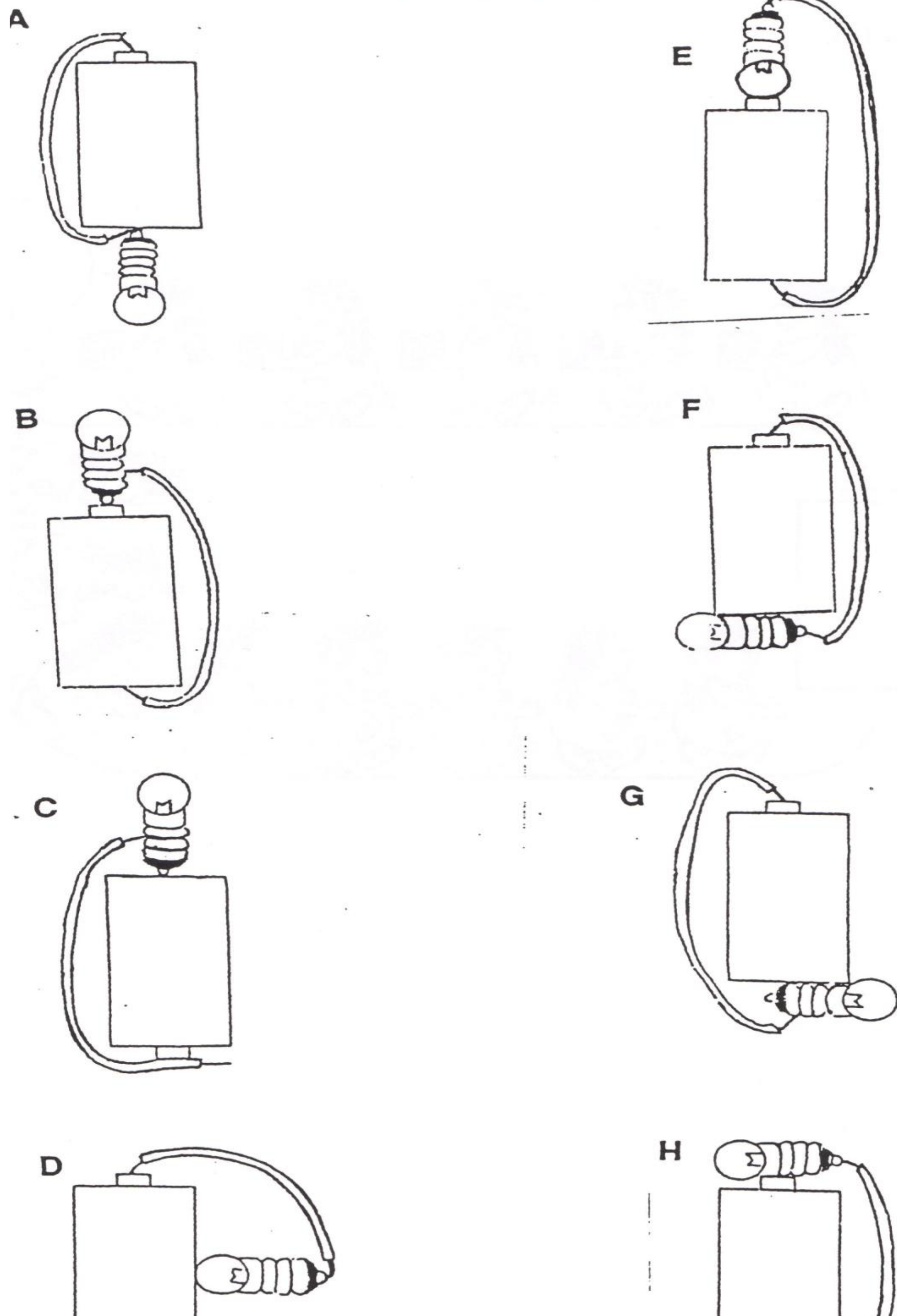
Draw a picture to show how you think you can how to show use the wires, bulb and battery to make the bulb go.



Once you get the bulb to go, draw in how you connected the 2 wires to the battery and bulb to make it go.

Now try to get it to go with just one wire, battery and bulb. Draw the picture of how you connected them to make the bulb go.

Test Sheet



Calling for Help: This is an adaptation of an interview with *George Kappianaq* of *Igloolik*

I recall a very difficult time when we were traveling. When we were traveling back by canoe to Igloolik from hunting we were running through ice floes that had just formed in October. We had difficulty running through them, but we were able to pass them slowly. We left to cross into Igloolik, and this was now towards evening. There were times when the canoe had to be rocked in order to go through thin ice and to prevent it from getting a hole from the ice.

The sun soon set. It was getting dark. We would try to go to ice free areas, where we would go fast, but then soon we would have to go through thin ice again. It was a wonder that the canvas skin of the canoe did not get punctured as there was so much thin ice that we had to go through.

We passed the Igloolik point and we could see the community. We were getting close to home. But, we got too close to the shore. The day had seen easterly winds, so the thin ice was in contact with the land. We got into the ice too much due to darkness. We were almost free from the thin overlapped ice when our motor could no longer propel the canoe. As it turned out the piston in the motor was shot. We had to get the attention of the community but we had no way of getting their attention. When the motor became useless, the people on board were trying to get attention of the community. Then we considered that we could use our broken flash light to get their attention.

YOUR TASK: The travelers found that their flashlight was broken but they still had the two batteries, a 10 cm square piece of aluminum foil, bulb, wires and tape to make a flashlight to get their attention. Your task is to make a flashlight that will get their attention.

Soon we could hear a sound of a canoe in the dark. Then it came right to us. Using his trail he started to tow us back. It so happened that we were almost free on the thin ice when we got stuck and we were now using the trail that the canoe had made when it came for us. The light from the community were bright so that we could see in front of us. When we finally arrived, there were a lot of people on the beach near the Peter Head, they all had come down to greet us. It was a joyous occasion.

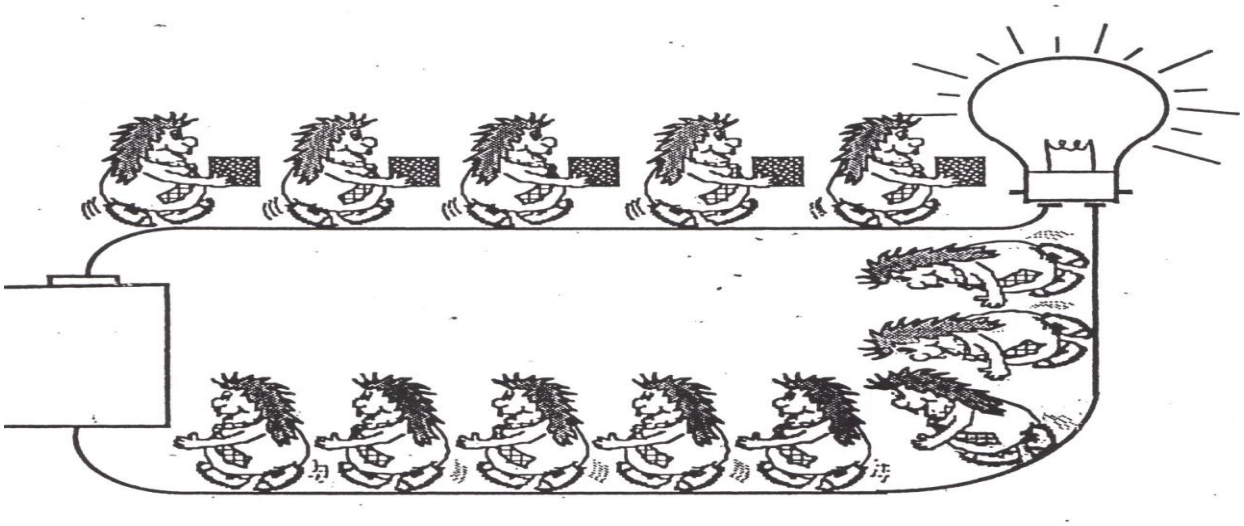
Calling for Help

Draw a picture of the story when the people were in trouble.

