

Answers to Climate Change Homework



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#4.	Weather is what you see out the window. It is the atmospheric conditions (temperature, precipitation, wind speed, humidity etc.) at that moment. Climate is an average of the atmospheric conditions over at least 30 years. Weather can change very quickly, in a matter of hours even. Climate changes more slowly.

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#3	Ozone in <b>troposphere</b> : the troposphere is low in the atmosphere and here ozone reacts with UV to create toxic chemicals (smog). This smog is harmful to our health and can damage buildings! So government should try to reduce ozone in the troposphere Ozone in <b>stratosphere</b> helps block out the high-energy, harmful UV rays. These rays can cause sunburn and even cause skin cancers in humans and other life forms. The government SHOULD try to protect the ozone here.

<b>8.4 – Components of Earth’s Climate System</b>	
#3	Troposphere is near the earth. Stratosphere is above that. UV radiation and car exhaust produce ozone and a smog in the troposphere that is harmful to us. Governments are trying to reduce this. Ozone in the stratosphere protects us from harmful UV rays. Governments are trying to protect ozone levels in this layer.
8.6 – Greenhouse Effect	
#1	Greenhouse effect is beneficial to us as it heats up the earth to a temperature that is inhabitable. We do want our earth to be warm enough to grow plants and sustain other life.
#3	Greenhouse gas is a gas which traps infrared energy (heat) that would otherwise escape to space and re-emits it back to earth thus warming the earth.
#4	How effective a greenhouse gas is can be determined by 2 factors: a) how much thermal energy each molecule can absorb and b) the concentration (how much) of the gas in our atmosphere.
#5.	Carbon sink = forests or oceans – things that ABSORB CO <sub>2</sub> and take it out of the atmosphere. This reduces the amount of greenhouse gases. In the iceage, land was covered by ice and thus drastically reducing the number of trees/forests. This takes away a method for reducing CO <sub>2</sub> so the temperature likely began to rise slowly as much CO <sub>2</sub> accumulated in the atmosphere.
#6	Natural sources of: Carbon dioxide – volcanic eruptions, forest fires (burning trees) Water vapour – evaporation from oceans, lakes, etc. Methane – plant decomposition and animal digestion. Nitrous oxide – reactions of bacteria in soil/water
#7	Greenhouse gases are composed of 3+ atoms with bonds in different directions. This allows the atoms to vibrate in a variety of directions and thus effectively absorb sun’s radiation and re-emit heat. Nitrogen and oxygen have only 2 atoms and very limited in their ability to vibrate so they are not effective greenhouse gases.

**Be familiar with these terms**

Anthropogenic → means man-made or the source is from human activity.

Fossil Fuels → coal, oil and natural gas

Carbon sink → oceans or forests or anything that absorbs CO<sub>2</sub> and thus takes this greenhouse gas out of the atmosphere. (reduces a greenhouse gas)

ppm → parts per million - how we measure amounts of GH gases.

Industrial Age → about 1880's when motors and machines began to take off – burning fossil fuels and adding CO<sub>2</sub>

<b>8.10 Feedback Loops</b>	
#2	<p>A positive feedback loop is sometimes called a 'vicious cycle'. This is when an event 'X' causes 'Y' to happen and 'Y' makes 'X' happen more. This cycle exaggerates the initial situation. For example: If the temperature rises, more ice melts. With less ice, less light is reflected back to space so the earth warms more. This causes more ice to melt!! Initial situation (ice melts) is exaggerated.</p> <p>A negative feedback loop is a stabilizing cycle. A situation oscillates up and down but generally stays the same. 'X' happens and causes 'Y' to happen. 'Y' reverses the initial 'X' condition. For example: temperature rises creating more high clouds. High clouds reflect light away from earth so earth cools. This is opposite to the original event (earth warming). This stabilizes the temperature.</p> <p>NOTE: Be able to draw these in circles like we did in class and like you see in textbook.</p>
#3	Rock has an albedo of 0.30 which means it reflects 30% of the light it receives. Grass only reflects 20% (albedo = 0.20). So rock reflects more.
#5	<ul style="list-style-type: none"><li>a) Increase in water vapour means more clouds. More clouds would reflect light away from earth and the temperature would drop. If the temperature drops then there would be less evaporation and less clouds.</li><li>b) This is a negative feedback loop because initially you had more water vapour and by the end there was less water vapour.</li></ul>

