Physics

Name

Review

Light

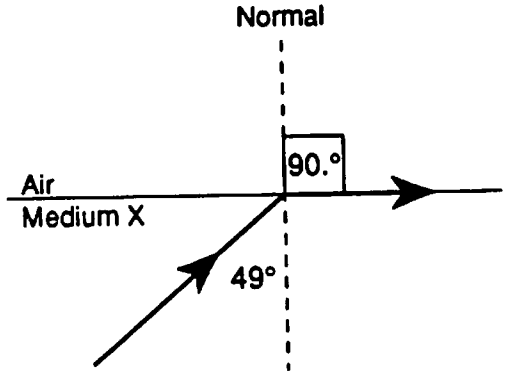
1 The distance from the Moon to Earth is 3.9×10^5 meters. What is the time required for a light ray to travel from the Moon to Earth?

(1) 0.65 s
(2) 1.3 s
(3) 2.6 s
(4) 3.9 s

2 Parallel light rays are incident on the surface of a plane mirror. Upon reflection from the mirror, the light rays will

1 converge
2 diverge
3 be parallel
4 be scattered

3 In the diagram below, a ray of monochromatic light ($\lambda = 5.9 \times 10^{-7}$ meter) reaches the boundary between medium X and air and follows the path shown.



Which medium is most likely medium X?

1 diamond
2 flint glass
3 Lucite
4 water

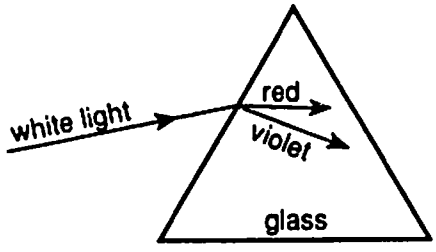
4 Which phenomenon can *not* be exhibited by longitudinal waves?

1 reflection
2 refraction
3 diffraction
4 polarization

5 As the color of light changes from red to yellow, the frequency of the light

1 decreases
2 increases
3 remains the same

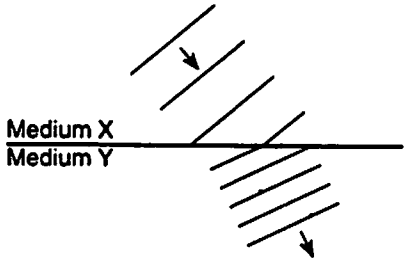
6 The diagram below shows white light being dispersed as it passes from air into a glass prism.



This phenomenon occurs because, in glass, each frequency of light has a different

1 intensity
2 amplitude
3 angle of incidence
4 absolute index of refraction

7 The diagram below represents wave fronts traveling from medium X into medium Y.



All points on any one wave front shown must be

1 traveling with the same speed
2 traveling in the same medium
3 in phase
4 superposed

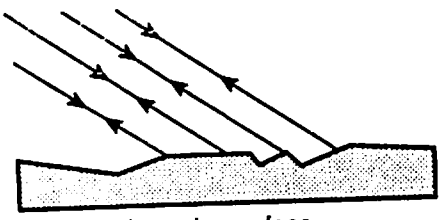
8 A laser beam does *not* disperse as it passes through a prism because the laser beam is

1 monochromatic
2 polychromatic
3 polarized
4 longitudinal

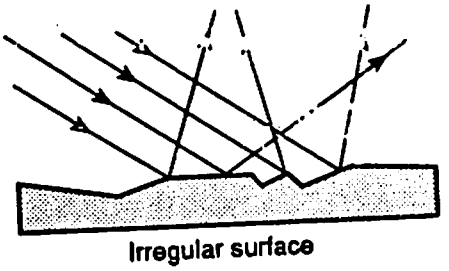
9 In a nondispersive medium, the speed of a light wave depends on

1 its wavelength
2 its amplitude
3 its frequency
4 the nature of the medium

10 Which diagram best represents the reflection of light from an irregular surface?



(1)



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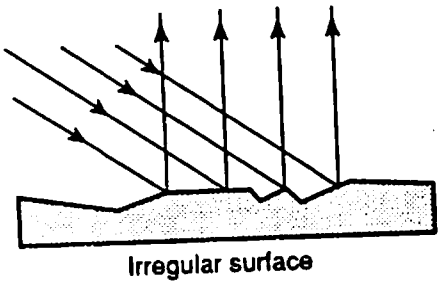