Draw a picture of your flashlight. Explain to someone how it works. Explain how it works on your picture

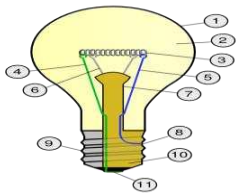
Draw a picture of how you would make a very bright flashlight. How could you improve your flashlight to make it very bright?

Where Does the Light Come From?



The picture above helps to show the job of the battery and how the energy it makes gets used to make light and heat.

1. Draw a picture of the bulb below connected in a circuit. In your picture draw the inside of the bulb to show how the wires make a complete circuit.



2. In the picture you have drawn, show how the electric current travels through the circuit and where the light is produced.

3. In words, describe how light and heat are produced in the bulb. Explain what the role or purpose of the battery is. Also explain why, in time, the battery will go flat.

I'm in Trouble….Can you Help?

Elijah was travelling back to his town on skidoo. He had been travelling all day and was travelling alone. He had been hunting caribou and had been away for several days. The toboggan was filled with caribou. He was happy because he had been successful. He was looking forward to getting home that day.

No one had heard from him for several days. His CB radio had broken and he had no way of contacting his family and people in town.

As he travelled, he noticed the skidoo light was flickering off and on. Every time it went off, he wasn't able to see. He had an idea what the problem was.

After a while, the light went off. He couldn't see in the dark without the light. He had to find out what the problem was.

He opened his gear box and took out a small flashlight. He looked at the headlamp to see if the filament in the lamp of the skidoo was broken. It wasn't.

He then opened the cover of the skidoo and looked at the wires around the lamp. The connecting wires to the lamp were ok.

He then looked at the wires leading to the lamp. One of the wires had broken. He thought, this will be easy to fix. I just need to make the two wires connect and I will have my circuit complete again.

He tried to make the two ends join, but they were too short to join. He couldn't make them connect.

He needed to put something in between them to make them connect. Something that would complete the circuit and stay there until he got back to town.

What do you think he could use?

Lights Going Off and On

Complete this chart

Object	Light Off or On?	Insulator or Conductor

Draw a picture of Elijah and, in words, explain how he fixed his skidoo. Show how he fixed the wires.

Draw pictures of where we use insulators

Draw pictures of where we use conductors

We

Turning Mistakes into Opportunities

Elizabeth and her younger brother, Joel loved springtime in their northern community. The longer days and warm sunlight made for ideal ice fishing conditions. During the day many people would use ice augers to drill through the ice so they could fish for char. She and her brother would try to fish at their own holes close to each other so they could talk away as they jigged for fish. They would talk away for hours and usually there were plenty of fish caught to keep them happy.

One day they were getting frustrated fishing as they could see the fish swimming by their bait but there were no bites. Joel started to get really frustrated and said, “You know, if we had a spear we’d have better luck in getting these fish that using a baited hook. I’ve had enough, I’m going home!”

Elizabeth watched her brother throw down his jigging line and march across the lake to the town. She was content to keep trying to catch fish expecting that maybe Joel would come back once he cooled down. It was no surprise that only about ten minutes later he came running back across the lake. But, he had something in his hand. As he got closer Elizabeth could see that Joel had their father’s metal spearing rod. This was just no spearing rod; it was one of their dad’s prize possessions. Elizabeth wondered how Joel convinced their dad he could use it.

“Hey”, Elizabeth yelled, “How did you convince dad to let you used that?”

Elizabeth didn’t get a response and watched Joel go to a distant hole and begin to fish. Elisabeth went back to fishing and kept an eye on how her brother was doing. A while later Elizabeth heard Joel start to yell at the top of his lungs. He was upset and down on his hands and knees gazing into the hole. Elizabeth ran over to the hole. Joel was both crying and mad. There was no spearing rod to be found.

" I dropped it in the water", Joel wailed. "I can see it on the bottom of the lake. It's really shallow here, maybe only two meters deep. How am I going to get it? Dad told me to look after it." Elizabeth said she didn't know what they could do, but telling dad was a good start she told Joel. Joel reluctantly agreed and they slowly walked across the lake not looking forward to what their father might have to say about this!

Joel tried to calmly tell his dad what had happened. Rather than getting mad, he told Joel he can, instead, figure out how he could get the spear off the bottom of the lake.

Joel didn't have any ideas at all; nor did Elizabeth. He was even more surprised when his father said that he could get it out by just using **a car battery, a long length of wire and a tire iron**. Elizabeth and Joel looked at each other and wondered how this would help them get the metal spearing rod off the bottom of the lake. The only advice dad gave was they would never be able to hook it off the bottom of the lake as the spear was a straight metal pole.

Using a flashlight battery, a length of copper wire and a nail as a small scale version of the equipment required, figure out how to get the spear (an unfolded paper clip) from the bottom of the lake. Use a nearly full glass of water as the lake and put the clip at the bottom of the glass.

Draw a picture of the device.

Explain how it works.

Once you have made a way to retrieve the spear, consider ways in which **you can improve the device to make it better** for retrieving the ‘spear’. See who can pick up the most paper clips joined together. In the end the group that produces the ‘best’ device is the hero of the day. Carry out a fair-test to try to make this device as strong as possible.

Draw pictures of your attempts below and the results from each attempt.

Finally, draw a picture of what this device would look like if it was used by Joel and Elizabeth to get the spear off the bottom of the lake.

There Must be an Easier Way to Do This!

Because of the steep bank leading up from the shore in their community, hauling fish and other gear from the boats up the bank was a lot of work. Going out fishing and camping with their parents was great fun for Joel and Elizabeth but having to haul the gear up the bank was a pain.

It wasn't uncommon for Joel and Elizabeth to begin to complain about what was ahead when their dad turned the boat around the last point and the town came into view. Hauling all the gear up the bank took away all of the enjoyment that they had experienced in their time away.

"There has to be an easier way to do this", said Joel. "Why do we have to struggle with this gear all of the time?"

"Why can't someone build something to do the work for us?"said Elizabeth.

Their mother said that there was an easier way where possibly they would not have to lift a finger.

"Hey", said Joel, "How can that be?"

Their mother went on to say that years ago someone in the town had an idea. She told them that using **only a rope, a large car battery, a strong magnet, and some lengths of stiff copper wire, people made a device that did all the work for them.**

Using a flashlight battery, a rare-earth magnet, some thread and length of copper wire, figure out how the gear (a paper clip) can be hauled up from the shore.

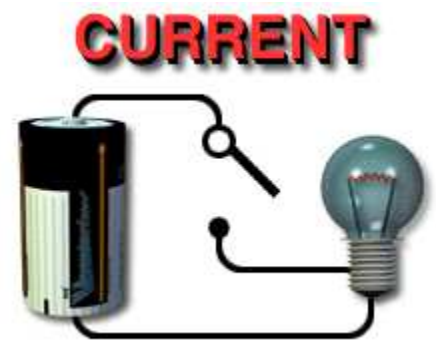
Draw a picture of the device below.

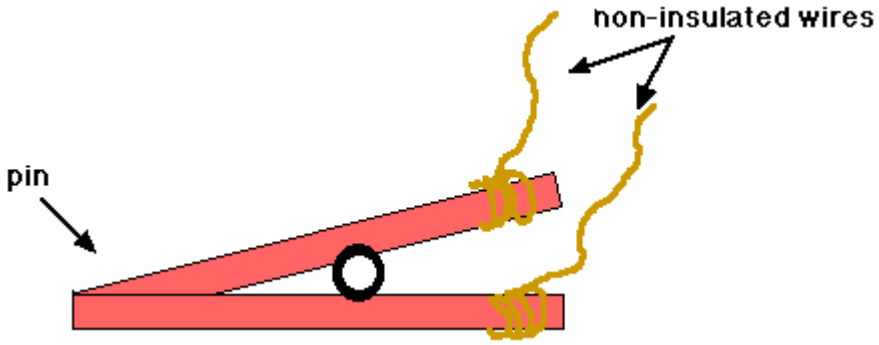
Explain, using a drawing how this device works.