<b>8.11 – Studying Clues to Past Climates</b>	
1.	<ul style="list-style-type: none"><li>a) Old paintings show people skating on the River Thames in London. This river has not frozen over for a very long time, but it must have for people to skate on it! Because we know the date of the painting, we get an idea of when the Thames froze over and when it was significantly colder in London, England.</li><li>b) Paintings are direct records of the climate. Paintings aren't as precise as weather data collected, but they are NOT proxy records (proxy – nature's records)</li></ul>
2	<ul style="list-style-type: none"><li>a) last 200 years – we have weather records</li><li>b) past 1000's of years – we look at proxy records (ice cores, tree rings, coral reefs, etc)</li><li>c) When proxy records are compared to weather records over past 200 years, they correlate well so we figure these proxy records back further are correct.</li></ul>

3	Ontario – studying climate 300 years ago – use tree rings from VERY OLD trees. – use cave formations (we have caves in Ontario). – use paintings and diaries. We CANNOT use ice cores (no glaciers in Ontario) and we CANNOT use corral reef data (no corral in Ontario).
4	a) ice cores – level of greenhouse gases – air temperature (by looking at oxygen levels) b) tree rings – tell us of temp & precipitation. Larger rings = warm and wet growing season. Smaller rings = dry and cold growing season. Ocean sediment – fossilized pollen can give clues to the temperature and climate since each plant requires a certain climate to grow (and produce pollen)
5	Ice core data doesn't directly tell us the temperature. Scientists can directly measure the concentration of heavy and light oxygen. This data can be analyzed to give us the temperature that it was. This is <b>indirectly</b> giving us the information. Directly giving us information would be reading old weather reports with the temperature given. When you have to be a detective about getting the information, it is indirect information.
6	a) Very old trees (cedar trees growing on the side of the Niagara Escarpment for example) give us information back 2767 in Ontario. To determine if the tree ring data is accurate, scientists could compare different tree data from slightly different areas and see if they have similar data.
7	Fossils tell us what types of living things lived in a given area. If you find evidence of animals that only grow in warm tropical areas and you find them that must mean that back in that time, the climate was warm and tropical! ie: dinosaurs did not like the cold – where you find dinosaurs bones is evidence that the climate was more tropical in that area long ago. (there are ways to date the fossil to figure out how long ago)

<b>9.1 – Evidence of a Changing Climate</b>	
#1	a) ecosystems – earlier flowering in spring – insects & animals moving north as it warms. b) sealevels – are rising as ice& glaciers melts and water runs into oceans c) growing seasons – longer growing seasons d) glaciers & ice sheets – are melting and shrinking e) hurricanes – becoming stronger f) precipitation –more rain and less snow. More extreme rain storms too. Other areas are becoming drier. (drought)
2	I would suggest doubters look at the temperature graph on page 373 and see that the temperature is definitely rising – this is a logical reason for the changes in temperature. The dry and mild spell in 1930's and 1940's had a much lower temperature.
3	Glaciers melt and provide fresh water in rivers. Although people downriver from glaciers are currently enjoying more fresh water, in 30 years they may have significantly less or no water if the glaciers are completely melted and gone.
4	a) Sea levels rise because ice above the water (ice bergs or ice sheets on land) melt and add water to oceans. Also, water expands as it warms. Although it expands only a little, there is an awful lot of water in the oceans! So: melting land ice & thermal expansion. b) Perhaps the sea levels have risen a bit more around India since the average temperature of the ocean near the equator (compared to North America) would be warmer – thus more thermal expansion.
5	Effects of Warming – for Canada a) Positive – longer growing season means we could grow more crops and perhaps more diverse crops that traditionally couldn't be grown in 'cold' Canada.) Negative – harmful insects that were kept out of Canada because of the cold can migrate to Canada ie: pine beetle or the malaria-bearing mosquitos.  Effects of Warming – for India (nearer equator)

