

Name: _____ Date: _____

1. As light passes from air into a dense but transparent material it
 - A) speeds up.
 - B) slows down.
 - C) maintains its speed.
 - D) changes its speed to the speed of sound in glass.

2. By what factor is the amount of light gathered by the 10-m diameter Keck telescope on Mauna Kea, Hawaii, greater than that gathered by the 2.5-m diameter Mount Wilson telescope?
 - A) 4
 - B) 16
 - C) 256
 - D) 2

3. A particular reflecting telescope has an objective mirror with a focal length of 1.2 m and an eyepiece lens of focal length 6 mm. What is the magnifying power of this telescope?
 - A) 5×
 - B) 2000×
 - C) 20×
 - D) 200×

4. To produce the sharpest images of very distant objects, the best shape for the cross-section of a large astronomical mirror should be
 - A) elliptical.
 - B) spherical.
 - C) perfectly flat and smooth.
 - D) parabolic.

5. A spherical mirror suffers from spherical aberration because
 - A) the starlight is distorted by turbulence in Earth's atmosphere.
 - B) the mirror sags under its own weight, distorting the image.
 - C) different parts of the mirror focus the light at different distances from the mirror.
 - D) different colors are focused at different distances from the mirror.

6. If all effects caused by Earth's atmospheric variations (seeing) could be removed from the visible image of a star on one of the 10-m diameter Keck telescopes on Hawaii, what would be the angular resolution achievable by this telescope in arcseconds for light of wavelength 500 nm? (1 nm = 10^{-9} m)
- A) 0.00125 arcsec
 - B) 0.125 arcsec
 - C) 12.5 arcsec
 - D) 0.0125 arcsec
7. At the extreme limit of magnification, the major cause of blurred and unsharp images of objects observed through very large telescopes is
- A) the poor tracking capabilities of modern telescopes.
 - B) air turbulence in Earth's atmosphere.
 - C) the poor optical polish achievable on large mirrors.
 - D) the clumsiness of the telescope operator.
8. Why was adaptive optics developed?
- A) to prevent distortion of mirrors by the vacuum of space
 - B) to prevent distortion by sagging in very thin, lightweight mirrors
 - C) to compensate for spherical aberration
 - D) to compensate for image distortion caused by Earth's atmosphere
9. The charged-coupled device (CCD), now used extensively for astronomical imaging, works on what principle?
- A) Light generates electrical charge on a computer-readable, multi-element array of detectors.
 - B) Light from the image modifies the plastic material on a disk, which can then be read on a standard video compact disk (CD) player.
 - C) Light from the image is detected by new, high-sensitivity, fine-grain, automatically processed film.
 - D) A single optical detector generates an electrical signal as it is scanned quickly across the astronomical image.
10. What is the main reason for combining many radio telescopes together into an interferometer with large distances between telescopes?
- A) to obtain much sharper images of sources
 - B) to ensure that at least one of the telescopes is in a radio interference-free zone
 - C) to ensure that observations are uninterrupted by the failure of one or two telescopes
 - D) to collect more radiation from very faint sources