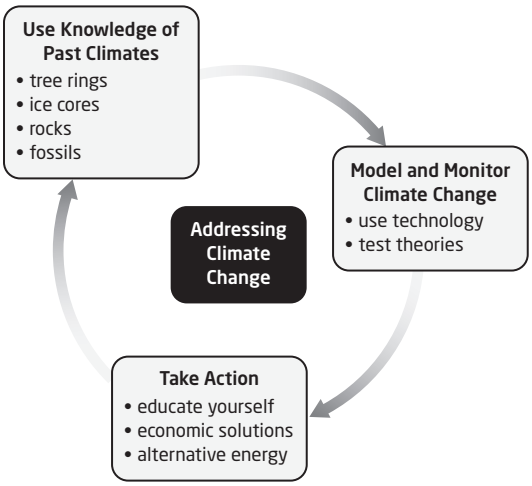
Chapter Review Answers (Student textbook pages 346 and 347)

Please also see **BLM 8-16 Chapter 8 Review (Alternative Format).**

Make Your Own Summary



Reviewing Key Terms

1. concentration
2. system
3. energy budget
4. global warming potential
5. nitrogen fixation
6. greenhouse gases
7. biogeochemical cycles
8. stores
9. feedback loops

Knowledge and Understanding

10. Greenhouse gases absorb infrared radiation. They allow other wavelengths of radiation to pass through.
11. In an open system, energy and matter cross the boundaries of the system. In a closed system, energy can cross the boundaries, but matter cannot.
12. Different gases have different warming effects that vary based on the ability of the gas to absorb heat and the length of time the gas remains in the atmosphere. These differences must be accounted for when recommending action. Nitrous oxide, for example, will cause much greater global warming than a similar amount of carbon dioxide.
13. The diagram shows that most of the solar energy that enters Earth's system is absorbed.
14. Convection moves warm air from near the surface of Earth upward and cool air from higher in the atmosphere downward.
15. A decrease in albedo means that less infrared radiation is reflected back into the atmosphere. This means that more infrared radiation is absorbed by Earth, increasing temperatures.
16. The diagram shows a positive feedback loop because the loop increases the effects of the interacting parts. An increase in carbon dioxide and methane released into the atmosphere will result in more thermal energy being absorbed, which will result in an increase in temperature and so on.
17. Humans have caused imbalances in the nitrogen cycle by adding nitrogen to the land, adding nitrogen to water and adding nitrogen to the atmosphere. A major contributor has been the use of fertilizers for agriculture.
18. Halocarbons are efficient at absorbing infrared radiation and have a high global warming potential. They are very stable molecules that can remain in the atmosphere for thousands of years and therefore the concentrations of halocarbons in the atmosphere can build up over time.
19. Earth's natural greenhouse effect is necessary for Earth to be habitable for humans and other life. The anthropogenic greenhouse effect may be responsible for recent climate change and is the result of an increase of greenhouse gases.

Thinking and Investigation

20. Methane; methane has a higher global warming potential than carbon dioxide.
21. During El Niño, changes to surface temperature in the oceans are caused by changes to the normal patterns of trade winds. If these trade winds reverse, warm waters in the Western Pacific move eastwards, warming the water off the coast of South America and causing heat and moisture to rise from the ocean off of Ecuador and Peru. The changes in atmospheric circulation affect the jet stream that normally flows over Canada, changing patterns of precipitation and temperature.
22. The carbon is stored in carbon sinks.
23. The peaks and the lows are reflecting the seasonal changes of deciduous forests losing and growing leaves.

Communication

24. Student answers will vary. The models created should illustrate that matter cannot cross the boundary of the system.

25. Student answers will vary. The greenhouse effect regulates Earth's global temperature by capturing heat energy from the Sun and creating a blanket of warmth around Earth. Without greenhouse gases, Earth would be too cold for humans to survive. At the moment, there are too many greenhouse gases so the greenhouse effect is causing too much heat to surround Earth.

26. Student answer will vary. For example, students might illustrate how the melting of the Arctic icecap would result in less infrared radiation being reflected out to space. The heat would be absorbed. This increase in absorbed heat would heat up the oceans and the land, increasing the global temperature. The increase would cause more of the Arctic icecap to melt.

27. Student answers will vary. A cartoon that shows humans using or burning fossil fuels, such as driving cars, using electricity, or cutting trees, would be acceptable. The cartoon should also show alternatives to this, such as people riding bikes, turning off the lights and planting trees.

Application

28. Actions that could be taken to limit greenhouse gas production include: conserve electricity; improve home-heating efficiency; and reduce, reuse and recycle.

29. The benefits would include creating a significant carbon sink, as the carbon present in the algae would remain on the ocean floor for centuries or even longer. The drawbacks would include losing the algae's contribution to photosynthesis. Algae are one of the key photosynthesizing organisms.

30. Nitrous oxide is almost 300 times more potent than carbon dioxide, so the relative greenhouse gas potential of nitrous oxide is much higher than carbon dioxide.

31. Radiation is the transfer of energy via electromagnetic radiation. The heat will be transferred from the Sun to the road surface. Conduction is the transfer of thermal energy between two objects. In this case, the black road will heat up and transfer heat to the water in the puddle. Convection is the transfer of thermal energy from energized molecules to other molecules. As the water molecules heat up, they move and rise, transferring heat to other water molecules.

32. Examples: The carbon cycle could be affected by students' methods of transportation, using energy, or using products that require energy to produce; the nitrogen cycle could be affected by students using fertilizers in their gardens, letting soaps or fertilizers wash into the water system, or using ammonia. Students should be able to come up with various ways to reduce their impact. Ensure their solutions are logical and practical. It may be difficult for students to come up with three direct ways they influence the nitrogen cycle unless they live in a rural environment.