Name: _____ **Date:** _____

Blast Beyond Boundaries: 12th Grade Advanced Wave Optics Quiz

How does diffraction limit the resolution of the world's most powerful telescopes? Analyze Huygens-Fresnel principles and Malus's Law in this rigorous AP-level review.

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1. A beam of unpolarized light passes through two polarizing filters. If the second filter (the analyzer) is rotated to an angle of 60 degrees relative to the first (the polarizer), what fraction of the original unpolarized intensity (I_0) is transmitted?

A. 0.125 I_0
B. 0.25 I_0
C. 0.375 I_0
D. 0.5 I_0

2. In a Young's Double Slit experiment, the distance between the third-order bright fringe and the central maximum can be decreased by _____ the separation between the two slits.

A. Increasing
B. Decreasing
C. Maintaining
D. Eliminating

3. According to the Rayleigh Criterion, the angular resolution of an optical system improves (becomes smaller) as the wavelength of light being used increases.

A. True
B. False

4. When light undergoes internal reflection at the boundary of a thin film with a higher refractive index than the surrounding media, what is the phase shift of the reflected wave?

A. 0 radians
B. π/4 radians
C. π/2 radians
D. π radians

5. If a light ray enters a dispersive prism, the _____ light will bend the most because it travels the slowest within the glass medium.

A. Red
B. Yellow
C. Green
D. Violet

6. An anti-reflective coating on a lens uses destructive interference. To eliminate reflection for a specific wavelength λ in a coating with index 'n', what is the minimum thickness required?

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A. λ / 2n
B. λ / 4n
C. λ / n
D. 3λ / 4n

7. The Brewster's angle is the specific angle of incidence where light reflected from a dielectric surface is completely polarized parallel to the plane of incidence.

A. True
B. False

8. A diffraction grating has 5000 lines per centimeter. What is the slit spacing 'd' used in the grating equation?

A. 2.0 x 10^-4 m
B. 2.0 x 10^-5 m
C. 2.0 x 10^-6 m
D. 5.0 x 10^-6 m

9. Spherical aberration in a large reflecting telescope can be corrected by replacing a spherical mirror with a _____ mirror.

A. Planar
B. Convex
C. Cylindrical
D. Parabolic

10. Huygens' Principle states that every point on a wavefront may be considered the source of secondary spherical wavelets.

A. True
B. False