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PHYSICS DEPARTMENT

PHY2005, Spring 2011   EXAM III   March 25, 2011

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.
(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. If you believe that no listed answer is correct, leave the form blank.**
(6) Hand in the answer sheet separately.

Physical Constants:

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

1. At a distance of 1.0×10^{12}m from a star, the radiation from the star is 540 W/m^2, what is the total power output of the star?

   (1) 6.78×10^{27}W   (2) 2.34×10^{28}W   (3) 3.62×10^{26}W   (4) 7.48×10^{27}W   (5) 4.48×10^{28}W

2. An oil film floats on a water surface. The indices of refraction for water and oil, respectively, are 1.333 and 1.256. If a ray of light is incident on the air-to-oil surface at an angle of 39.0°with the normal, what is the incident angle at the oil-to-water surface?

   (1) 30.1°   (2) 18.1°   (3) 25.3°   (4) 47.0°   (5) 42.7°

3. If light from a 640-nm monochromatic source in air is incident upon the surface of fused quartz ($n = 1.56$) at an angle of 60°, what is the wavelength of the ray refracted within the quartz?

   (1) 410 nm   (2) 292 nm   (3) 560 nm   (4) 874 nm   (5) 640 nm

4. A ray of light travels across a liquid-to-glass interface. If the indices of refraction for the liquid and glass are, respectively, 1.70 and 1.52, what is the critical angle at this interface?

   (1) 63.4°   (2) 52.2°   (3) 30.0°   (4) Critical angle does not exist.   (5) 77.5°

5. An object is held at a distance of 24 cm from a convex mirror creating an image that is 1/3 the object size. What is the focal length of the mirror?

   (1) −12.0 cm   (2) −6.0 cm   (3) −9.0 cm   (4) −18 cm   (5) 18 cm

6. Which of the following best describes the image of a concave mirror when the object's distance from the mirror is less than the focal point distance?

   (1) virtual, upright and magnification greater than one
   (2) real, inverted and magnification less than one
   (3) virtual, upright and magnification less than one
   (4) real, inverted and magnification greater than one
   (5) virtual, inverted and magnification greater than one

7. Two thin lenses with focal lengths 50.0 cm and 60.0 cm are placed in contact in an orientation so that their optic axes coincide. What is the focal length of the two in combination?

   (1) 27.3 cm　　　　　　(2) 13.6 cm　　　　　　(3) 55.0 cm　　　　　　(4) 110 cm　　　　　　(5) 10.0 cm

8. An object is placed at a distance of 80 cm from a thin lens along the axis. If a real image forms at a distance of 40 cm from the lens, on the opposite side from the object, what is the focal length of the lens?

   (1) 26.6 cm　　　　　　(2) 45.3 cm　　　　　　(3) 90.9 cm　　　　　　(4) 120.0 cm　　　　　　(5) 21.4 cm

9. Two thin lenses with 10.0-cm focal lengths are mounted at opposite ends of a 30.0-cm long tube. An object is located 45.0 cm from one end of the tube. How far from the opposite end is the final image?

   (1) 24.0 cm　　　　　　(2) 12.8 cm　　　　　　(3) 25.6 cm　　　　　　(4) 33.6 cm　　　　　　(5) 38.2 cm

10. An object 5 cm high is placed 15 cm in front of a mirror. What type of mirror and what radius of curvature is needed for an image that is upright and 10 cm tall?

    (1) Concave, $R = 60$ cm
    (2) Concave, $R = 30$ cm
    (3) Convex, $R = -40$ cm
    (4) Convex, $R = -30$ cm
    (5) Convex, $R = -60$ cm