Pratt, Scott **Section 999**

–Introductory Physics II - EXAM , - Feb. 26, 1996

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1. [1pt] Light of wavelength 555 nm is incident on a glass block. (For each statement select G Greater than, L Less than, or E Equal to).

A) The FREQUENCY of the light in the glass is (GLE) than the FREQUENCY of the light in the vacuum.

B) The WAVELENGTH of the light in the glass is (GLE) than the WAVELENGTH of the light in the vaccum.

C) The VELOCITY of the light in the glass is (GLE) than the VELOCITY of the light in vacuum.

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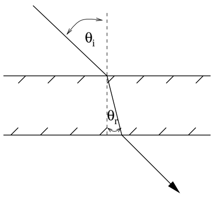
2. [1pt] (From C.J. 24.46) The mean distance between earth and the sun is $1.50 \times 10^{11} m$. The average intensity of solar radiation incident on the upper atmosphere of the earth is 1390 W/m^2. Assuming the sun emits radiation uniformly in all directions, determine the total power (in W) radiated by the sun.

A) 2.45×10^{26} B) 2.87×10^{26} C) 3.36×10^{26} D) 3.93×10^{26}
E) 4.60×10^{26} F) 5.38×10^{26} G) 6.29×10^{26} H) 7.36×10^{26}

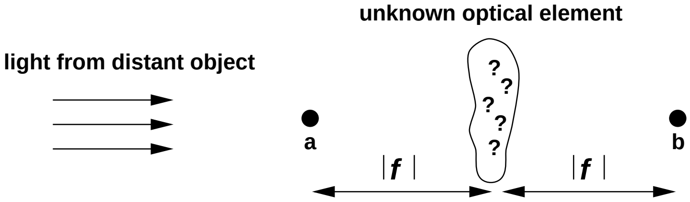


3. [1pt] A laser beam enters a 10.5 cm thick glass window at an incident angle of θ_i =51°. The index of refraction of the glass is 1.40. What is the angle of refraction θ_r? (in degrees)

A) 1.73×10^{1} B) 2.16×10^{1} C) 2.70×10^{1} D) 3.37×10^{1}
E) 4.21×10^{1} F) 5.27×10^{1} G) 6.59×10^{1} H) 8.23×10^{1}

4. [1pt] How long does it take the beam to pass through the plate (in *nanoseconds*)?

A) 3.77×10^{-1} B) 4.71×10^{-1} C) 5.89×10^{-1} D) 7.36×10^{-1}
E) 9.20×10^{-1} F) 1.15 G) 1.44 H) 1.80



5. [1pt] Light from a distant object is incident on an unknown optical element, as shown above. (For each statement select T True or F False).

A) If there is a VIRTUAL IMAGE at b the optical element is a CONVEX MIRROR.

B) If there is a REAL IMAGE at a the optical element is a CONCAVE MIRROR.

C) If there is a VIRTUAL IMAGE at a the optical element is a CONVERGING LENS.

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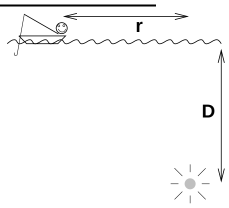
6. [1pt] An object whose height is 1.7 cm is placed 14.6 cm from a converging lens with a focal length of 7.3 cm. What is the height (in cm) of the image?

A) -9.07×10^{-1} B) -1.06 C) -1.24 D) -1.45
E) -1.70 F) -1.99 G) -2.33 H) -2.72



7. [1pt] A light is placed a depth D =42.7 m below the surface of a still lake. How far (What is maximum r) can a fisherman be from a point on the surface directly above the light, and still see the light? Assume the fisherman is just above the surface of the lake, and give your answer in m. DATA: The index of refr. of H_2O is 1.33.

A) 4.87×10^{1} B) 6.48×10^{1} C) 8.61×10^{1} D) 1.15×10^{2}
E) 1.52×10^{2} F) 2.03×10^{2} G) 2.70×10^{2} H) 3.58×10^{2}

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8. [1pt] Fred's far point is 25 cm for both eyes. From this information (only one answer is correct) we know that Fred

A) is farsighted and he needs to wear glasses with a diverging lens.

B) is farsighted and he needs to wear glasses with a converging lens.

C) has normal vision.

D) is nearsighted and he needs to wear glasses with a converging lens.

E) is nearsighted and he needs to wear glasses with a diverging lens.

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9. [1pt] Consider monochromatic light of wavelength λ incident on two narrow slits separated by a distance d. An interference pattern results on a screen which is situated a distance L from the slits. The first order interference maximum is located a distance y_1 from the central maximum. (For each statement select T True or F False).

A) If L is doubled while λ and d stay fixed, y_1 will increase.

B) If d is doubled while λ and L stay fixed, y_1 will increase.

C) If λ is doubled while L and d stay fixed, y_1 will increase.

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10. [1pt] (For each statement select T True or F False).

A) Due to Lorentz effects a human astronaut moving near the speed of light might live for thousands of years according to an observer on earth.

B) A moving meter stick appears shorter than one meter.

C) The kinetic energy of a moving object of mass m must always be less than $(1/2)mc^2$.

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11. [1pt] A supernova explosion releases 2.5×10^{46} J. How much mass (in earth masses) has the star converted to energy? DATA: $M_e = 5.98 \times 10^{24}$ kg.

A) 3.72×10^{4} B) 4.65×10^{4} C) 5.81×10^{4} D) 7.26×10^{4}
E) 9.07×10^{4} F) 1.13×10^{5} G) 1.42×10^{5} H) 1.77×10^{5}
