November 2, 2004 – mini-Quiz #7 – 8.03

Your name . . . .

Mark your recitation: R01 – R02 – R03 – R04 – R05

Why did the Moon turn haunting shades of red and orange during last week's total eclipse?

The answer was discussed during last Thursday's Lecture as a wonderful example of Rayleigh scattering.

The reddish hues are caused by sunlight scattered by the Earth's atmosphere. Viewed from the Moon, the sun is hiding behind the Earth. The Earth' atmosphere is visible as a very thin ring whose thickness is less than about 1% of the Earth' diameter. Rayleigh scattering off very small particles (and density fluctuations) in the Earth' atmosphere gives this ring its reddish colors. As derived in lectures, the scattering probability goes with the frequency to the power 4. The frequency of blue light is about 1.5 times higher than that of red light; $1.5^4 \sim 5$. Thus the high-frequency (short wavelength) components present in the sunlight have been largely removed and the reddish colors remain (like during sunrise and sunset). This faint reddish light illuminates the Moon. Look at the "Astronomy Picture of the Day" of October 29
http://antwrp.gsfc.nasa.gov/apod/ap041029.html