Once you have devised a means to which to retrieve gear, consider ways in which **you can improve the device to make it better** for hauling. In the end the group that produces the 'best' device is the hero of the day. Carry out a fair-test to try to make this device as strong as possible. Draw pictures of your attempts below and the results from each attempt.

Finally, draw a picture of Elizabeth and Joel using this device to get the gear up from the shore.

Switched ON! Switched OFF!



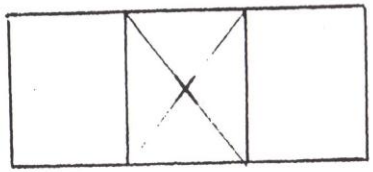


Draw your circuit with the switch on.

Draw your circuit with the switch off.

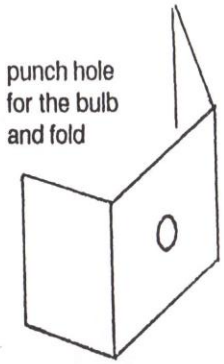
Explain to someone how a switch works. Then write your explanation below.

Bulb Holder

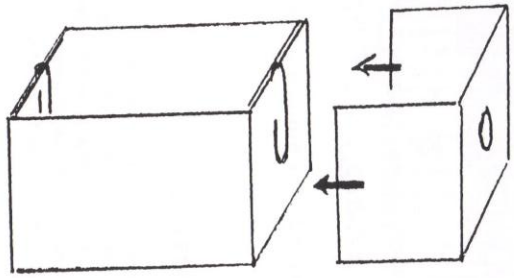


NOTE:

the hole for the bulb should allow a firm fit

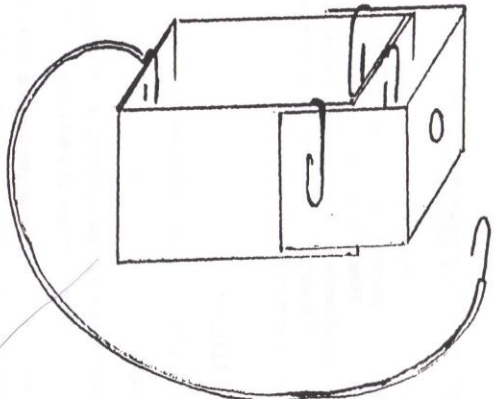


punch hole for the bulb and fold

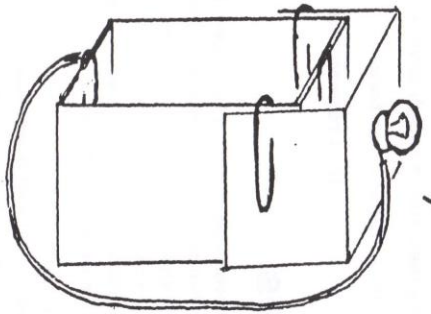


Fit to the end of the battery holder and clip in place

Fasten a wire to one end and bend the other end to hook into the bulb hole

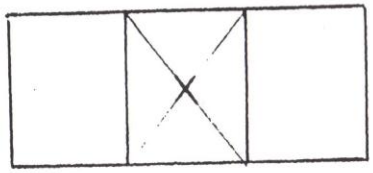


You could fold some foil over this end of the wire



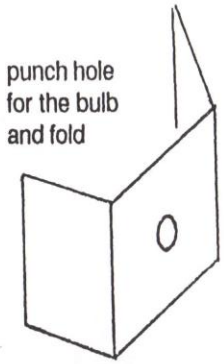
Hook the wire in the bulb hole and screw in the bulb

Bulb Holder

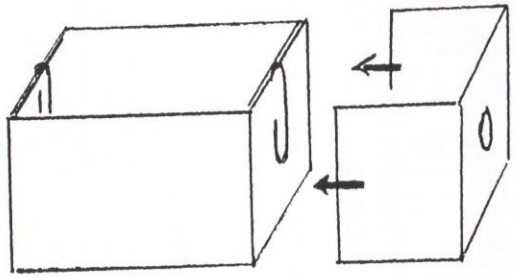


NOTE:

the hole for the bulb should allow a firm fit

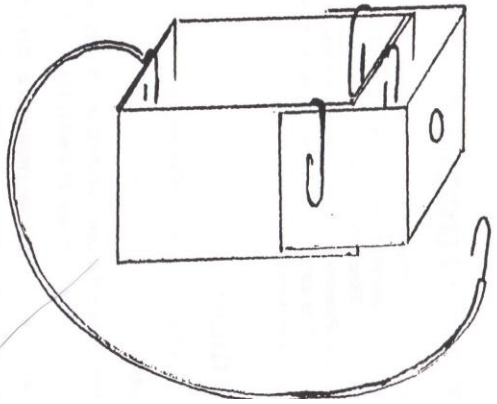


punch hole for the bulb and fold

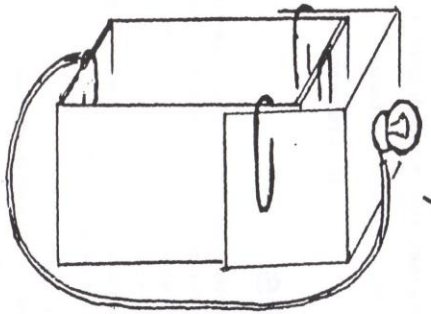


Fit to the end of the battery holder and clip in place

Fasten a wire to one end and bend the other end to hook into the bulb hole



You could fold some foil over this end of the wire

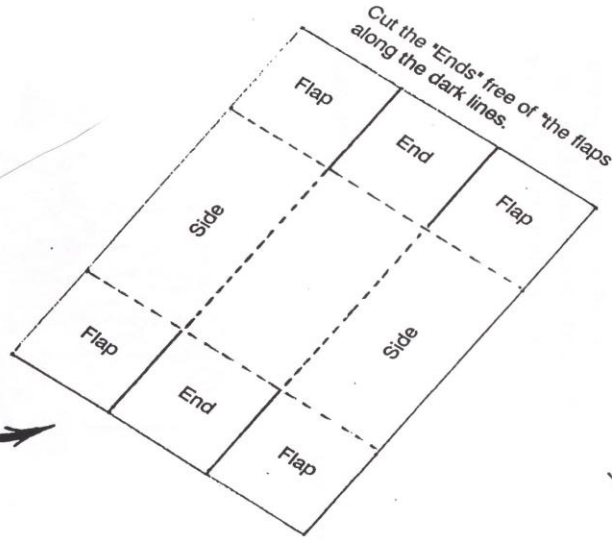


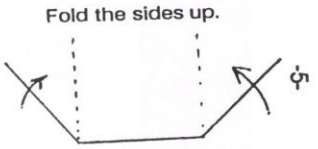
Hook the wire in the bulb hole and screw in the bulb

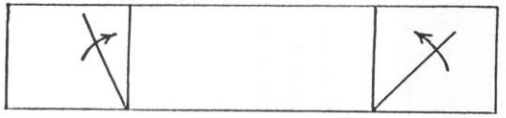
Make a battery holder

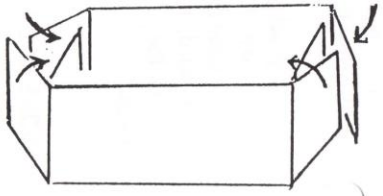
Measure and mark a piece of card like this to fit a size D battery.

