

**Physics 2135 End-Material Test**

December 16, 2015

**EM Test Total****/ 50**

Printed Name: \_\_\_\_\_

Rec. Sec. Letter: \_\_\_\_\_

Remove only the cover sheet and starting equations from the test before you begin. Write clearly on this page the answer you believe is the best or most nearly correct answer. You may also record the answers on your starting equation sheet for comparison with the answer key, which will be posted after all students have taken the test. When you finish both the 50-point End-Material Test and 200-point Final Exam, turn both in (with all pages, including this page, stapled together). You may keep the starting equation sheet.

Each question is worth 6 points, except question 8 is worth 8 points.

Your answers:

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

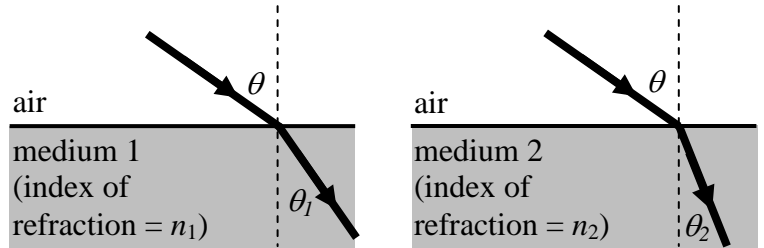
7. \_\_\_\_\_

8. \_\_\_\_\_

Eight multiple choice questions, 6 points each, except question 8 is worth 8 points. Choose the best or most nearly correct answer.

1. Light rays cross interfaces from air into two different media. The angle of incidence  $\theta$  in air is the same in both cases. If  $\theta_1 > \theta_2$  then

- [A]  $n_1 = n_2$
- [B]  $n_1 < n_2$
- [C]  $n_1 > n_2$



2. A diamond ( $n_D=2.42$ ) is immersed in a transparent oil ( $n_O=1.21$ ). Light traveling inside the diamond ( $n = 2.42$ ) is incident at the diamond/oil interface. What is the largest angle  $\theta$  that the light can make relative to the diamond/oil surface normal and still pass into the oil outside?

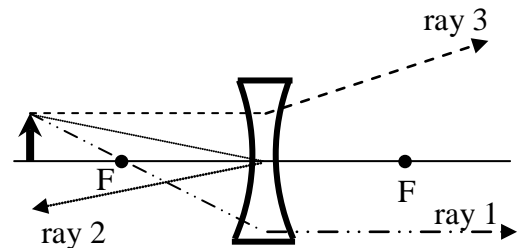
- [A]  $90^\circ$
- [B]  $60^\circ$
- [C]  $45^\circ$
- [D]  $30^\circ$

3. A spherical mirror has a focal length of +6 cm. An object is placed 9 cm away from the mirror. The resulting image is 18 cm away from the mirror and on the same side of the mirror as the object. The image is

- [A] real and inverted.
- [B] virtual and inverted.
- [C] real and upright.
- [D] virtual and upright.

4. Which of the three rays in the figure to the right is a valid principal ray for illustrating image formation for a **diverging** lens?

- [A] ray 1 — · · · · ·
- [B] ray 2 · · · · ·
- [C] ray 3 - - - - -



5. Coherent monochromatic light passes through two narrow slits that are separated by 0.1 mm. An interference pattern is observed on a screen 3 m away from the slits, and the central interference maximum is measured to be 18 mm wide. What is the wavelength of the incident light?

- [A] 750 nm
- [C] 400 nm

- [B] 600 nm
- [D] 300 nm

6. What is the thinnest film of a coating with  $n_C=1.2$  on glass with  $n_G=1.5$  for which constructive interference of reflected light of wavelength 720 nm in air can take place?

- [A] 120 nm
- [C] 240 nm

- [B] 150 nm
- [D] 300 nm

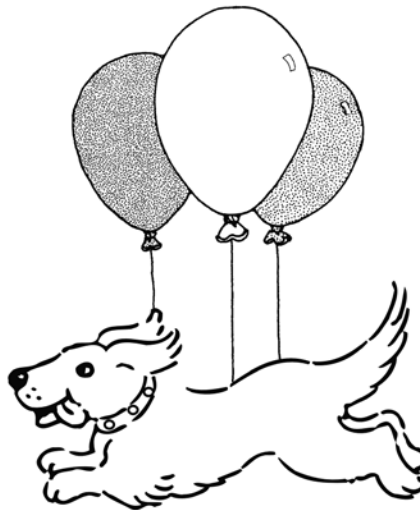
7. A diffraction grating produces its first order bright band at  $30^\circ$  for incident light of wavelength 600 nm. How many slits are there per centimeter of grating?

- [A] 3,000
- [C] 8,333

- [B] 3,333
- [D] 16,667

8. How do you levitate a dog?

- [A] The answer is always magnetism.
- [B] Electrostatic fields.
- [C] Magic.
- [D] Balloons.



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