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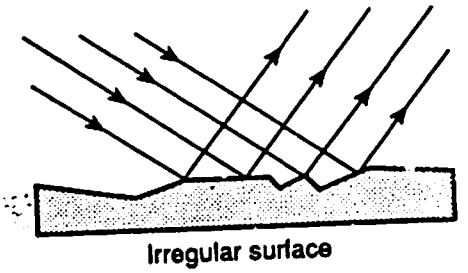


(4)

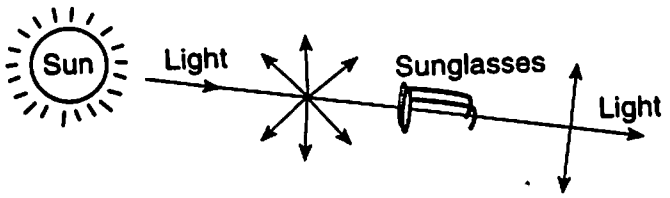
11 Light ($\lambda = 5.9 \times 10^{-7}$ meter) travels through a solution. If the absolute index of refraction of the solution is increased, the critical angle will

1 decrease
2 increase
3 remain the same

12 An astronomer on Earth studying light coming from a star notes that the observed light frequencies are lower than the actual emitted frequencies. The astronomer concludes that the distance between the star and Earth is

1 decreasing
2 increasing
3 not changing

13 The diagram below shows sunglasses being used to eliminate glare.



Which phenomenon of light is represented in the diagram?

1 dispersion
2 diffraction
3 internal reflection
4 polarization

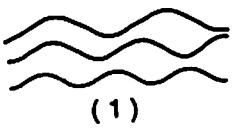
14 A beam of light crosses a boundary between two different media. Refraction can occur if

1 the angle of incidence is 0°
2 there is no change in the speed of the wave
3 the media have different indices of refraction
4 all of the light is reflected

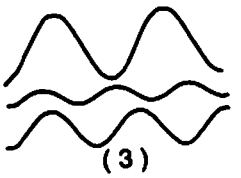
15 What is the energy of a photon with a frequency of 5.0×10^{14} hertz?

(1) 3.3 eV
(2) 3.2×10^{-6} eV
(3) 3.0×10^{45} J
(4) 3.3×10^{-19} J

16 Which diagram best represents light emitted from a coherent light source?



(1)



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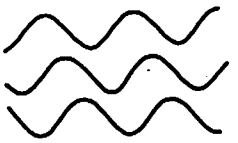
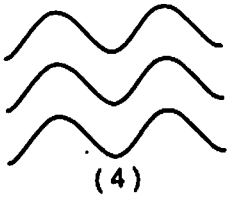
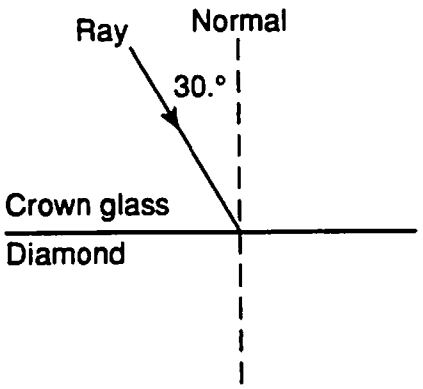


(2)



(4)

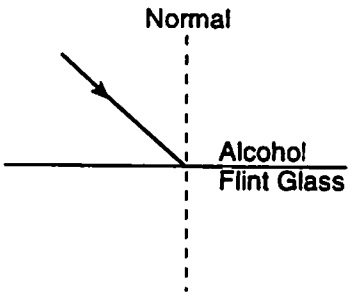
17 A ray of light ($\lambda = 5.9 \times 10^{-7}$ meter) traveling in crown glass is incident on a diamond interface at an angle of 30.°, as shown in the diagram below.



The angle of refraction for the light ray is closest to

(1) 12°
(2) 18°
(3) 30.°
(4) 53°

18 The diagram below shows a ray of monochromatic light incident on an alcohol-flint glass interface.



What occurs as the light travels from alcohol into flint glass?

1 The speed of the light decreases and the ray bends toward the normal.
2 The speed of the light decreases and the ray bends away from the normal.
3 The speed of the light increases and the ray bends toward the normal.
4 The speed of the light increases and the ray bends away from the normal.

