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PHYSICS DEPARTMENT
EXAM III

PHY2005, Spring 2012

March 28, 2012

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 blue or black 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:

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

1. At a distance of $1.0 \times 10^{13} \text{ m}$ from a star, the radiation from the star is 3.6 W/m^2 , what is the total power output of the star?
 - (1) $4.52 \times 10^{27} \text{ W}$
 - (2) $2.34 \times 10^{28} \text{ W}$
 - (3) $3.62 \times 10^{26} \text{ W}$
 - (4) $7.48 \times 10^{27} \text{ W}$
 - (5) $4.48 \times 10^{28} \text{ W}$

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. Which one of the following statements concerning electromagnetic waves is false?
 - (1) All statements are true.
 - (2) Electromagnetic waves transfer energy through space.
 - (3) The existence of electromagnetic waves was predicted by Maxwell.
 - (4) Electromagnetic waves can propagate through a material substance.
 - (5) Electromagnetic waves do not require a physical medium for propagation.

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 48 cm from a convex mirror creating an image that is $1/3$ the object size. What is the focal length of the mirror?
 - (1) -24.0 cm
 - (2) -12.0 cm
 - (3) -18.0 cm
 - (4) -36 cm
 - (5) Not enough information

6. Two thin lenses with focal lengths 5.0 cm and 6.0 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) 2.73 cm (2) 1.36 cm (3) 5.0 cm (4) 11 cm (5) Dependent on the order of lenses
7. An object is placed at a distance of 40 cm from a thin lens along the axis. If a image forms at a distance of 60 cm from the lens, on the same side as the object, what is the focal length of the lens?
- (1) 120.0 cm (2) 24.0 cm (3) 50.0 cm (4) 100.0 cm (5) 60.4 cm
8. Two thin converging lenses with 20.0-cm focal lengths are mounted at opposite ends of a 60.0-cm long tube. An object is located 90.0 cm from one end of the tube. How far from the opposite end is the final image?
- (1) 48.0 cm (2) 32.0 cm (3) 64.0 cm (4) 52.0 cm (5) 58.0 cm
9. 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
10. Yellow light has a wavelength 589 nm. What is the frequency and speed of the light in a medium with an index of refraction 2.14 (frequency, speed)? (in Hz and m/s)
- (1) $(5.09 \times 10^{14}, 1.40 \times 10^8)$ (2) $(2.38 \times 10^{14}, 6.42 \times 10^8)$ (3) $(10.9 \times 10^{14}, 3.00 \times 10^8)$ (4) $(5.09 \times 10^{14}, 3.00 \times 10^8)$
(5) $(2.38 \times 10^{14}, 1.40 \times 10^8)$