Clouds & Particles

Basics

3. Sun and clouds

Solution Worksheet 3

1.

a) About 30 % of the sunlight striking the earth is reflected back into space.
b) None of it is transmitted through the earth.
c) About 70 % is absorbed, contributing processes like photosynthesis and (most importantly) heating the earth.

2.

- About 30 % of the sunlight is reflected. Radiation energy reflected: 1.7×10^{17} joule * 0.3 = 5.1×10^{16} joule
- About 70 % is absorbed: 1.7×10^{17} joule * 0.7 = 1.2×10^{17} joule
- The earth must radiate approximately the same amount of energy out into space as it receives from the sun; otherwise it would quickly heat up or cool down. Thus, the earth radiates approximately 1.2×10^{17} joule of energy out to space each second, mainly in the form of infrared (heat) radiation.

3.

The earth's cloud cover resembles your night blanket since it keeps the heat in:

Just as your blanket absorbs your body heat and gives some of it back to you, the earth's cloud cover absorbs some of the infrared (heat) radiation coming from the earth and sends some of it back down, keeping the temperature up at night.

4.

Negative feedback loop involving clouds:

A hotter climate
→ more evaporation
→ more clouds
→ greater albedo
(more of the sun's radiation being reflected back into space)
→ less radiation energy reaching the earth's surface
→ a cooler climate.

Please note that the total effect of clouds on climate (the result of all positive and negative feedback loops) is not well understood by climate scientists.