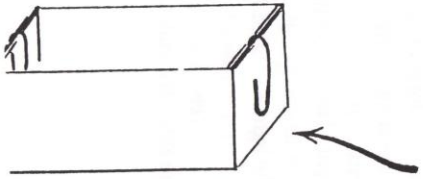
3 cm	6 cm	3 cm	3 cm
3 cm	6 cm	3 cm	3 cm
3 cm	6 cm	3 cm	3 cm





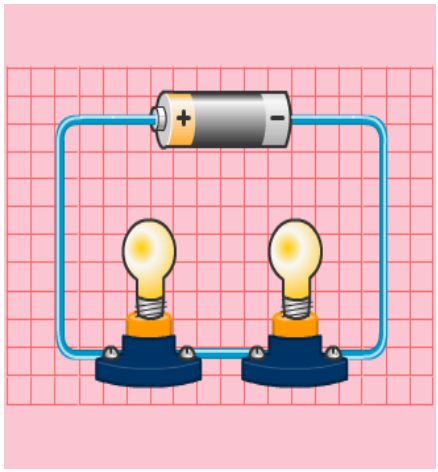


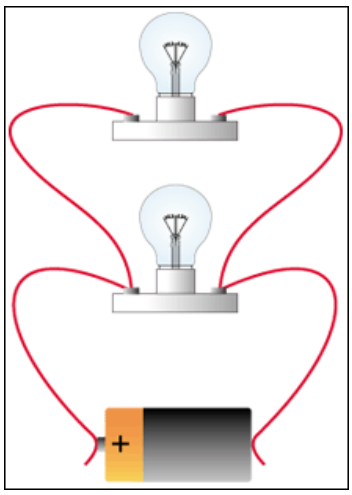


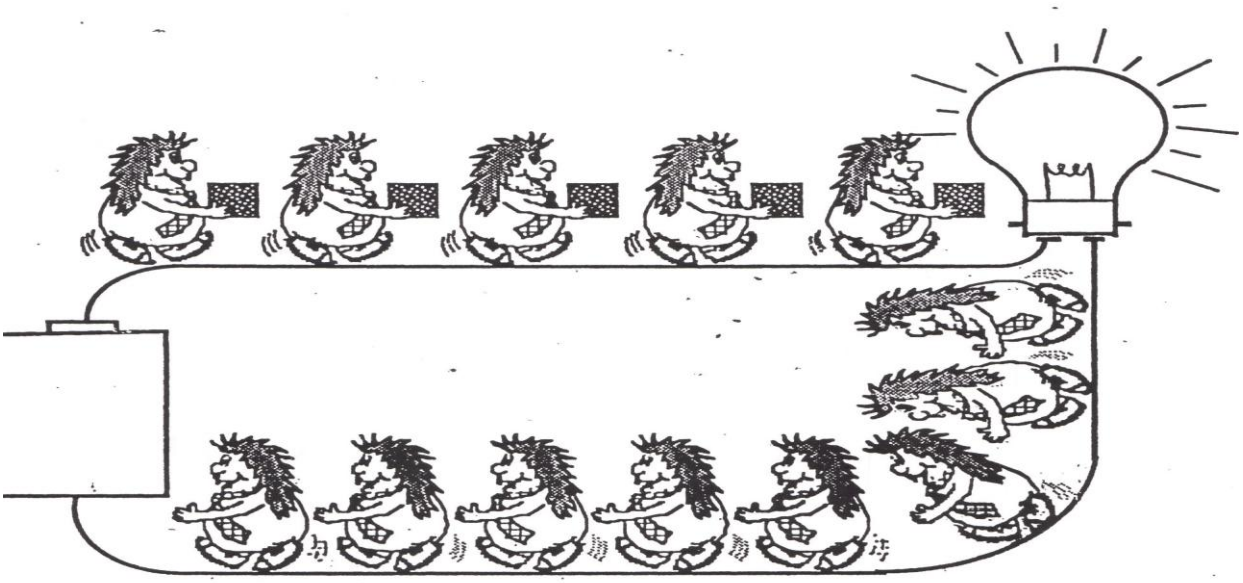


Fasten wires to the paper clips later.

Electricity can flow in circuits that are arranged in series or in parallel







Where Are These Objects in My Community?

Where have you seen these objects and what do they have to do with electricity?

HBC Archives: Wind Generator at Local Church Mission (Pond Inlet 1952)

When Electricity Came: *The following story is an adaptation of an interview with Annie Peterloosie of Pond Inlet*

We would always be excited when were able to go from our camp to Mittimatalik (Pond Inlet: the place where Mittima is buried). Mittimatalik was where the store was and it was here that special things would always come from.

HBC Archives Photo

The store had many things I had never seen. They say it was built in 1921. We would bring the skins there and buy things there as well.

The store in the 1950s had lights and these got their electricity from a wind generator that was on a tall pole near the store. There was a wind generator for he RCMP as well.

The wind generators are not here today. That was only when we moved to the houses provided by the government in the 1960s that we had lights like this from electricity. By that time the electricity did not come from a wind generator. By then it came from fuel generators.

I think sometimes that we should still be using wind generators.

Before the Diesel Generator There Were Wind Turbines

This a picture of a Northern Church Mission in the 1950s (HBC Archives)

1. Read the story about the early life in the north. Why did the Hudson's Bay Company and Church use wind power?

2. Draw a picture of your best wind turbine.

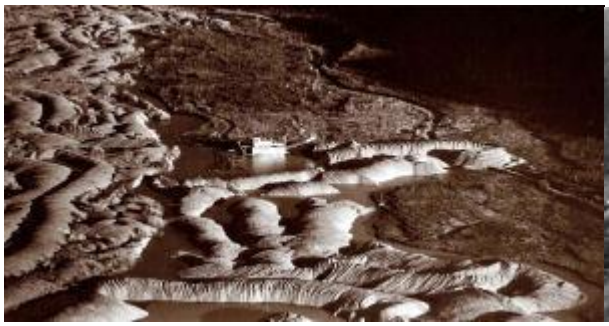
3. What is a generator?

4. Why are northern communities thinking more today about using wind to generate electricity?

4. Is this a good idea? Why or why not?

Energy Today in the Yukon

Electricity in the Past and the Klondike Gold Rush



Historic Photo of Dredge No 4. - Dawson City, Yukon Territory, Canada
© Parks Canada / George Hunter Collection / 40/147

BACKGROUND

During the early years of the Klondike Gold Rush, more than 30,000 miners hand mined for gold on the rich placer creeks. Much of the gold was simply too difficult and expensive to remove using hand mining techniques. While hand miners were working hard, promoters and investors were looking for long-term mining possibilities in the Yukon.

Large land holdings, called concessions had to be available to the corporations. Through negotiations with the Federal Government, the first concession was granted in 1900 to Joe Boyle. The corporations constructed hydroelectric power stations through the North Fork of the Klondike and Twelve Mile River to supply a reliable and consistent supply of power to run the dredges. They constructed a system of dams and ditches to provide an adequate supply of water for the dredges.

Dawson City was the key to the success of the efforts of the large corporations. It could provide government administration and banking services. The transportation network, of rail and steamship, that ended in Dawson City ensured that the companies could receive the supplies of machinery that were needed to operate. Dawson City also provided a large labour force and suppliers and services to meet the corporate mining needs.

In September 1898, the first dredge began working the Yukon River. Promotion of the Klondike fields brought in two large companies, the Canadian Klondike Mining Company in 1905 and the Yukon Gold Company a few years later.

Dredge No. 4 built in 1912 for the Canadian Klondike Mining Company, was the largest wooden hulled bucket lined dredge in North America. It worked in the Klondike Valley on the "Boyle Concession" until 1940 and then was relocated to Bonanza Creek and worked this valley until 1959.

At the peak of corporate mining, a dozen electricity driven dredges, churned through the creeks. Dredging continued in the Klondike until 1966, when the last of the Yukon Consolidated Gold Company's dredges shut down. Dredge No. 4 represents the many decades of corporate mining in the Canadian mid-north through the 20th century.

