

Physics 202 MWF10:20 Spring 2005 (Ford)  
Exam III Chpts. 23, 24, 25, 26 in Cutnell and Johnson 6e

Name (printed)\_\_\_\_\_

Name (signature as on ID)\_\_\_\_\_

Lab Section\_\_\_\_\_

Circle the correct answer. No work need be shown and no partial credit will be given.

(4 pts) 1. A very nearsighted eye has a far point of 75 cm. (This means the unaided eye cannot focus on an object that is farther than 75 cm from the eye.) What is the focal length of the contact lens that allows the person to see distant objects clearly?

- (a) 18.75 cm
- (b) 37.5 cm
- (c) 75 cm
- (d) -18.75 cm
- (e) -37.5 cm
- (f) -75 cm

(4 pts) 2. When light traveling in water refracts into a flat piece of plastic that is immersed in the water, the light is bent toward the normal. The refractive index of the water is 1.33. The refractive index of the plastic is

- (a) 1.33
- (b) greater than 1.33
- (c) less than 1.33

(4 pts) 3. An object is 5.0 cm to the left of a lens. The image formed by the lens is to the left of the lens. With respect to the orientation of the object, the image is

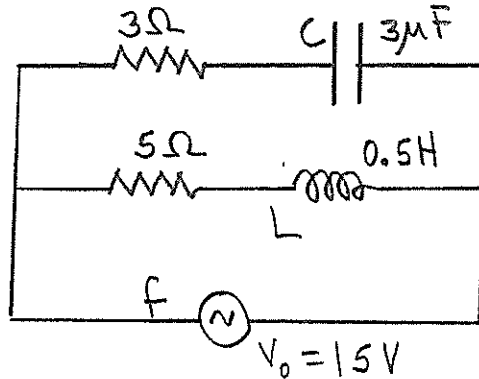
- (a) upright
- (b) inverted
- (c) can't tell without more information

(4 pts) 4. Unpolarized light with intensity  $500 \text{ W/m}^2$  is incident on a polarizing filter whose axis makes an angle of  $37^\circ$  with the vertical. The intensity of the light after it has passed through the filter is

- (a)  $181 \text{ W/m}^2$
- (b)  $250 \text{ W/m}^2$
- (c)  $319 \text{ W/m}^2$
- (d)  $400 \text{ W/m}^2$
- (e)  $500 \text{ W/m}^2$
- (f) none of these answers

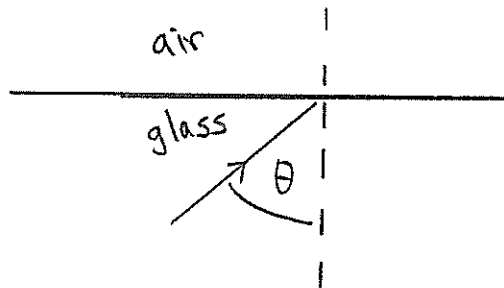
(5 pts) 5. Consider the ac circuit shown in the sketch. The amplitude  $V_0$  of the source voltage is 15 V. When the frequency  $f$  of the source is very large, the amplitude of the current through the source is

- (a) 0
- (b) 3 A
- (c) 5 A
- (d) 8 A
- (e) 11 A



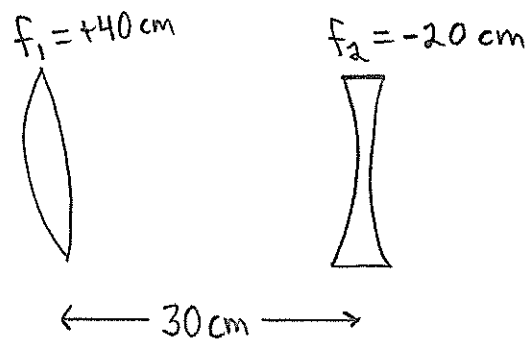
(4 pts) 6. A flat piece of glass is surrounded by air. Light traveling in the glass and incident on the glass-air interface is totally reflected back into the glass if the incident angle  $\theta$  is greater than  $53^\circ$ . The refractive index of the glass is

