

OpenStax Astronomy, Ch.6: WS Problems (Apr-2021)

Review Questions

1. Name the two spectral windows through which electromagnetic radiation easily reaches the surface of Earth and describe the largest-aperture telescope currently in use for each window.
2. When astronomers discuss the apertures of their telescopes, they say bigger is better. Explain why.
3. The Hooker telescope at Palomar Observatory has a diameter of 5 m, and the Keck I telescope has a diameter of 10 m. How much more light can the Keck telescope collect than the Hooker telescope in the same amount of time?
4. What is meant by “reflecting” and “refracting” telescopes?
5. Why are the largest visible-light telescopes in the world made with mirrors rather than lenses?
6. Compare the eye, photographic film, and CCDs as detectors for light. What are the advantages and disadvantages of each?
7. Why is it difficult to observe at infrared wavelengths? What do astronomers do to address this difficulty?
8. Why do astronomers place telescopes in Earth’s orbit? What are the advantages for the different regions of the spectrum?
9. Describe the techniques radio astronomers use to obtain a resolution comparable to what astronomers working with visible light can achieve.
10. What kind of visible-light and infrared telescopes on the ground are astronomers planning for the future? Why are they building them on the ground and not in space?
11. What would be the properties of an ideal astronomical detector? How closely do the actual properties of a CCD approach this ideal?
12. The largest observatory complex in the world is on Mauna Kea, the tallest mountain on Earth. What are some factors astronomers consider when selecting an observatory site? Don’t forget practical ones. Should astronomers, for example, consider building an observatory on Mount McKinley (Denali) or Mount Everest?
13. How much more light can be gathered by a telescope that is 8 m in diameter than by your fully dark-adapted eye at 7 mm?
14. The HST cost about \$1.7 billion for construction and \$300 million for its shuttle launch, and it costs \$250 million per year to operate. If the telescope lasts for 20 years, what is the total cost per year? Per day? If the telescope can be used just 30% of the time for actual observations, what is the cost per hour and per minute for the astronomer’s observing time on this instrument? What is the cost per person in the United States? Was your investment in the Hubble Space telescope worth it?