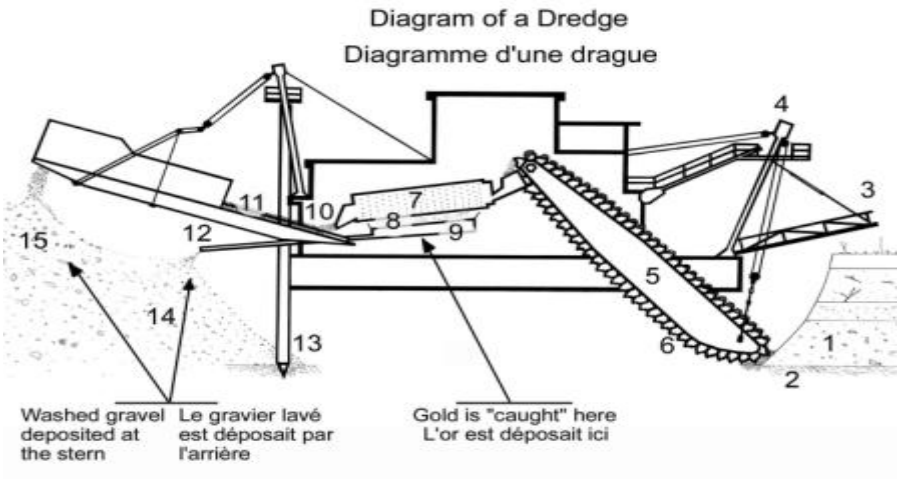


Diagram Of A Dredge

MILESTONES

1898
The first dredge began operating in the Yukon.

1899
Promoters negotiated with the Canadian government for large tracts of land

1900
Joe Boyle from Woodstock Ontario, was granted 40 square miles of land.

1905
Canadian Klondike Mining Company managed by Joe Boyle, built their first dredge.

1906-1925
The Yukon Gold Corporation operated nine dredges

1909
Yukon Gold built the Twelve Mile ditch to provide water for hydraulic mining.

1911
North Fork Hydro Power Plant was in operation and supplying electricity to run all of the dredges

1912
CKM Co. Dredge No. 4 was built.

1921
Canadian Klondike Mining Company went bankrupt.

1923
The Yukon Consolidated Gold Corporation was formed and they were the only company until 1966.

1940
Dredge No. 4 was relocated to Bonanza Creek.

1951

The first of its Yukon facilities, a five megawatt hydro plant in Mayo in the central Yukon, was built in 1951. It was originally developed to supply electricity to the United Keno Hill Mine at Elsa, located about 45 kilometres north of Mayo. It now supplies electricity to the communities of Mayo, Dawson City, Keno City and neighbouring areas.

1958

Next came the Whitehorse Rapids hydro facility, built in 1958 to meet a growing demand in the capital city. It began with two hydro turbines. A third turbine was added in 1969 and a fourth one was installed in 1985. To learn more about the history of the Whitehorse facility, see the document located at the bottom of this page.

1959
Trapped by increasing labour costs, shrinking gravel reserves and the fixed price of gold, YCGC shuts Dredge No. 4 down.

1966
The last of the four operating dredges are shut down, ending YCGS's mining operations in the Klondike including electricity generation.

1975

The final of NCPC's Yukon installations is the Aishihik plant, located about 110 kilometres northwest of Whitehorse. This hydro station was built in 1975 to serve a large lead-zinc mine at Faro in the central Yukon, and to address the growing electrical needs of Whitehorse.

1987

In 1987, all of the Northern Canada Power Commission's assets in Yukon were devolved to the Yukon government. The territorial government formed Yukon Energy Corporation to take over these assets. Yukon Energy, in turn, gave the Yukon Electrical Company Limited the license to manage and operate the generating facilities. Since then alternative sources of energy including wind and solar have been trialled.

Dredging and Electricity: *This is a story based on account given by T.A. Richard. Mr. Richard was a mining engineer for Yukon Consolidated Gold Company.*

One of the problems with the dredging of gold in the Klondike Valley was finding a steady flow of water to generate electricity. The water has to moving so there is pressure to generate electricity. That is, the there has to be lots of water and it has to be flowing fast. Also, the water has to be reliable. If the water is not available for the entire dredging season, then the supply of electricity will not be reliable.

Several ideas were considered on how to bring water under pressure to the Klondike area, especially to Hunker and Bonanza. It was thought that the water in the Klondike River from the Northfork would be enough. But because the Klondike Valley is not steep enough because the altitude difference between the upper Klondike and lower Klondike is not that great, the Klondike would not provide enough pressure for generating electricity.

In the early 1900s, it was decided that the best thing to do was to bring water by a 'ditch' from the Tombstone area. This is the headwaters of the upper Twelve Mile River.

Over several seasons a system of open ditch, pipes and flumes a total length of 70 miles was built. The water starts at an elevation of 3,199 feet and is at an elevation of 1282 feet at Klondike River. The water does not run downhill all the way. There are places it actually moves through pipes uphill because of the pressure caused by the elevation differences. In all, there was 20 miles of flume, 38 miles of ditch and 12 miles of pipe. The wood for the flumes came from California and the steel for the pipe came from Pennsylvania.

Many of the people that worked on this project over several years were from Dawson. But, in one season over 320 men came from outside. People were paid $4.00 per day. Of the 320 men hired in British Columbia, 20 deserted on the way. It was hard to recruit people for this project because the building season was so short. When the North Fork Hydroelectric project was built, it supplied three times as much electricity as the Yukon Ditch.

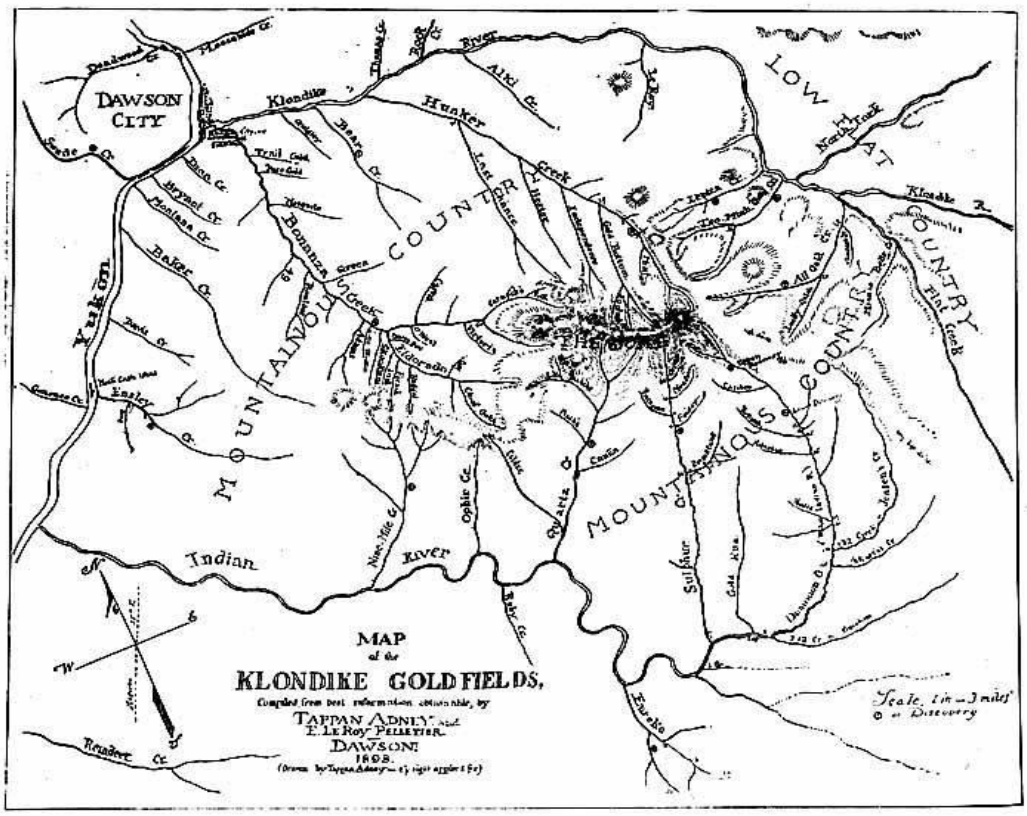
Dredging for Gold: *This is a story based on the life of James Drugan of Dawson City.*

When I was growing up in Dawson in the 1920s and 30s, most people worked for Yukon Consolidated Gold Company (YCGC). In the days during and after the war there was not much employment in Dawson other than YCGC. YCGC's main work was dredging the gold fields. The Gold Rush had come and gone and YCGC looked for ways to mine in a way that used machinery to get to the gold on the riverbeds.

