**Ch. 20 Reading Q’s: Climate Change and Ozone Depletion**

**Miller: *Living in the Environment***

**Part I – Climate Change**

1. **Studying a Volcano to Understand Climate Change**
   1. What did James Hansen predict would happen to the average Earth’s temperatures after the volcano exploded in the Philippines?
   2. Define global warming.
   3. How did Hansen make his forcasts?
2. **Past Climate Change and the Greenhouse Effect**
   1. Global Warming and Global Cooling are Not New
      1. Give 4 reasons why Earth’s climate has changed over the past 4.7 billion years.
      2. What are glacial and interglacial periods?
      3. What are some hypotheses to explain major climate changes in the past?
   2. How do we know what temperatures were in the Past?
      1. Identify 3 techniques that allow scientists to know that there were past temperature changes.
      2. What do measurements of CO2 correlate with?
      3. Using figure 20-4, where are the CO2 levels the highest they have been in 160,000 years? What does this imply about temperature?
   3. The Natural Greenhouse Effect
      1. Describe the greenhouse effect.
      2. List and describe 3 factors that shape the earth’s climate.
   4. Major Greenhouse Gases
      1. List 4 natural greenhouse gases.
      2. What has causes the changes in average temp over the past 400,000 years?
      3. When did human actions create significant increases in greenhouse gases? Which gases were increased? Give 3 ways these gases were increased?
      4. Identify the top 6 greenhouse gas producing countries and their total emissions.
      5. What is the US greenhouse gas emissions per capita?
3. **Climate Change and Human Activities**
   1. Signs that the Troposphere is warming: The Human Connection
      1. What would have happened if these early societies had not done this?
      2. What is the IPCC and what does it do?
   2. The Scientific Consensus about Future Climate Change
      1. Define Global Climate Change.
      2. There is an overwhelming consensus among the world’s climate scientists that global warming is occurring. Why is it difficult to predict the speed of warming and the locations of major disasters?
      3. What is the goal of carbon-based industries? What other industry does your book compare it to? Do you think this is a fair comparison?
   3. Why should we be concerned about a warmer Earth?
      1. What is a tipping point? What are some effects that could be seen if we reach the tipping point?
4. **Factors Affecting the Earth’s Temperature**
   1. Harmful and Corrective Feedbacks in the Global Climate System
      1. Explain a positive and negative feedback loop.
   2. Can the Oceans Store More CO2 and Heat?
      1. How much CO2 do the oceans remove?
      2. What happens to the solubility of CO2 in ocean water with increasing temp?
   3. Effects of Cloud cover
      1. How can clouds create positive feedback or negative feedback?
   4. Effects of Outdoor Air Pollution
      1. What are aerosols?
      2. What may be the second biggest contributor to global warming after CO2? Give 2 reasons why?
   5. Effects of Higher CO2 levels on photosynthesis.
      1. What happens to the rate of photosynthesis?
      2. List 4 reasons why this effect would be temporary.
5. **Effects of Global Warming**
   1. Effects of a Warmer Troposphere: An Overview
      1. Where will the most harmful effects of global warming be felt? Why?
   2. Melting Ice and Snow
      1. Why are temperature increases greater in polar regions?
      2. Why should we care if there is less ice in the Arctic?
      3. What is one benefit of the loss of the ice in the Arctic Sea?
      4. What is a problem with the melting of mountain glaciers? Could it affect us?
      5. What will happen if Greenland’s ice sheet melt?
   3. Rising Sea Levels
      1. List and Describe 5 effects of rising sea levels.
   4. Changing Ocean Currents
      1. Explain how Global Warming could alter the oceans currents.
   5. Warmer and More Acidic Seas
      1. How can warmer surface ocean waters prevent upwelling of nutrients? What will happen to the organisms that depend on these upwellings and how does that create a positive feedback effect for global warming?
      2. How does CO2 lower the pH of the ocean? What are 2 effects of a higher ocean pH?
   6. Changes in Precipitation and Weather
      1. List and describe 5 ways that global warming will change weather patterns.
   7. Effects on Biodiversity: Winners and Losers
