Instructor(s): *Y. Lee*

PHYSICS DEPARTMENT

PHY2005, Spring 2006   EXAM III   March 31, 2006

Name (print, last first): _____   Signature: _____

On my honor, I have neither given nor received unauthorized aid on this examination.

YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.
(1) **Code your test number on your answer sheet (use lines 76–80 on the answer sheet for the 5-digit number)**. Code your name on your answer sheet. **DARKEN CIRCLES COMPLETELY**. Code your UFID number on your answer sheet.
(2) Print your name on this sheet and sign it also.
(3) Do all scratch work anywhere on this exam that you like. **Circle your answers on the test form.** At the end of the test, this exam printout is to be turned in. No credit will be given without both answer sheet and printout with scratch work most questions demand.
(4) **Blacken the circle of your intended answer completely, using a #2 pencil or <u>blue</u> or <u>black</u> ink**. Do not make any stray marks or some answers may be counted as incorrect.
(5) The answers are rounded off. Choose the closest to exact. There is no penalty for guessing.
(6) **Hand in the answer sheet separately.**

Physical Constants:

$g = 9.8 \text{ m/s}^2$	$m_e = 9.11 \times 10^{-31} \text{ Kg}$
$m_p = 1.67 \times 10^{-27} \text{ Kg}$	$e = 1.6 \times 10^{-19} \text{ C}$
constant k in Coulomb's Law: $k = 8.99 \times 10^9 \text{ Nm}^2/\text{C}^2$	
$\varepsilon_o = 8.85 \times 10^{-12} \text{ C}^2/\text{Nm}^2$	$\mu_o = 4\pi \times 10^{-7} \text{ N/A}^2$
$c = 3.0 \times 10^8 \text{ m/s}$	

1. Two identical spot lights are illuminating on vertical walls. #1 spotlight is 10 m from the wall and #2 spotlight is 20 m from the wall. Choose a correct statement describing the light intensities on the wall.

   (1) the same luminous intensity but different illuminance.
   (2) the same luminous intensity and illuminance.
   (3) different illuminance and different luminous intensity
   (4) the same illuminance but different luminous intensity
   (5) not enough information

2. A linearly polarized Electromagnetic (EM) wave is propagating in air. Which of the following statements are true?
   a. The electric (E) field vector oscillates in a specific direction.
   b. This wave propagates in the same direction as the electric field vector oscillates.
   c. When and where the E field is zero, the magnetic (B) field is also zero.
   d. The E vector is always perpendicular to the B vector.

   (1) only a, c, and d   (2) all   (3) only a and b   (4) only a, b, and d   (5) only b and c

3. A light meter reads 1000 lx when aimed at a point source from a distance of 10 cm. What will it read when placed 40 cm and aimed at the source? (in lx)

   (1) 62.5   (2) 250   (3) 1000   (4) 125   (5) need to know the solid angle.

4. If one wants to form a real image four time as large as an object by use of a concave mirror with a radius of curvature $R = 80$ cm, where should the object be placed? (in cm) Is that image inverted?

   (1) 50 and inverted   (2) 40 and inverted   (3) 37.5 and inverted   (4) 37.5 and not inverted   (5) 40 and not inverted

5. A small object is placed in front of a concave mirror with a radius of curvature, R. Choose a wrong statement describing the image of this object.
   a. If the object is placed farther than $R/2$ from the mirror, the image is real.
   b. If the object is placed at R from the mirror, the size of the image is exactly same as that of the abject.
   c. If the object is placed within $R/2$ from the mirror, the image is virtual and inverted.
   d. If the object is placed at R from the mirror, the size of the image is the same as that of the object.

   (1) c   (2) a   (3) b   (4) d   (5) none

6. Two lenses are both converging, and each has a 20-cm focal length. They are placed 40 cm apart with their optical axes aligned each other. A 6-cm tall object is placed 80 cm in front of the first lens. Find the size of the image. (in cm) Is it inverted or erect?

   (1) 6, inverted   (2) 6, erect   (3) 2, inverted   (4) 2, erect   (5) 12, erect

7. It is desired to use a 60-cm focal length diverging lens to form a virtual image of an object. The image is to be one-half as large as the object. Where should the object be placed and what will be the image distance? (in cm)

   (1) $(60, -30)$ (2) $(180, 90)$ (3) $(30, -60)$ (4) $(90, -180)$ (5) $(60, -120)$

8. Light from a light bulb passes through two polaroid sheets stacked together. While the second polaroid is rotating $360°$ relative to the first sheet, the intensity of light passed through the polaroids

   (1) has two maxima and two minima.
   (2) does not change.
   (3) has one maximum and minimum.
   (4) has two maxima but one minimum.
   (5) has one maximum but two minimum.

9. As a beam goes through layers of different materials (I, II, and III), it bends as shown in the figure. The angles in the figure indicate the angle between each beam and the vertical line. Those materials and their index of refraction are listed in the table. Identify each material (material I, material II, material III). The numbers in the figure indicate the angles formed by each beam and vertical line.

Material	Index of Refraction (n)
air	1.00
ice	1.31
diamond	2.42
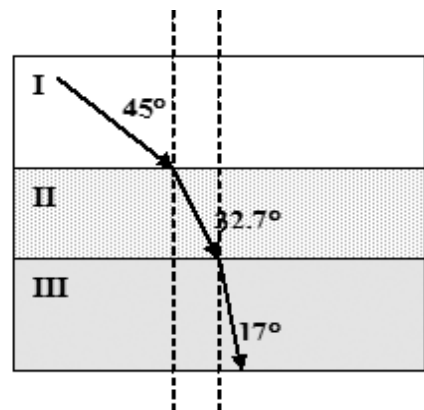
   (1) (air, ice, diamond) (2) (diamond, ice, air) (3) (diamond, air, ice) (4) (air, diamond, ice) (5) (ice, diamond, air)