Environmental Science, Problems Chapter 8

8.1

If looking through a telescope with an opening of 22 cm at two objects close to each other at a wavelength of 550 nm, what is the minimum angle between objects we see, in radians?

Answer: 3.0 μrad

8.2

We are using a telescope with an opening lens with diameter D, at two objects close to each other at a wavelength of λ, giving a minimum angle of resolution between the two objects. If we double the lens diameter to $2D$. How will the resolution change?

Answer: The angle of resolution will drop to half of its initial value

8.3

A Landsat satellite is studying the Earth. The opening of the observing telecope is 45 cm and one uses infrared light with $\lambda = 1.5$ μm. The satellite travels 706 km above the ground. Is it possible to see an object of the size of a car, around 5.0 m?

Answer: It is possible to observe the car.

8.4

A satellite is orbiting around the Earth with an orbiting period of $T = 12$ h. What is the satellite's height above the ground?

Answer: $2 \cdot 10^4$ km

8.5

A satellite is orbiting around the Earth with an orbiting period of T and orbits with a radius R from the center of the Earth. If the orbiting period would be $8T$, what would the radius of the orbit be?.

Answer: 4R

8.6

Satellites often use interference filters to observe special bands in the spectra. Construct a thin trnasmission filter that operates at 550 nm and uses a material

with refractive index 1.48, surrounded by air. Give the thickness of the filter as an answer.

Answer: 93 nm