

Name (printed) With Answers

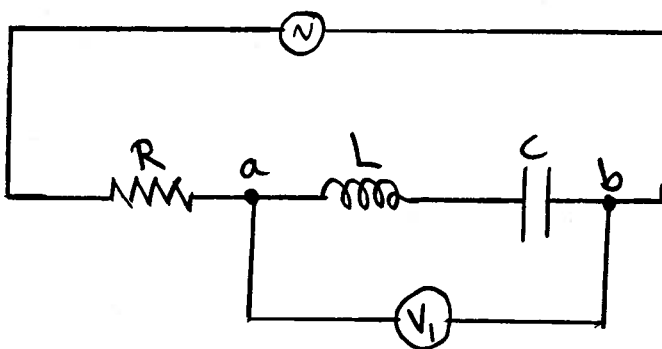
Name (signature as on ID) _____

Lab Section _____

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

(5 pts) 1. In the circuit shown in the sketch the voltage amplitudes for the resistor, capacitor and inductor are $V_R = 300$ V, $V_L = 300$ V, and $V_C = 700$ V. The voltmeter V_1 reads the voltage amplitude between points a and b in the circuit. The reading of V_1 is

- (a) zero
- (b) 200 V
- (c) 300 V
- d (d) 400 V**
- (e) 600 V
- (f) 700 V

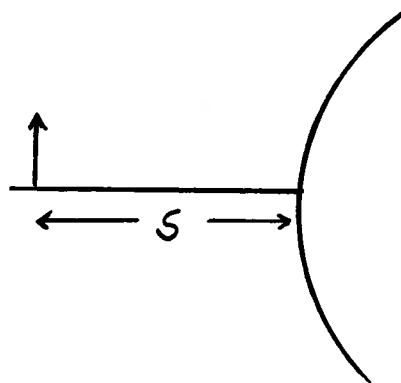


(5 pts) 2. An ac circuit consists of an ac voltage source, a resistor, and an inductor. There is no capacitor. Does the source voltage lag or lead the current in the circuit, or is the source voltage in phase with the current?

- (a) source voltage lags the current
- b (b) source voltage leads the current**
- (c) source voltage is in phase with the current
- (d) depends on the numerical value of X_C

(5 pts) 3. An object is placed a distance s to the left of the convex surface of a spherical mirror. The image is

- a (a) upright**
- (b) inverted
- (c) the orientation of the image depends on s



(5 pts) 4. Unpolarized light with an original intensity I_0 passes through two ideal polarizers. The axis of the first polarizer is vertical and the axis of the second polarizer makes an angle of 60° with the vertical. The intensity of the light after passing through both polarizers is

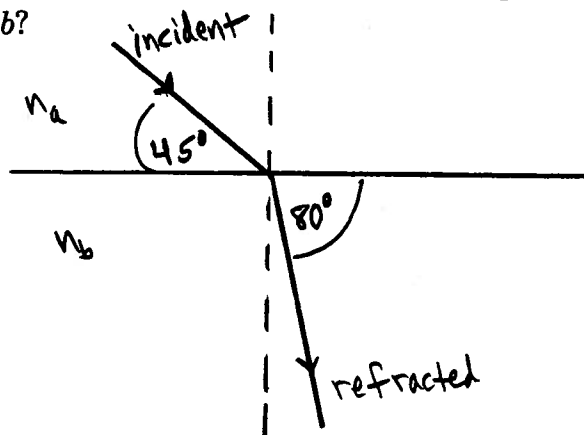
- (a) I_0
- (b) $\frac{1}{2}I_0$
- (c) $\frac{1}{4}I_0$
- (d) $\frac{1}{8}I_0$**
- (e) zero

(5 pts) 5. A light beam has a wavelength of 200 nm in a material of refractive index 4.00. In a material of refractive index 2.00 its wavelength will be

- (a) 100 nm
- (b) 200 nm
- (c) 400 nm**
- (d) 600 nm
- (e) 800 nm

(5 pts) 6. Light traveling in a material a that has refractive index n_a , refracts into material b , that has refractive index n_b . The angles that the incident and refracted rays make with the surface of the two materials are shown in the sketch. How does the speed of light in material a compare with the speed in b ?

- (a) slower in a
- (b) faster in a**
- (c) speeds are the same



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

(16 pts) 7. A circuit consists of an ac source with voltage amplitude 600 V, a resistor with $R = 200 \Omega$, a capacitor with $C = 5.0 \times 10^{-6} \text{ F}$ and an inductor with $L = 0.400 \text{ H}$.

a) When the source is operated at the resonance frequency for the circuit, what is the voltage amplitude across the inductor?

Ans. 849 V

b) When the source is operated at the resonance frequency for the circuit, what is the average power delivered by the source?

Ans. 900 W

(15 pts) 8. A plane sinusoidal electromagnetic wave has a magnetic field amplitude of 5.00×10^{-5} T.

a) What is the electric field amplitude of the wave?

Ans. 1.5×10^4 V/m

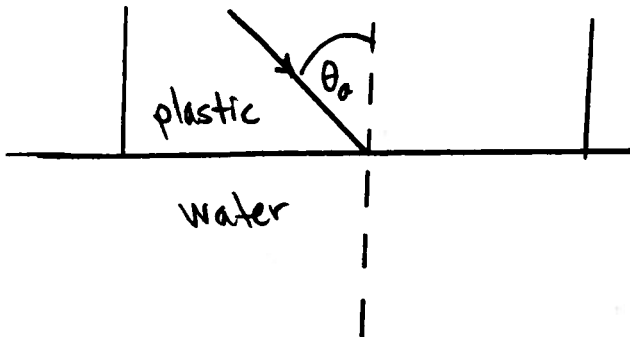
b) How much energy is contained in a volume of 1.0×10^{-3} m³, if the wave completely fills this volume?

Ans. 9.96×10^{-7} J

c) What average force does this radiation exert on a totally reflecting surface of area 0.500 m², if the plane of the surface is perpendicular to the direction of propagation of the wave?

Ans. 9.96×10^{-4} N

(12 pts) 9. A ray of light traveling in plastic is incident at angle θ_a with a flat interface with water. If it is found that if θ_a is greater than 60° , no light enters the water. If the refractive index of the water is 1.33, what is the refractive index of the plastic?



Ans. 1.54

(12 pts) 10. An eye cannot focus on objects that are closer than 60.0 cm from the eye.

a) What is the focal length of the corrective contact lens that will allow this eye to see objects clearly that are a distance of 25.0 cm from the eye?

Ans. + 42.9 cm

b) Is the corrective lens a diverging lens (negative f) or a converging lens (positive f)?

Ans. converging

(15 pts) 11. A thin lens is used to project an image of an object onto a wall. The object is a distance s to the left of the lens. The wall is 2.00 m to the right of the lens. The magnitude of the height of the image is 4.00 times the height of the object.

a) Is the image real or virtual?

Ans. real

b) Is the image upright or inverted?

Ans. inverted

c) What is the focal length of the lens?

Ans. +40.0 cm

d) How far is the object from the lens?

Ans. 50 cm