

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. Unpolarized light with intensity I_0 is incident on two ideal polarizers. The axis of the first polarizer makes an angle of 60° with the vertical and the axis of the second polarizer is horizontal. The intensity of the light after it has passed through the second polarizer is

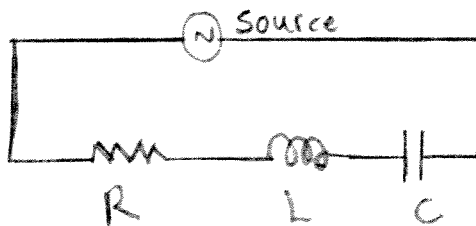
- b
- (a) $0.125I_0$
 - (b) $0.375I_0$
 - (c) $0.500I_0$
 - (d) $0.750I_0$
 - (e) none of the above answers

(5 pts) 2. A beam of light has a wavelength of 600 nm in a material of refractive index 2.0. In a material of refractive index 1.5 the light's wavelength will be

- e
- (a) 300 nm
 - (b) 450 nm
 - (c) 600 nm
 - (d) 700 nm
 - (e) 800 nm
 - (f) 1200 nm
 - (g) none of the above answers

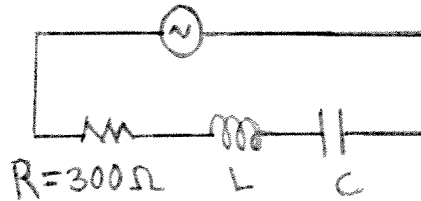
(5 pts) 3. In the circuit shown in the sketch the voltage amplitudes for the resistor, inductor and capacitor are $V_R = 300$ V, $V_L = 600$ V, and $V_C = 200$ V. The voltage amplitude of the source is

- c
- (a) 300 V
 - (b) 400 V
 - (c) 500 V
 - (d) 700 V
 - (e) 1100 V
 - (f) none of the above answers



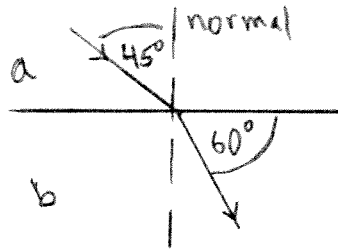
(5 pts) 4. In the circuit shown in the sketch the source is operated at the resonant angular frequency for the circuit. At this frequency, the reactance X_C of the capacitor is 300Ω and the maximum voltage amplitude across the capacitor is 600 V . The voltage amplitude of the source is

- (a) 200 V
- (b) 300 V
- (c) 400 V
- (d) 500 V
- e (e) 600 V
- (f) none of the above answers



(5 pts) 5. Light traveling in material a that has refractive index n_a refracts into a material b that has refractive index n_b . The angles that the incident and refracted rays make with the surfaces of the two materials are shown in the sketch. What can you conclude about the relative indexes of refractive of these two materials?

- a (a) n_a is smaller than n_b
- (b) n_a is larger than n_b
- (c) $n_a = n_b$



(5 pts) 6. A single converging lens used as a magnifying glass produces an image that is

- a (a) virtual and upright
- (b) virtual and inverted
- (c) real and upright
- (d) real and inverted

(4 pts) 7. A certain nearsighted person cannot focus clearly on objects that are farther than 2.0 m from his eye. Which type of lens be used to correct his vision and allow him to focus clearly on distant objects?

- (a) converging
- b (b) diverging

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

(8 pts) 8. A piece of plastic is surrounded by air. Light traveling in the plastic is incident of the flat upper surface of the plastic. It is observed that if the light makes an angle of 53° or greater with the normal to the surface of the plastic, no light refracts into the air. What is the index of refractive of the plastic?

Ans. 1.25

(12 pts) 9. A plane sinusoidal electromagnetic wave carries 16.0 J of energy through a small window of area 0.20 m^2 in 10.0 s.

(a) What is the intensity of the wave?

Ans. 8 W/m^2

(b) What is the amplitude of the magnetic field of the wave?

Ans. $2.59 \times 10^{-7} \text{ T}$

(14 pts) 10. An object is placed 12.0 cm from a spherical mirror. The image is upright and the height of the image is 3.0 times the height of the object. What is the focal length of the mirror? (Be sure to indicate whether the focal length is positive or negative.)

Ans. +18 cm

(14 pts) 11. When an object is 20.0 cm to the left of a lens, an image is formed that is 14.0 cm from the lens, on the same side as the object.

(a) What is the focal length of the lens?

Ans. -46.7 cm

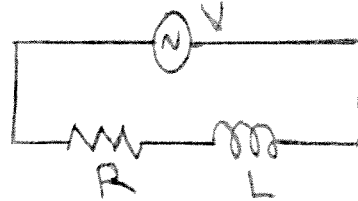
(b) Is the lens converging or diverging?

Ans. diverging

(c) Is the image upright or inverted?

Ans. upright

(18 pts) 12. Consider the circuit shown in the sketch. Note that there is no capacitor. $R = 300 \Omega$ and the voltage amplitude of the ac source is 500 V. The rate at which electrical energy is dissipated in the resistor is 216 W.



(a) What is the current amplitude in the circuit?

Ans. 1.2 A

(b) What is the impedance Z of the circuit?

Ans. 417 Ω

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

Ans. 0.72

(d) What is the amplitude of the voltage across the inductor?

Ans. 348 V

(e) Does the source voltage lag or lead the current in the circuit?

Ans. leads