Physics 202 MWF10:20 Spring 2006 (Ford)
Exam III Chapts. 23, 24, 25, 26 in Cutnell and Johnson 6e

Name (printed)_____

Name (signature as on ID)_____

Lab Section_____

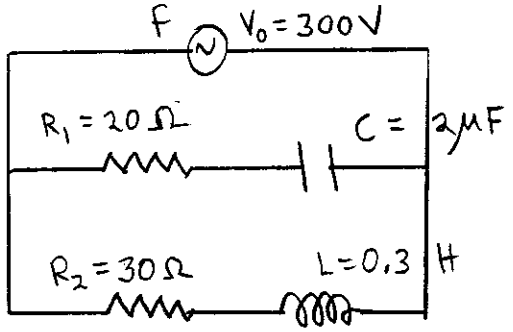
Circle the correct answer. No work need be shown and no partial credit will be given.

(5 pts) 1. An ac circuit consists of an ac voltage source, a resistor, and a capacitor. There is no inductor. Does the source voltage lag or lead the current in the circuit, or is the source voltage in phase with the current?

(a) source voltage lags the current
(b) source voltage leads the current
(c) source voltage is in phase with the current

(5 pts) 2. For the circuit shown in the sketch, the ac source has a voltage amplitude of 300 V and frequency f. In the limit of very small frequency f, the current through the source has amplitude

(a) 6.0 A
(b) 10.0 A
(c) 15.0 A
(d) 25.0 A
(e) none of these answers



(5 pts) 3. A block of glass is totally immersed in a liquid. Light traveling in the glass does not refract into the liquid if the light has an angle of incidence at the glass-liquid interface that is greater than 53.1°. The refractive index of the glass is 1.50. What is the refractive index of the liquid?

(a) 1.88
(b) 1.33
(c) 1.25
(d) 1.20
(e) 1.00
(f) none of these answers

(5 pts) 4. An object is to the left of a concave mirror. The image formed by the mirror is upright. The image is

(a) to the left of the mirror
(b) to the right of the mirror
(c) can't tell if it is to the left or to the right without more information

(5 pts) 5. A single converging lens with $f = 5.0$ cm is used as a magnifying glass by a person whose near point is 30 cm from his eye. An object has an angular size of $0.50°$ when it is at the near point of the unaided eye. What is its angular size when it is viewed through the lens, if the object is placed at the focal point of the lens?

(a) $3.0°$
(b) $2.5°$
(c) $0.50°$
(d) $0.10°$
(e) none of these answers

(5 pts) 6. A certain eye has a near point of 280 cm. What is the focal length of a contact lens that allows the eye to see clearly an object that is 30 cm from the eye?

(a) -27.1 cm
(b) -30.0 cm
(c) -33.6 cm
(d) -280 cm
(e) 27.1 cm
(f) 30.0 cm
(g) 33.6 cm
(h) 280 cm
(i) none of these answers

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

(15 pts) 7. A laser produces a cylindrical beam of light of wavelength $\lambda = 400$ nm. The average energy in a 2.00 m length of the beam is 5.0×10^{-8} J. The cross sectional area of the beam is 4.00×10^{-6} m^2.

(a) What is the rms value of the electric field in the light?

Ans. _____

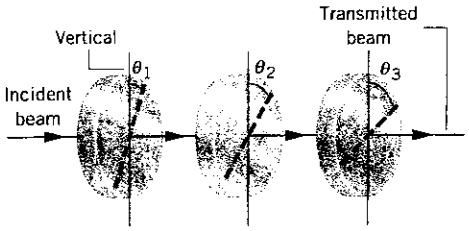
(b) What is the intensity of the beam?

Ans. _____

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

Ans. _____

(12 pts) 8. Unpolarized light with intensity 400 W/m^2 is incident on three polarizers, as shown in the sketch. The axis of the first polarizer is at $\theta_1 = 20.0°$ from the vertical, the axis of the second polarizer is at $\theta_2 = 45.0°$ from the vertical, and the axis of the third polarizer is at $\theta_3 = 70.0°$ from the vertical. What is the intensity of the light after it has passed through all three polarizers?



Ans. _____

(13 pts) 9. An object 2.0 mm tall is 14.0 cm to the left of a thin lens. The virtual image formed by the lens is 6.0 mm tall. What is the focal length of the lens? (Be sure to indicate the sign of f.)

Ans. _____

(16 pts) 10. In an R-C-L series circuit $R = 80.0\ \Omega$. The rms voltage across the capacitor is 80.0 V, the rms voltage across the inductor is 140.0 V and the rms voltage across the source is 100 V.

(a) What is the rms voltage across the resistor?

Ans. _____

(b) What is the rms current in the circuit?

Ans. _____

(c) What is the average power delivered by the source?

Ans. _____

(d) Does the source voltage lag or lead the current?

Ans. _____

(14 pts) 11. In an R-C-L series circuit, the source frequency equals the resonant frequency of the circuit. The voltage amplitude across the capacitor is 240 V, the voltage amplitude of the source is 300 V, and the current amplitude is 0.50 A.

(a) What is the voltage amplitude across the inductor?

Ans. _____

(b) What is the value R of the resistance of the resistor in the circuit?

Ans. _____

(c) What is the power factor $\cos\phi$?

Ans. _____