

Degrees of Variation:
Climate Change in Nunavut

Group Members: _____

Trivia Challenge: Search the entire poster to find answers for the following: (bonus)

1. What Nunavut town has 3 “Q’s” in its name?
Qikiqtarjuaq
2. What is a “thermosyphon”?
A device put into the ground to remove heat from the ground and dissipate it to the air, which prevents the permafrost from melting.
3. What colour are the ptarmigans?
White (birds)

Did You Know? Use the pieces of information under this heading (“Did You Know?”) on the poster to answer the following true/false (T or F) questions. If the statement is false, cross out the incorrect word or number value, and write in the correct version. (10)

___ About ~~2/3~~ of Canada’s CO₂ and NO_x emissions come from transportation. **F, 1/3**

___ Every litre of gas used in your vehicle produces almost 4 kg of CO₂. **F, 2.5**

___ Human activity is responsible for emitting 30 million tons of methane each year. **T**

___ Greenhouse gas molecules have life spans of ~~months~~ or even years.
F, decades, centuries

___ Climate models predict the greatest warming will occur in ~~southern Ontario~~.
F, arctic regions

___ If the Greenland Ice Sheet melts, it contains enough ice to raise the global sea level by 6 – 7 metres. **T**

___ Polynyas are areas of open water surrounded by sea ice. **T**

___ In the Arctic, ocean temperature varies only a few degrees (-2 to +3°C). **T**

___ Burning garbage is a major source of ~~ozone~~ emissions. **F, greenhouse gas**

___ The average temperature of Earth without the Earth’s natural greenhouse effect would be ~~zero~~ degrees Celsius. **F, -18**

Climate Change - The Basics:

1. Locate the box with the sun in it, and record the following information: (3)
 - 31 %** of incoming solar radiation reflected back to space.
 - 23 %** of incoming solar radiation absorbed by the atmosphere.
 - 46 %** of incoming solar radiation absorbed by the earth's surface.
2. Predict the effects that melting of polar ice caps would have on these percentages (in 1 above). (1)
 - Less reflected, more absorbed.**
3. What human-induced factors contribute to climate change? (2)
 - Enhanced GH effect and atmospheric aerosols; land use change.**
4. What greenhouse gas is most closely linked to human activities? (1)
 - CO₂**
5. What is the current concentration (parts per million by volume) of CO₂ in our atmosphere? (1)
 - ~360 ppm**

Climate Has Always Changed:

Examine the ice core data from the last 12 000 years:

1. Has most of the last 12 000 years in Nunavut been above or below present normal temperatures? (1)
 - Above**
2. Estimate what percentage of the last 12 000 years has had above/below present normal temperatures: (2)
 - ~ 75 - 80%** above normal temperatures
 - ~ 20 - 25%** below normal temperatures
3. Estimate what percentage of the last 150 000 was spent below present normal temperatures. (1)
 - ~80%**
4. What was the eastern high arctic average summer temperature in the year you were born? (1) **(0.5 – 3°C)**

The Current Conditions:

1. Was the global ground surface temperature in the year 1500 warmer or cooler than today? By how many degrees? (1) **1°C cooler**
2. Using the graph, comment on any trends in frequency of intense winter storms in the northern hemisphere. (2) **Increasing, with regular fluctuations.**

Climate Projections:

1. What is the projected intermediate estimate for CO₂ concentration (ppm by volume) for the year 2100? (1) **~650 ppm**
2. What technology was necessary for us to develop GCMs (general circulation models) of the Earth's climate? (1) **Computers**
3. How accurate are these models? (1)
Not very, since there are many variables to climate that we don't fully understand.

Glaciers and Sea-Level Rise:

1. From the map showing sensitivity to sea level rise, which province's Hudson Bay coastline is the least vulnerable (i.e. has the lowest sensitivity to sea-level rise), Manitoba, Ontario or **Quebec**? (Circle the right answer) (1)
2. Which Ice Cap in the Arctic is beginning to show a trend toward more summer melt? (1) **South Melville Ice Cap**

Of Ice and Men:

1. What traditional northern activities depend on sea ice? (2)
Travel, hunting, fishing
2. What emergency occurred in early June 1997? (1)
Students were left drifting on an ice floe for 6 days!
3. Predict how the opening of the "Northwest Passage" would: (3)
 - a) Create social change: **What was once a relatively isolated social community/cultural landscape would be open to significant impacts.**
 - b) Increase environmental hazards: **With increased travel, comes increased risk associated with tankers/spills, etc.**
 - c) Raise sovereignty issues: **The Canadian OEEZ boundary might be threatened, particularly with the effect of melting polar ice recreating newly defined political boundaries.**

Life at Sea:

1. What do scientists predict will happen to the range of many marine species as climate changes? (1) **Northward shift**
2. What animals require strong sea ice to breed, nurse pups and rest? (1) **Walrus and bearded seals**

- How will Inuit hunters be affected as animals shift their range in response to climate change? (2) **Forced to change their hunting regimes**
- According to the News North, when it gets too warm, what do the animals do? (1)
Go to cooler areas.

Northern Landscapes:

- What is found beneath the ground surface in nearly all of Nunavut? (1)
Permafrost
- How will people be affected if the permafrost thaws? (3)
Infrastructure suffers greatly: roads, runways, sewage, water supply, underground mines collapse, etc. Open pit mining benefits.

Life on the Land:

- How will the herbivores' food supply in the north be affected by climate change? (2)
Improved with increased plant growth.
- What small mammal pictured may be threatened by CO₂ trapped under the snow? (1)
Lemming
- What is expected to happen to the range of plant species in the north? (1)
Expand northward
- How will warming affect birds in the region? (2)
Positive impacts on northern birds, negative on southern.

The Challenge:

- How does Canada rank globally for CO₂ emissions? (1) **2nd!**
- What is the world average CO₂ emission (tonnes/year)? (1) **3.9 tonnes/year**
- Examining residential emissions of CO₂, what activity is responsible for 53% of these emissions? **Transportation** Propose ways to decrease this output, from this source: (3)
Carpool, public transit...
- How might human health be affected by GHGs (greenhouse gases)? (2)
Food/water quality, infectious diseases
- Did any of the information on this poster alarm you in any way? If so, how? (1)