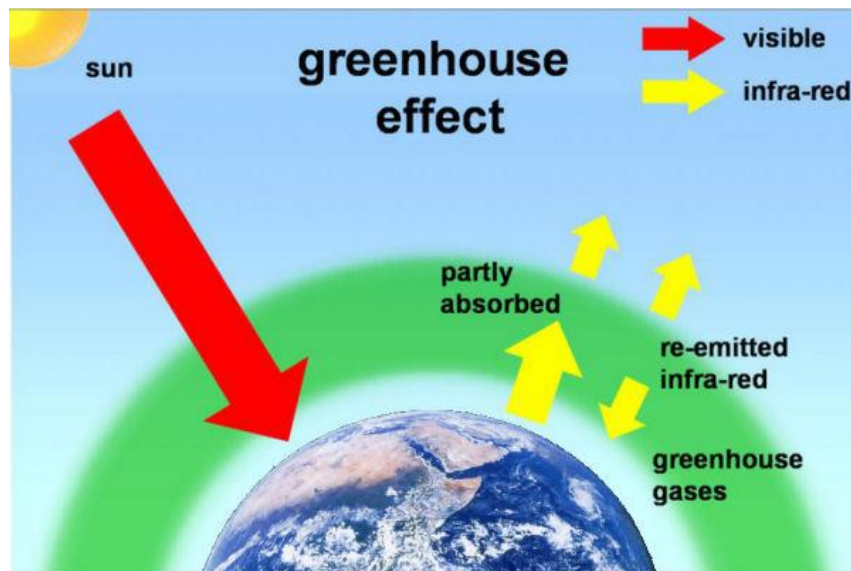


## The Greenhouse Effect: Fact or fiction?

Living things need energy to survive. The energy that sustains life on the Earth comes from the Sun, which radiates energy into space because it is so hot. A tiny proportion of this energy reaches the Earth. The Earth's atmosphere acts like a protective blanket over the surface of our planet, preventing the variations in temperature that would exist in an airless world. Most of the radiated energy from the Sun passes through the Earth's atmosphere. The Earth absorbs some of this energy, and some is reflected back from the Earth's surface. Part of this reflected energy is absorbed by the atmosphere. As a result of this the average temperature above the Earth's surface is higher than it would be if there was no atmosphere. The Earth's atmosphere has the same effect as a greenhouse, hence the term *greenhouse effect* (see image below).



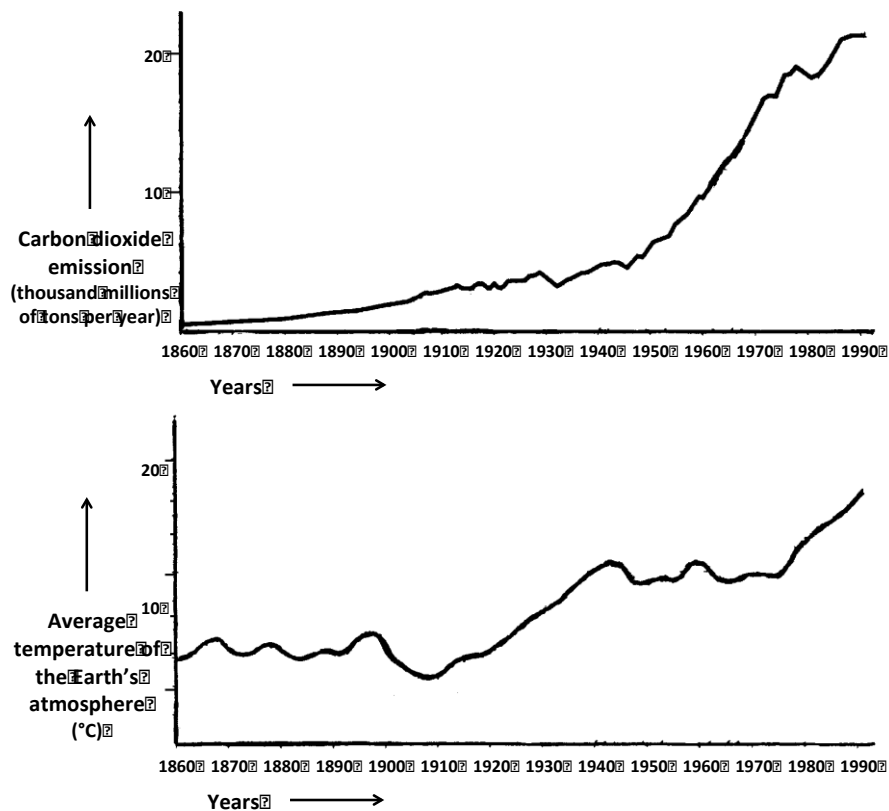
Greenhouse effect. Image sourced from the website of the Hong Kong Observatory:  
[http://www.hko.gov.hk/climate\\_change/faq/faq\\_e.htm#Q4](http://www.hko.gov.hk/climate_change/faq/faq_e.htm#Q4)

The greenhouse effect is said to have become more pronounced during the twentieth century and the first part of the twenty-first century. It is a fact that the average temperature of Earth's atmosphere has increased. In newspapers and periodicals the increased carbon dioxide emission is often stated as the main source of the temperature rise in the twentieth century.

## Activity A: Interpreting the evidence

Based on "Greenhouse," by the OECD, Take the Test Sample Questions from OECD's PISA Assessments, <http://www.oecd.org/pisa/pisaproducts/Take%20the%20test%20e%20book.pdf>, 2009.

Student A is interested in the possible relationship between the average temperature of the Earth's atmosphere and the carbon dioxide emission on the Earth. When searching for information, he finds the following two graphs.



Graphs showing emission of carbon dioxide and mean global temperature from 1860 to 1995.

From these two graphs, student A draws the conclusion that it is certain that the increase in the average temperature of the Earth's atmosphere is due to the increase in the carbon dioxide emission.

**Task 1.** Where in the graphs can support be found for the conclusion made by Student A that the increase in mean temperature in Earth's atmosphere is caused by the increased emission of carbon dioxide? Give supportive arguments for this conclusion with reference to the graphs. Use the rubric to check your answer.

**Task 2.** Another student, Student B, thinks that the conclusion by Student A is wrong. She compares the graphs and claims that some parts of the graphs do not support the conclusion that the increase in mean temperature in Earth's atmosphere is caused by the increased emission of carbon dioxide.

Identify the parts of the graphs that do not support the conclusion by Student A and present supportive arguments for the conclusion made by Student B. Use the rubric to check your answer.