Classroom Response System Questions

Chapter 36 Diffraction

Reading Quiz Questions
36.2.1. When does a Fresnel bright spot occur?

a) when light interferes destructively

b) when light is focused through a Fresnel lens

c) when light waves diffract around a disk, creating a bright spot in the shadow

d) when light passes through a circular opening and constructively interfere

e) when there is intense magnetic activity on the surface of the Sun
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36.2.2. Which one of the following scientists was a supporter of the particle theory of light?

a) Huygens  
b) Fresnel  
c) Young  
d) Newton
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36.3.1. By what path difference must two waves passing through a single slit differ to produce a dark fringe?

a) zero wavelengths

b) one-quarter wavelength

c) one-half wavelength

d) one wavelength

e) two wavelengths
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36.4.1. For what calculation would one use phasors in single slit diffraction?

a) the size of the slit

b) the amplitude of the electric field at the screen

c) the location of the secondary maxima or minima

d) the intensity of the light at a point on the screen

e) the number of interference bands in the diffraction pattern
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36.6.1. A telescope was used to photograph two distant stars, but the photograph only shows what appears to be one star. What term is used to describe the ability of an optical instrument to distinguish between two closely spaced objects?

a) diffraction limit
b) critical factor
c) separation angle
d) resolvability
e) Huygens’ criterion
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36.6.2. Which one of the following scientists is credited with the following: Two point objects are just resolved when the first dark fringe in the diffraction pattern of one fails directly on the central bright fringe in the diffraction pattern of the other?

a) Huygens  
b) Rayleigh  
c) Young  
d) Snell  
e) Michelson
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36.6.3. Consider the following equation that approximates the smallest angle that two point objects can subtend at an aperture of diameter $d$ for a given wavelength $\lambda$:

$$\theta_R = \frac{\lambda}{d}$$

Which of the following numbers belongs in the blank in the equation?

a) 1.22

b) 0.138

c) 2.18

d) 1.49

e) $4\pi$
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36.6.4. How will diffraction rings from a circular aperture be affected by reducing the diameter of the aperture?

a) The rings will spread further apart.

b) The rings will be spaced closer together.

c) The rings will increase in number.

d) The ring pattern will remain unchanged.
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36.6.5. How will diffraction rings from a circular aperture be affected by reducing the wavelength of the light?

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c) The rings will increase in number.

d) The ring pattern will remain unchanged.
36.6.6. Complete the following sentence: Rayleigh’s criterion refers to
a) the parameter that determines the location of the central maximum.

b) the minimum angular separation of two objects that they may be resolved.

c) the maximum diameter of a circular aperture that yields a diffraction pattern.

d) the critical angle for light approaching an aperture for diffraction to occur.

e) the minimum wavelength of light for diffraction to occur for a given aperture.
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36.8.1. What happens when sunlight falls on a diffraction grating?

a) A rainbow of colors is produced with one color at each principal maximum, but the central maximum is white.

b) Equally bright white fringes are produced at each principal maximum, but the central maximum is a rainbow of colors.

c) Bright white fringes of varying intensity are produced at each principal maximum.

d) A rainbow of colors is produced at each principal maximum, but the central maximum is white.

e) A solid, rainbow band of equally bright colors is produced.
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36.8.2. Monochromatic light passes through a diffraction grating. Which of the following statements concerning the light that falls on a distant viewing screen is true?

a) Bright principal fringes and less bright secondary fringes are observed.

b) Only bright principal fringes are observed.

c) A broad, bright band of light is observed.

d) A rainbow of colors is produced at each principal maximum, but the central maximum is white.

e) A very faint band of light is observed.
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36.9.1. On which of the following does the resolving power of a diffraction grating depend?

a) the distance between the rulings and the wavelength of light

b) the number of rulings on the grating and the diffraction order

c) the area of the grating and the distance between the rulings

d) the angular separation of two light sources and the difference in their wavelengths

e) Scientists have not yet explained the physical origin of the resolving power of a diffraction grating.
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36.9.2. Complete the following sentence: The larger the resolving power of a diffraction grating,

a) the more two different wavelengths are spread apart.

b) the narrower the line shape.

c) the wider the line shape.

d) the less two different wavelengths are spread apart.

e) the greater the dispersion of the grating.
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36.9.4. What does the dispersion of a diffraction grating indicate?

a) the resolvability of the grating

b) the variation in the intensity of light diffracted from the grating

c) the spreading that occurs depending on the wavelength of light

d) the number of lines per millimeter the grating has

e) the degree of polarization of light exiting the grating
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36.10.1. Which one of the following methods can be used to determine the crystalline structure of a material?

a) infrared diffraction

b) x-ray diffraction

c) diffraction grating photography

d) electron lithography

e) Raman spectroscopy
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a) Amontons

b) Dirac

c) Curie

d) Pauli

e) Bragg
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