NO 7. A MAMMOTH GOLD DREDGE ON THE KLONDIKE, DAWSON CITY, YUKON

I started work for YCGC as a wenchman. The dredge had to be moved by a system of pulleys as it was not motorized for movement. I was also an oiler. I put grease on the rollers on the conveyor belt where the tailings were being dumped. Someone else worked on the front end where the buckets were bringing in the river gravels. It was very noisy and dusty work. I remember getting paid $0.60 (60 cents) and hour. We worked long hours and stayed in camps because we were working up Hunker and Bonanza Creeks. I later became a dredge master around Dominion Creek. I was married at the time and my wife and children moved to Dominion. We had a house in Dawson but mainly we stayed at Dominion. There were many families that lived at Dominion in those days.

The dredges used much electricity. The electricity was generated through the Klondike and Ditch power plants. The water that was used to generate that power came from way up the Klondike and Tombstone area.



Property of Special Collections, University of Washington Libraries.

Most of the people that worked for YCGC in the 1940s and 1950s were not from Dawson. Many people came from all over Canada to work.

When the gold prices were high they were dredges as far away as McQuesten and Clear Creek. When the gold prices dropped, it was just too expensive for YCGC to keep mining so everything came to an end.

Many people left the Klondike area and those that stayed had a hard time finding work. In later years the Clinton Creek Asbestos Mine started up and people worked there and on smaller gold claims. But, that was it for the dredges.

It was unfortunate that when the dredging stopped, the hydroelectric power generation stopped as well. Dawson should have kept them going instead of using diesel generated electricity.

Hydro-electricity in the Yukon

Mayo Power Plant

Aishihik Power Plant

Whitehorse Power Plant

Electricity Production in the Yukon

Look at the pages that show and describe how the Yukon has produced electricity past and present. In the chart below summarize each.

How Was Electricity was Generated	Where was this Electricity Generated?	Good Reasons for Using This Way to Generate Electricity	Bad Reasons for Using This Way to Generate Electricity	Interesting Points?

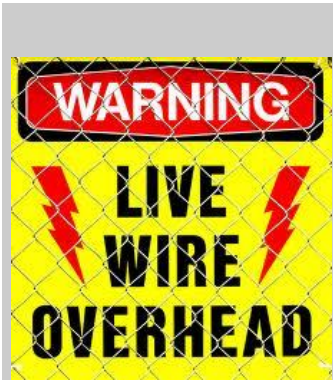
In the space below write an email to Yukon Energy that shows your concern over an electricity issue in the Yukon today. Your email should show you are informed about this issue.

To: yukonenergy@nwt.net
From:
Subject:

Signs in Our Community

Where might you find these signs in our community and what do they mean?

Safety with Electricity
What do these symbols mean?



1. Where would we find these signs in our community?

Your teacher will help you find internet sites that deal with electrical accidents. Look at internet sites by Google; electrocution + accidents

2. Develop a small poster based on what you learn.

Saving Electricity

In this activity, determine the power use in your home. Begin by writing down all of the electrical appliances in your house that use power. As an example, your house may have 2 televisions. List each television as a separate item. You might have 15 light bulbs and they might have different power ratings, so each must be listed separately.

Electrical Device	How Many Hours Used Daily?	Cost for Usage?
Total Costs for Month		

Use the on-line calculator to determine the cost for your house for the month.
http://michaelbluejay.com/electricity/howmuch.html

Now that you have calculated your costs for a month, read through the web-link entitled Saving Electricity 101:

Start Here

How much it costs / how they charge

What's a Watt / Kilowatt?

How much energy do things use?

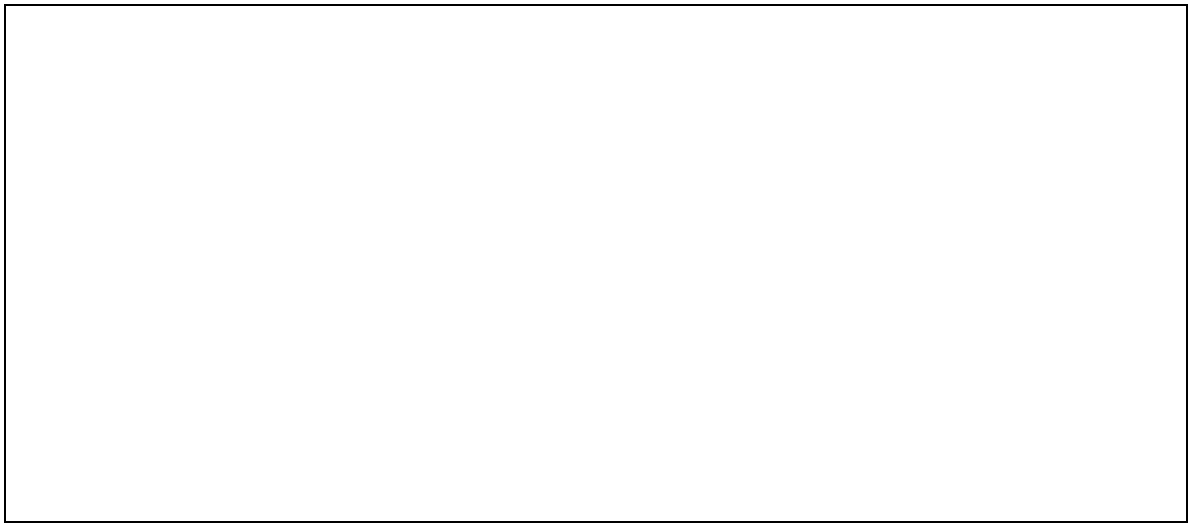
How to measure electrical use

In the space below, think about what you can do to return electricity costs in your home. Write these down in the space below.

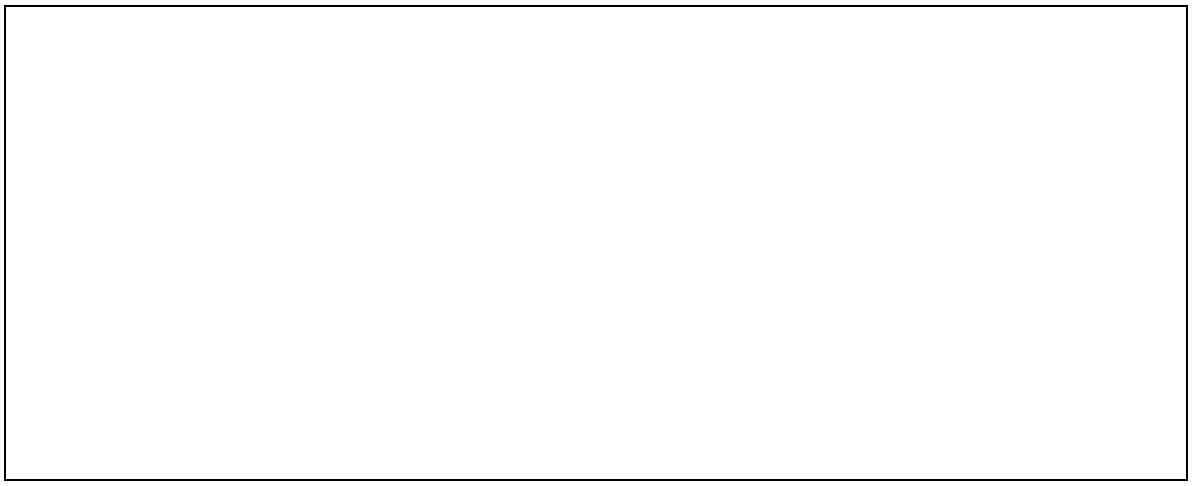
Figure out how much money you might save by making the changes listed above:

Lightning and Thunder

Draw a picture of the two girls and how they became lightning and thunder.



