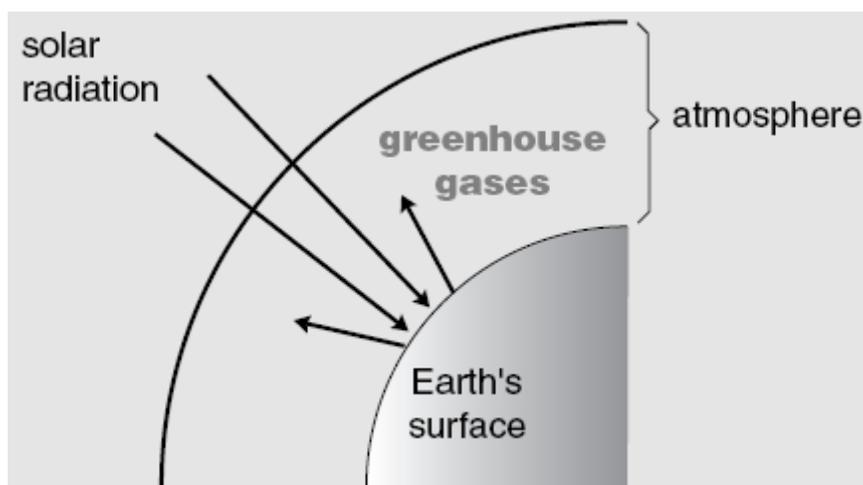


Thought Lab 15.1: Fossil Fuels and Climate Change Answer Key

Answers to Procedure Questions

1. (a) The features shown in your diagram should include the following:

Radiant energy from the Sun is absorbed by the surface of Earth. Earth's surface re-radiates the energy, but at a longer wavelength. This energy is absorbed by greenhouse gases such as CO_2 , H_2O , and CH_4 , which causes warming of the lower atmosphere and surface. A simple diagram might appear as follows:



- (b) Greenhouse gases are those gases in the atmosphere that selectively absorb electromagnetic radiation at the infrared wavelength range, causing the chemical bonds joining adjacent atoms to stretch. When the chemical bonds return to the lower energy state, they emit an electromagnetic wave of slightly longer wavelength than that absorbed. This longer infrared radiation is absorbed by other gases in the atmosphere, resulting in a warmer atmosphere.
2. (a) Concentrations of methane, carbon dioxide, and dinitrogen monoxide (nitrous oxide), all powerful greenhouse gases, are at levels significantly higher than those found in pre-industrial times. If the increasing trend continues, many scientists argue that this will accelerate warming of the lower atmosphere, causing an overall warming of Earth's surface and possible climate change.
- (b) The main sources for dinitrogen monoxide and methane are related to human agricultural practices. The extensive use of nitrogen based fertilizers in agriculture is one of the biggest factors involved in production of dinitrogen monoxide. Both methane and dinitrogen monoxide are formed by microbes in the anaerobic conditions maintained in flooding of agricultural lands for rice farming. In addition, methane is generated as the natural byproduct of ruminant digestion and from landfills. The human production of carbon dioxide is primarily from fossil fuel burning. The rate of increase in the atmosphere is closely tied to the agricultural practice of cutting down tropical forests.

CHAPTER 15		BLM 15.1.1A
ANSWER KEY	<p style="text-align: center;">Thought Lab 15.1: Fossil Fuels and Climate Change Answer Key (continued)</p>	

Answers to Analysis Questions

1. The burning of fossil fuels is expected to increase the level of greenhouse gases in the atmosphere. Although the amount of change that could result is still being hotly debated, it is expected that disruptions to global weather patterns, leading to shifts in precipitation and vegetation patterns, will affect most areas of the world. In addition, a warmer atmosphere is expected to lead to changes in the polar ice sheets, with a corresponding change in sea level and a general increase in severe storms in certain areas, such as the tropics.
2. The agricultural practices of flooding arable land to produce rice crops and cutting down tropical rainforest areas to produce pasture land are increasing the levels of greenhouse gases in the atmosphere. In addition, the destruction of tropical rainforest removes an important method of withdrawing carbon dioxide from the atmosphere.
3. Four possible methods are outlined below:
 - (i) Electricity production is one of the largest sources of carbon dioxide emissions in developed countries. Therefore, reducing electricity use by turning off unnecessary lights and appliances, and buying energy efficient appliances is a good start.
 - (ii) Reducing the amount of organic materials deposited in landfills can reduce the possibility of methane production.
 - (iii) Reduction or changes to the way in which nitrogen based fertilizers are used may reduce production of nitrous oxide.
 - (iv) Reduction in fossil fuel combustion by reducing automobile use and lowering household heating/cooling levels will reduce carbon dioxide emissions.