- (a) 0.60
- (b) 0.80
- (c) 1.00
- (d) 1.25
- (e) 1.33
- (f) 1.66



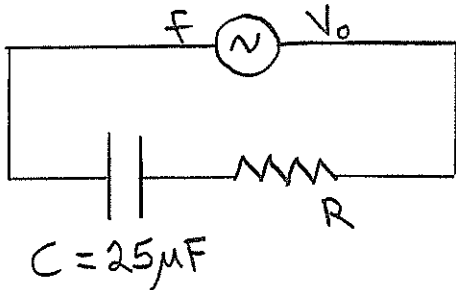
(5 pts) 7. A converging lens with  $f_1 = 40$  cm is 30 cm to the left of a diverging lens that has  $f_2 = -20$  cm. The object is a very large distance to the left of the converging lens. What is the object distance for the second lens, the object distance used when calculating the image formed by the second lens?

- (a) +10 cm
- (b) -10 cm
- (c) +20 cm
- (d) -20 cm
- (e) +40 cm
- (f) -40 cm
- (g) none of these answers



Show all your work. Partial credit will be given if earned. Write your answers in the blanks provided.

(18 pts) 8. Consider the ac circuit shown in the sketch. The amplitude of the source voltage is  $V_0 = 300$  V. The frequency of the source is  $f = 200$  Hz. The capacitance is  $C = 2.5 \times 10^{-5}$  F. The amplitude of the current in the circuit is  $I_0 = 5.0$  A.



a) What is the voltage amplitude  $V_R$  across the resistor?

Ans. \_\_\_\_\_

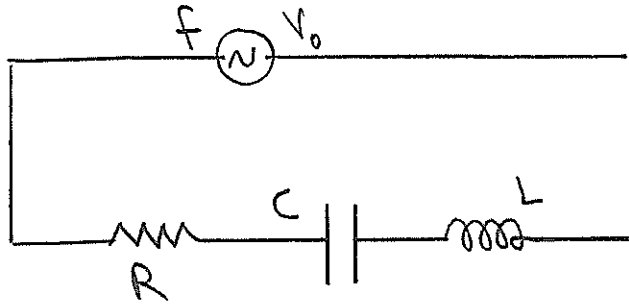
b) What is the average power delivered by the source?

Ans. \_\_\_\_\_

c) Does the source voltage lag or lead the current?

Ans. \_\_\_\_\_

(18 pts) 9. Consider the ac circuit shown in the sketch. The frequency  $f$  of the source equals the resonance frequency of the circuit.  $C = 5.0 \times 10^{-4}$  F,  $L = 0.20$  H, and  $R = 30$   $\Omega$ . The voltage amplitude across the capacitor is 80 V.



a) What is the voltage amplitude across the inductor?

Ans. \_\_\_\_\_

b) What is the voltage amplitude across the resistor?

Ans. \_\_\_\_\_

c) What is the voltage amplitude of the source?

Ans. \_\_\_\_\_

(18 pts) 10. The cylindrical beam of light from a laser has wavelength 500 nm and a cross sectional area  $2.0 \times 10^{-4} \text{ m}^2$ . The intensity of the light is  $5.0 \times 10^4 \text{ W/m}^2$ .

a) What is the rms value of the magnetic field in the laser light?

Ans. \_\_\_\_\_

b) On average, how much energy is contained in a 4.0 m length of the beam?

Ans. \_\_\_\_\_

c) What is the average power output of the laser?

Ans. \_\_\_\_\_

(16 pts) 11. A spherical mirror is designed so that the image it produces is upright and 2.0 times the size of the object when the distance between the object and the mirror is 20 cm.

a) Is the image real or virtual?

Ans. \_\_\_\_\_

b) How far is the image from the mirror?

Ans. \_\_\_\_\_

c) What is the radius of curvature of the mirror?

Ans. \_\_\_\_\_

d) Is the mirror concave or convex, as viewed from the location of the object?

Ans. \_\_\_\_\_