Draw a picture of one thing you learned from looking at lightning and thunder on the internet



What causes lightning and thunder?

Lightning (ittutuuqtuq) and Thunder (kallik): *The following story is an adaptation of an interview with Annie Peterloosie of Pond Inlet*

There is a story of two sisters. When they were young they were always being bullied and teased. They were often depressed and sad because they were being bullied by others. They did not know why this happened to them.

To get away from this, they walked up to a little mountain above the town. They built little houses with the rocks that were around them. They enjoyed playing alone away from the others that were bullying them. They wished they could become something else so they could back at the others. The older sister asked the younger sister if she could, what would she like to become. Was there something she would like to become so she could pay back or get revenge by becoming something else?

The younger sister started singing. "ALIQAAK, ALIQAAK, SUUNAUVINUK." [Aliqaak aliqaak: what are we?]. She sings that she wants to become some kind of an animal. While she is singing, the older sister asks her what she would like to become so she could get revenge. She asked her if she would like to become a caribou. The younger sister said no. Did she want to become a polar bear? The younger sister said no? What about thunder [ittutuuqtuk]? The little sister stops singing and she says yes.

So, during the night the girls very quietly collect seal skin and seal oil. They also yellow ingnitt [flints for striking to make sparks] from the Salmon River and take them up on the mountain. One girl shook the skin and oil and the other starts striking the rocks. They did this with much energy. This was the cause of the thunder. As well the striking made sparks [umma] that made the oil ignite. This called the lightning. There was also rain and this came from the girls peeing.

They wanted to pay back for being badly treated. It rained, thundered and there was lightning. The lightning struck the tent of the people that were bullying them. It went down the pole of the tent that was made of whale bone and this electrocuted the children that were bad.

The girls were satisfied that they had done this. After this, they did not return to the town. They became thunder and lightning.

Thunder and Ptarmigan Feathers: *The following story is an adaptation of an interview with Annie Peterloosie of Pond Inlet and Philip Qipanniq of Igloolik.*

The ptarmigan is a very special bird (tingmia). It is not that common and it tastes very good. It tastes very good, even when it is raw. Even today it is a bird that is very special and not everyone gets to eat it very often. In some places it is a bird just for the elders to eat.

The two little girls who made the thunder and lightning really cherished and enjoyed eating ptarmigan too. It was all that they had to eat on the mountain. These girls lived away from the town and they had chosen to become thunder and lightning. They were very jealous girls and did not want other people to have these birds. So, to stop people from eating them they would make the lightning and thunders come if anyone else but them ate the birds. It was there way of making sure that other people did not eat the birds.

One time they were very upset with people in the town. Someone caught ptarmigan and when they were eating it, they decided to only eat the back of the ptarmigan and burn its feathers.

As you can imagine, the girls became very upset and the thunder and lightning came. Today it is still the same way. When the thunder and lightning come it is maybe because someone has not treated the ptarmigan well and the girls have been angry with them. Even today, you cannot burn their feathers. And, you are not to test this myth.

The Shocking Balloon Race

Dorothy, Susan, and Ozzy are all at their Auntie Em's birthday party. The three siblings have always been very competitive, even little Susan. Dorothy and Susan kick of their sandals and run in to give their Auntie Em a hug, while Ozzy unties his running shoes as slow as he can so he doesn't have to hug his Auntie Em!

The kids like to race at everything from running, and bicycling, and even to doing their homework. Ozzy is in grade 9, Dorothy is in grade 6, and Susan is in grade 5. Ozzy's favorite subject is math, and he calculates his odds of beating his two sisters in every race. Usually the odds are in his favor, he likes to think of himself as smarter, faster, and even trickier.

Dorothy, on the other hand, loves science. Not only does she always have her homework done but she also loves to read books and magazines about science in her spare time. She reads so much that sometimes she gets her ideas mixed up!

Susan's favorite subject is physical education. She has always been a very fast runner, and she is extremely coordinated. Susan is on the softball and soccer teams. She may be little and people always underestimate her, but she is strong and quick!

Ozzy looked over at Dorothy, who was yawning and staring at

the ceiling while their little sister Susan unbraids her long hair.

"Hey Dorothy, want to have a contest?" Ozzy shouted at her across the living room.

"I want to play!" Spoke up Susan, excited by the idea of some potential fun.

"Sure Ozzy, what did you have in mind?" Dorothy was always skeptical of Ozzy's ideas, because usually his contests were only for games he knew he would win at.

"Okay Dorothy! Grab those balloons. We are going to have a race to see who can put the most balloons up on the wall in one minute" Ozzy's smiling as he explains to his two little sisters the rules he has made up.

The kids sit in a circle on the floor and discuss the rules of the race:

Rule #1: everyone starts at the same time

Rule #2: no pushing or shoving, and no stealing from each others balloon pile

Rule #3: you must start at one end of the living room and run to the other end and stick the balloon to the wall and then run back.

Ozzy gets up and shuffles across the living room floor carrying two bags of balloons that are not yet blown up and three packs of tape. Dorothy notices him wince after being shocked from the static and the two sisters begin to giggle at his surprised expression.

"You won't be laughing after I beat you two at this race" Ozzy warns his sisters. The girls continue to laugh and the three begin to blow up the balloons to prepare for their race. After the balloons are

blown up the three set their tape down by the opposite wall and motion for their mom to come and be the timer and referee.

"I love when you guys choose these races that involve running" laughs Susan, "you just never learn that when it comes to running, you can't beat me!"

"Oh my dear sister," Ozzy responds in a silly, deep sounding voice "I am older and stronger, there is no way that my sister, WHO IS FOUR YEARS YOUNGER, is going to beat me!"

"Oh you two!" says Dorothy. "Quit talking and get ready to lose!"

"On your mark… Get set… GO!" exclaims their mother!

The timer starts and Dorothy has way more balloons up then her two siblings within seconds. Susan notices her strategy and begins to *sl*owl*y* do the same thing. Dorothy notices Susan copying her and frantical*ly* tries to get as many balloons up as possible. What was Dorothy's strategy? Did she win? If you think she didn't then who won?

Why It Happens:

In the race, the balloon should stick to the wall after being **charged** by rubbing. When you rub the balloon with your hair negatively charged particles called **electrons** are transferred from the hair to the balloon, giving the balloon an overall negative charge. When the charged balloon is brought near the wall, it repels some of the negatively charged electrons in that region of the wall (remember:

negative charges repel other negative charges, and positive charges repel other positive charges). Therefore, that region of the wall is left repelled. Then, the negatively charged balloon and the positively charged section of the wall are attracted to each other, and the balloon sticks. The charged balloon may be made to stick to a wide variety of objects (even a person) because of the charge it receives after being rubbed.

1. What are the definitions of Static, Electricity, and Charge?

2. Demonstrate your understanding of static electricity by describing a time you noticed static in your everyday life. What happens and why?

3. After discussing the story we learned about charge and static electricity. With a balloon try the activity the kids in the story made up. Try charging the balloon for different lengths of time.

4. Create a chart to record the information you have gathered by charging the balloon for different times. Time how long the balloon sticks to the wall.

Balloon Trial Charge Chart

Trial #	Charged for: (seconds/minutes)	Stayed up for: (in seconds / minutes)
1.		
2.		
3.		
4.		