      1. What ecosystems will be the most effected? How?
      2. What will happen to forests and forest fires? Why?
      3. What will happen to overall biodiversity?
   8. Effects on Agriculture and Fish Stocks: Winners and Losers
      1. Explain which areas will be winners and which areas will be losers. Why?
   9. Effects on People
      1. What will happen to the number of tropical infectious diseases? Identify 3 diseases that could cause problems.
      2. What will happen to levels of weeds, and insects? Why are these problems?
      3. What will happen to people when there is flooding and drought?
      4. How many people are dying from climate change annually now? How many by 2030? How many by 2100?
6. **Dealing with Global Warming**
   1. Solutions: What are our Options?
      1. Define mitigation.
      2. Describe the 2 schools of thought for using mitigation with global warming.
      3. What do economists think about global warming?
   2. Solutions: Reducing the Threat
      1. ID 7 ways to prevent global warming.
      2. ID 7 ways to clean up global warming.
   3. Removing and Storing CO2
      1. ID and describe 4 ways we can remove CO2 from the atmosphere.
   4. Government Roles in Reducing the Threat of Climate Change
      1. Explain the 3 methods that governments can use to promote solutions to climate change.
   5. Can We Afford to Reduce the Threat of Global Warming?
      1. Explain the fiscal argument to prevent global warming and the fiscal argument to wait and do nothing.
7. **What is Being Done to Reduce Greenhouse Gas Emissions?**
   1. International Climate Negotiations: The Kyoto Protocol
      1. Describe the Kyoto protocol.
   2. Moving Beyond Kyoto
      1. List 2 ways to move beyond Kyoto.
   3. Actions by some Countries, States, Cities, Businesses, Schools, and Individuals
      1. Identify 2 specific plans implemented in some countries.
      2. Identify 2 specific plans implemented in some corporations.
      3. Identify 8 things that you can do to reduce greenhouse gases.
   4. Solutions: Preparing for Global Warming
      1. Using figure 20-17, identify 8 ways to prepare for global warming.
8. **Ozone Depletion in the Stratosphere**
   1. Threats to Ozone Levels in the Stratosphere
      1. What does the ozone layer do?
      2. Where is there a thinning of the ozone layer?
   2. What Causes Ozone Depletion?
      1. What are CFCs? What is their trade name?
      2. List 5 characteristics of CFCs.
      3. What were CFCs used for?
      4. What are the disadvantages of CFCs?
      5. What are 4 conclusions made about CFCs?
      6. What is the substitute for CFCs?
   3. Annual Drops in Ozone Levels over the Earth’s Poles
      1. What happens annually to the ozone layer over Antarctica? What is this known as?
      2. What causes this?
      3. What is a polar vortex?
      4. What do scientists project about ozone thinning between 2010-2019?
   4. Why should we be worried?
      1. List 10 reasons why the ozone layer is important.
   5. Case Study: Skin Cancer
      1. What causes skin cancer?
      2. Describe melanoma and its effects.
      3. What happened to women who visited tanning salons once a month?
      4. List 5 ways you can reduce your exposure to UV radiation.
9. Protecting the Ozone Layer
   1. How can we protect the ozone layer?
      1. What happened in Montreal in 1987?
      2. What was the treaty’s goal?
      3. What happened in Copenhagen in 1992? What was its goal?
      4. What is happening with CFCs on the black market? Why?
      5. What is the problem with HCFCs and HFCs?

**Supplement 11 – Earthquakes, Tsunamis, and Volcanic Eruptions**

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1. Earthquakes
   1. What is an earthquake?
   2. How is it measured? Describe this scale.
   3. What are aftershocks and foreshocks?
   4. What are primary effects of earthquakes?
   5. What are secondary effects of earthquakes?
2. Tsunamis: Earthquakes and Huge Waves
   1. What is a tsunami?
   2. What causes a tsunami?
   3. How fast does a tsunami travel?
   4. What is a tsunami like in deep water compared to shallow water?
   5. How can we detect tsunamis?
   6. What ecosystems can help protect people from tsunamis? How?
3. Volcanoes
   1. Describe an active volcano.
   2. How does a volcano contribute to air pollution?
   3. What are some benefits of volcanoes?
   4. How can we prepare for volcanoes and reduce the loss of life?