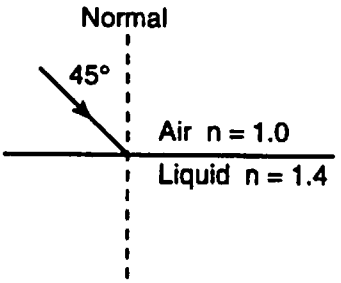
19 In a vacuum, a monochromatic beam of light has a frequency of 6.3×10^{14} hertz. What color is the light?

1 red
2 yellow
3 green
4 blue

20 The absolute index of refraction for a substance is 2.0 for light having a wavelength of 5.9×10^{-7} meter. In this substance, what is the critical angle for light incident on a boundary with air?

(1) 30.°
(2) 45°
(3) 60.°
(4) 90.°

21 A ray of monochromatic light ($\lambda = 5.9 \times 10^{-7}$ meter) traveling in air is incident on an interface with a liquid at an angle of 45°, as shown in the diagram below.



If the absolute index of refraction of the liquid is 1.4, the angle of refraction for the light ray is closest to

(1) 10.°
(2) 20.°
(3) 30.°
(4) 40.°

22 Which phenomenon can occur with light, but *not* with sound?

1 interference
2 polarization
3 refraction
4 the Doppler effect

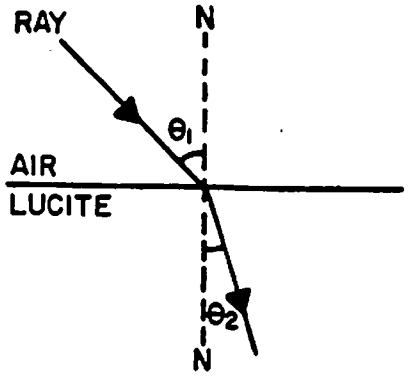
23 The speed of light in glycerol is approximately

(1) 1.0×10^7 m/s
(2) 2.0×10^8 m/s
(3) 3.0×10^8 m/s
(4) 4.4×10^8 m/s

24 How long will it take a light wave to travel a distance of 100. meters?

(1) 3.00×10^{10} s
(2) 3.00×10^8 s
(3) 3.33×10^{-7} s
(4) 3.33×10^7 s

Base your answers to questions 25 through 29 on the diagram below which represents a ray of yellow light ($\lambda = 5.9 \times 10^{-7}$ meter in air) passing from air into Lucite. Angle θ_1 is 45°.



25 If the light ray were reversed in direction with the angle in the Lucite remaining the same, the angle in the air would be
(1) less than 45°
(2) 45°
(3) between 45° and 72°
(4) between 72° and 90°

26 What is the approximate speed of light in the Lucite?
(1) 1.5×10^8 m/s
(2) 2.0×10^8 m/s
(3) 3.0×10^8 m/s
(4) 4.5×10^8 m/s

27 The sine of θ_2 equals
(1) 0.707
(2) 0.577
(3) 0.471
(4) 0.333

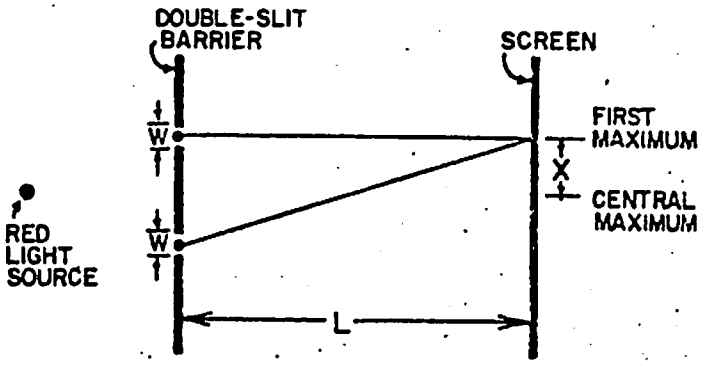
28 What is the sine of the critical angle for a ray passing from Lucite into air?
(1) 0.866
(2) 0.707
(3) 0.667
(4) 0.500

Note that question 29 has only three choices.

29 Lucite is replaced by medium X, which makes θ_2 smaller for the same θ_1 in air. Compared to the speed of the yellow light in Lucite, the speed of the yellow light in medium X is
1 less
2 greater
3 the same

Base your answers to questions 30 through 34 on the diagram and the information below.