5. List and describe 3 examples of static electricity (in the classroom, at home, outside).

Playing Around with Salt & Pepper

1. In pairs, prepare a salt and pepper mixture in the Petri dish provided. Make sure that the salt and pepper particles do not form clumps and are well mixed. When they are finished mixing, they put the lid on the dish.

2. **Salt and pepper** is called a **mechanical mixture** because it is made by mixing two distinct substances that remain in their original state. P**redict** a technique for separating the two substances

3. Take a balloon and inflate it and tie a knot. Rub your hair with the balloon and then slowly bring the balloon near the top surface of the Petri dish containing the salt and pepper mixture. O**bserve** that the pepper particles fly up and stick to the surface of the plastic cover. **Why did this occur?**

4. **N**ormally most things in the world have a neutral charge (equal positive and negative charges). Two like charges will repel each other, while two opposite charges are attracted. The rubbing action added negatively charges (*electrons)*from the surface of the individual hair strands to the balloon surface, making it negatively charged overall; this is called **static electricity** because it is not moving. Show this by drawing negative symbols on the balloon after it has been rubbed. Because the balloon now has too much negative charge, it wants to give away some in order to become neutral again. By attracting and coming into contact with other positive or neutral particles, it can donate or pass along the extra negative charge (cross out the negative symbols on the balloon to indicate that it is losing its negative charge) and become neutral again. Demonstrate how two negatively charged balloons repel each other, so students get to **observe** both attraction and repulsion caused by static electricity.

5. **W**hy is the pepper attracted before the salt. Because the individual pepper particles are lighter and closer to the surface than the salt particles, they will more easily overcome the forces of gravity and be attracted to the top of the Petri dish. Resting the balloon directly against the dish cover will immediately cause both salt and pepper particles to be attracted to the balloon.

6. Repeat the activity by slowly bringing the balloon near the top of the Petri dish and **observing** how the particles in the mixture are affected. **You** should see the pepper particles already being attracted to the balloon when it is several inches away from the surface of the cover. Compare how distance affects the attractive force of static electricity.

- Does the material used for rubbing (balloon) or the material being rubbed (hair) to pick up negative charges affect the static electricity produced?

7. Students can **design and conduct an investigation** to see if other mixtures made from common substances (sand, sugar, cinnamon, canola seed, wheat grain, etc.) can be separated using the electrostatic technique.

8. **Concluding Questions:**

- What happens to the balloon when it is rubbed against the hair?

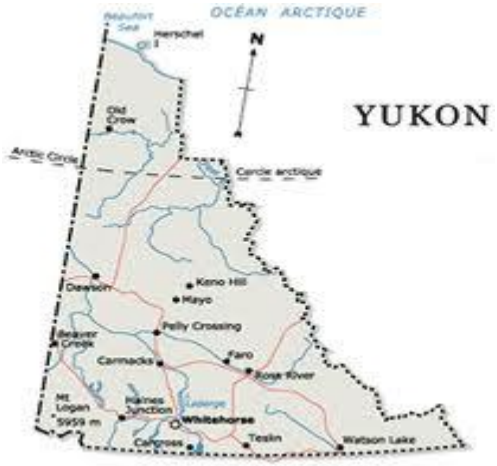
- Why are the pepper and salt attracted to the plastic top?

- What are some industrial applications for static electricity? (painting, photocopying, making sandpaper)

- Can you think of challenges that static electricity poses for industrial applications? (explosions, damaging electrical components).

Static Electricity in the Winter

It is in the winter you see the static electricity. When we stay in the cabin along the river in the trapping season, we only had kerosene lamps for lights and log fire for cooking and heating.



When it is really cold –maybe -40 degrees Celsius or colder – that is when it is really dry.

You wear wool clothing and when you pull your sweater off, there is sparks of electricity and your hair stands on end, especially when you pull off a wool toque.

When you walk around in the cabin in wool socks and then touch a metal plate or something, there is a shock of electricity.

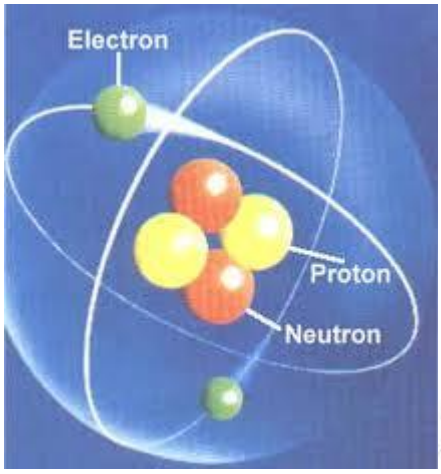
When you are sleeping and pull the blanket up, you see the sparks of electricity.

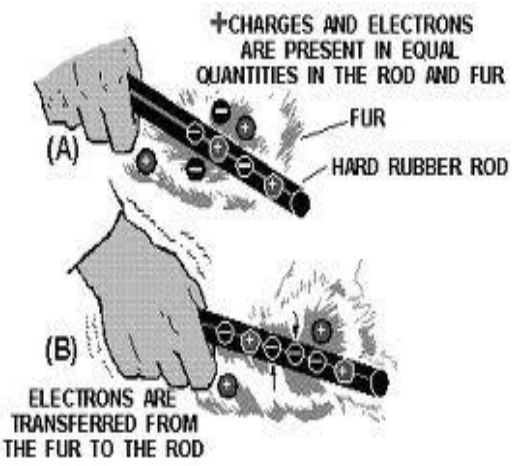
It is then your skin is dry and your hair it stands on end. That is when you see the static electricity.

Even the dogs' fur and the fur trim on the parka becomes charged and you see the static electricity.

Sometimes you wonder that if the spark is too big could it catch some fuel like gasoline on fire?

If we keep pots of water on the stove and the water evaporates, then the air is not as dry and then there is less static electricity.





Draw pictures of static electricity from the story or other examples you can think of. Explain why 'rubbing' causes static electricity.

Forest Fires in the Yukon

This is a fire report for the Yukon (CBC News, 2011).

Lightning starts about a third of all fires in the Yukon, and this past year (2011) has been a particularly bad year for lightning-caused fires compared to those caused by humans. Lightning and hot, dry weather sparked seven new forest fires across Yukon on Monday, in addition to most of the nine fires that were reported over the weekend.

With more lightning and above-average temperatures forecast for Tuesday, Yukon government officials say they anticipate another hectic day.

"There's a lot of activity there, and with that we are fortunate that we're going to bring in some additional resources from British Columbia," wildland fire information officer George Maratos told CBC News.

Maratos said 24 firefighters from B.C. are being briefed in Whitehorse on Tuesday before they travel to areas that need assistance.

"We don't actually typically see this much lightning this time of year, and we were expecting an above-average amount throughout the season, so that's obviously a little disconcerting," Maratos said.

"The message is pretty simple, that with lightning in the forecast, we need the public to be more vigilant when it comes to being responsible following any bans."

Maratos added that while there are no campfire bans in effect right now, Yukoners should start fires only if "absolutely necessary." Meanwhile, fire officials are monitoring an aggressive forest fire that is burning 72 kilometres east of Carmacks on Tuesday. Officials warn that the fire could jump the Yukon River, about 20 kilometres downstream of the confluence of the Yukon and Teslin rivers.

Unlike Alberta, which has forestry towers to keep an eye out for wildfires, the Yukon relies on aerial patrols to cover its vast expanses of boreal forest.

Fighting Forest Fires

A variety of methods are employed to prevent and control fires, depending on the location and severity of the fire.

Find out through researching information how your area deals with forest fires, Are helicopters used? Are planes used? Are there ground crews? How does your community prepare to deal with or prevent forest fires? Does anyone you know help in forest fire protection? Should all forest fires be controlled? Communicate your ideas in words and illustrations.

End of Unit Review: Vocabulary

Activity 1: Have students collectively create a Word Splash.
Activity 2: Challenge students to write a paragraph with sentences from the list.

word splash

Please read the words from the word splash and discuss their meaning with your partner.