9. Compare an optical reflecting telescope with a radio telescope. What do they have in common? How are they different?

An optical reflecting telescope and a radio telescope both use a curved reflecting surface to focus the incoming radiation. The radio telescope uses a metal dish as the reflecting surface instead of a thin reflective coating on glass. The metal dish does not have to appear shiny or even be continuously solid, while the optical mirror must appear shiny. Because radio wavelengths are longer than visible light wavelengths, radio telescopes must have larger diameters than those of visible light telescopes.

10. Why can radio astronomers observe at any time of the day or night, whereas optical astronomers are mostly limited to observing at night?

Day and night refer to the ambient visible light in the sky. Daylight does not interfere with radio waves passing through Earth’s atmosphere, while visible light from stars and other astronomical objects are too dim to be seen during the day, and to some extent in regions that experience light pollution. Some human-made radio signals emitted at any time of the day or night do interfere with radio astronomy.

11. Why must astronomers use satellites and Earth-orbiting observatories to study the heavens at X-ray wavelengths?

The atmosphere is not transparent to X rays (nor to gamma rays). Therefore, these forms of radiation must be studied from orbits outside Earth’s atmosphere.