Red light passing through a double slit is producing a stationary interference pattern on a screen as shown on the diagram.



30 The interference pattern is produced because the light passing through the two slits is
1 dispersed
2 polarized
3 diffracted
4 refracted

Note that questions 31 through 33 have only three choices.

31 If the distance L from the slits to the screen were increased, the distance X between the bright lines of the pattern on the screen would
1 decrease
2 increase
3 remain the same

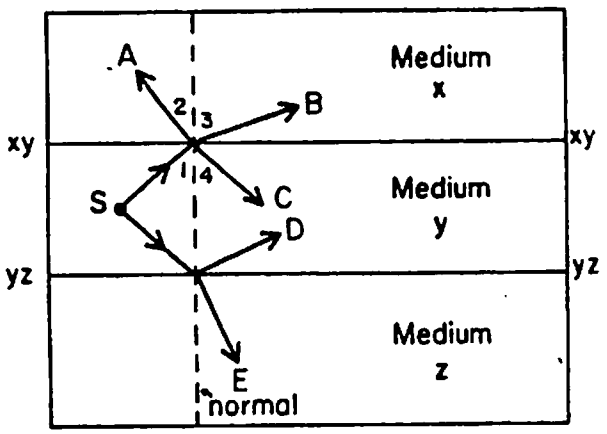
32 If blue light were substituted for the red light source, the distance X between the bright lines of the pattern on the screen would
1 decrease
2 increase
3 remain the same

33 If a single slit with the same width (W) as one of the double slits were used, the width of the central maximum of the interference pattern on the screen would
1 decrease
2 increase
3 remain the same

34 If a ray of light in glass is incident upon an air surface at an angle greater than the critical angle, the ray will
1 reflect, only
2 refract, only
3 partly refract and partly reflect
4 partly refract and partly diffract

Light #5

Base your answers to questions 35 through 39 on the diagram below. The diagram shows two light rays originating from source S in medium y. The dashed line represents a normal to each surface.



35 Which light ray would *not* be produced in this situation?
(1) A (2) B (3) C (4) E

36 A reflected light ray is ray
(1) A (2) B (3) C (4) E

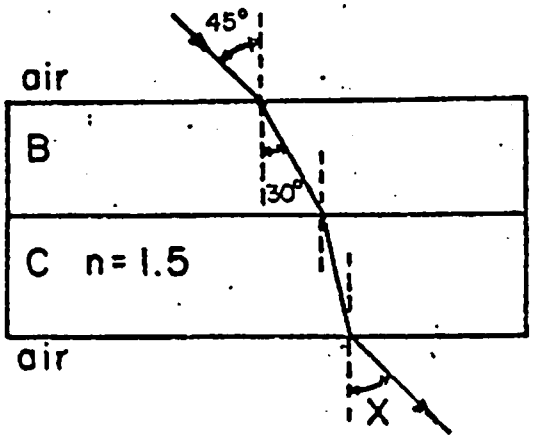
37 Which two angles must be equal?
(1) 1 and 2 (3) 3 and 4
(2) 2 and 3 (4) 1 and 4

Note that questions 38 and 39 have only three choices.

38 Light originating from source S could produce total internal reflection at
1 surface *yz*, only
2 surface *xy*, only
3 neither surface *xy* nor *yz*

39 Compared to the speed of light in medium x, the speed of light in medium z is
1 less
2 greater
3 the same

Base your answers to questions 40 through 44 on the diagram below which represents a ray of light moving from air through substance B, through substance C, and back into air. The surfaces of substances B and C are parallel.



40 What is the index of refraction of substance B?
(1) 0.75 (3) 1.4
(2) 1.2 (4) 1.5

41 What is the velocity of light in substance C?
(1) 1.0×10^8 m/s (3) 3.0×10^8 m/s
(2) 2.0×10^8 m/s (4) 4.5×10^8 m/s

42 At the boundary between substance C and air, what is the sine of the critical angle?
(1) 0.866 (3) 0.667
(2) 0.707 (4) 0.500

Note that questions 43 and 44 have only three choices.

43 If the angle of incidence of the light ray in air is increased, the angle of refraction in substance B will
1 decrease
2 increase
3 remain the same

44 Compared to the wavelength of the light in air, the wavelength of the light in substance C is
1 shorter
2 longer
3 the same