	<p>a) positive – hard pressed to think of a positive</p> <p>b) negative – if glaciers in Himalayas disappear then there is much less or no fresh water down the major rivers. – more extreme heat &amp; droughts</p>
6.	Insects and plant pests are more of a problem because if the climate is warming, they can now survive as it is not as cold. Generally, insects do not tolerate the cold; cold kills them.
7.	<p>Melting ice – once melted completely, there is less fresh water for China, S. Asia (rivers rely on melting glacial ice)</p> <p>Animals in the north and south poles that rely on ice sheets (polar bears) will have a drastically changed environment.</p> <p>Rising sea levels – could flood major cities that are low-lying and on the ocean front (New York , New Orleans)</p>

### 10.2 – Global Impact of Climate Change p. 417

#1	<p>Rising sea level → flooding in low level areas ie: New York City, London England, Bangkok, India. This could cause a mass migration of people and where would they go?</p> <p>Changes to agriculture → Dry areas will get even drier. Ie: southwest United States and part of western Canada. The cattle farmers may not be able to keep the herds and grain crops may not be able to grow.</p> <p>Changes to ecosystems → plants &amp; animals near the equator will migrate towards the poles upsetting the balanced ecosystems. Ecosystems on the coasts could disappear as the flooding occurs. Some suggest 30% of our species may become extinct. This lessens our biodiversity in the world.</p> <p>Increase spread of diseases → tropical diseases will move towards poles. Malaria could move into Canada. Some pests may move towards poles too. Ie: pine beetle.</p>
#3	The ice will melt at the poles, reflecting less light away and increasing the warming. This accelerates the warming at the poles. This is a positive feedback loop. The poles will warm faster than other areas of the globe.

### 10.3 - Impact of Climate Change on Ontario p. 422

#2	<p>a) <u>Risks</u> to Ontario if climate change continues → some areas will be very wet and some much drier, fish that like cooler water will die in our lakes (trout), more algae in lakes, invasive species could increase (zebra mussel, lamprey), invasive species could move north like kudzu vine (very destructive), insects carrying disease could move north into Canada (Lyme disease, West Nile), heat will increase heart attacks and increased smog will irritate respiratory conditions (asthma), hotter summers, more energy for air conditioning in summer</p> <p><u>Benefits</u> to Ontario if climate change continues → lower heating costs in winter, easier to keep roads free of ice &amp; snow, longer shipping season in Great Lakes (b/c lakes not frozen over), some crops will do better in warmer temperature (soya beans and corn), more fruits &amp; vegetables could grow in Ontario,</p> <p>b) Be able to write an opinion about how Ontario will be negatively affected (risks) and could also benefit from global warming. Be able to include some facts from answer (a) above.</p>
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#6	<p>b) This is a positive feedback loop. It will continue to increase temperature. It is a vicious cycle and NOT a stabilizing cycle.</p> <p>c) There are many things the government could do. One that comes to mind is that the government can encourage the development of renewable energy resources like solar and wind power so we are less reliant on fossil fuel energy.</p>
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**10.1 – Climate Models & Clean Energy p. 411**

#3	<p>a) A clean energy source is one that does not create greenhouse gases. ie: solar energy or wind energy.</p> <p>b) Wind energy is being used in Ontario. Towards Windsor and towards Bruce Peninsula, many more wind generators are being built. Also solar panels. Individual people are now starting to put solar panels on their houses. Some businesses as well.</p>
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**10.5 – What Can we do? P. 433 # 1, 2, 6a**

#1	<p>a) Transportation creates 50% of the greenhouse gases. That means driving vehicles fueled by gas.</p> <p>b) Think of how you and your family use fossil fuel based energy AND look at the list on page 429. Be able to discuss 3 or 4 ways you could realistically help reduce greenhouse gas emissions.</p>
#2	<p>a) heating (winter) and cooling (summer) our houses is the second greatest source of G.H. gases.</p> <p>b) There are many things to do to help reduce our heating &amp; cooling. Try using passive ways to cool (blinds pulled down in midday heat). Fans help circulate cool air throughout the house. Get used to keeping the house a degree or two warmer than usual when your air conditioning is on. The same goes for heating. Perhaps keeping your home a few degrees cooler at night when you sleep. Keep winters closed when heating and cooling to keep the heat/cool in! Etc...</p>
#6a	<p>Planting trees helps build up our carbon sink! Remember that carbon sinks take carbon dioxide OUT of the atmosphere. Trees and all green plants do this for us when they photosynthesize. Planting trees and shrubs and anything green helps!!</p>