Choose the best answer. For T/F problems, choose only ONE answer.
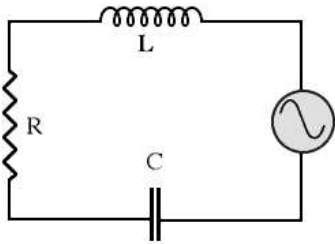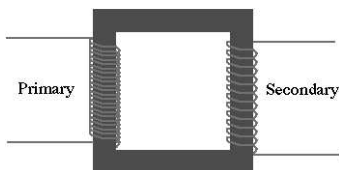

1. A series RLC circuit like the one above is running at the resonance frequency with $V = 110$ volts rms. What is the power supplied by the source (W) if $R = 190$ ohms, $L = 32$ H, and $C = 0.57$ μF (microfarad)

   (a) 45.3 W
   (b) 63.7 W
   (c) 71.2 W
   (d) 88.9 W
   (e) 91.1 W

2. Consider the same figure as used in the previous problem. If $R = 1000$ ohms, $L = 32$ H and $C = 0.57 \mu$F, what is the resonant frequency?

   (a) 9.45 Hz
   (b) 19.0 Hz
   (c) 37.3 Hz
   (d) 46.7 Hz
   (e) 91.1 Hz

3. A transformer is used to reduce an AC source at f = 330 Hz from v1 = 1810 V to v2 = 110 V. If the secondary has 1630 turns, how many turns should there be in the primary?

   (a) 408 turns
   (b) 815 turns
   (c) 1,630 turns
   (d) 5,670 turns
   (e) 26,800 turns

4. Which ONE of the following statements is FALSE?

   (a) The dimensions of $\epsilon_0 \mu_0$ are $[T^2]/[L^2]$.
   (b) When a wire carries an AC current, $I = I_0 \sin \omega t$, there will be electromagnetic radiation from the wire.
   (c) When a wire carries an AC current, $I = I_0 \cos \omega t$, there will be electromagnetic radiation from the wire.
   (d) The speed of electromagnetic waves in the vacuum depends on their wavelength.
   (e) Two polaroids are each lined up perpendicular to incoming light with their transmission axes arranged 45° to one another. If the intensity after traversing the first polaroid is I, the amplitude after traversing the second polaroid is $I/2$.
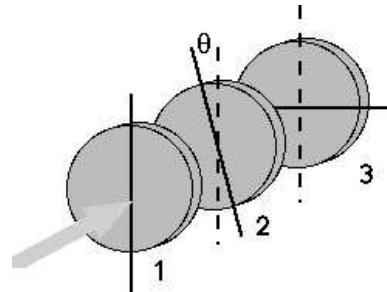

5. Polarizers 1 and 3 have their axes of polarization, indicated by the black solid lines, perpendicular to each other. If you try to shine light through only the combination of 1 and 3, you will find that none passes through. However, now we put in another polarizer (number 2 in the figure) between number 1 and number 3. This polarizer has an axes of polarization that has an angle of 49° with respect to the polarization axes of polarizer 1. Surprisingly, now some light passes through the combination 1+2+3. What percentage of the initial (unpolarized) light intensity passes through?

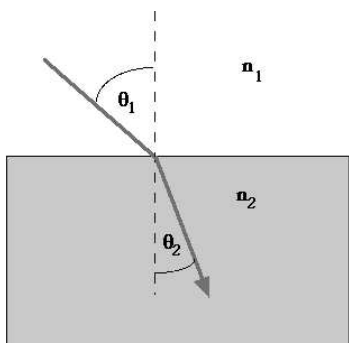   (a) 53.92%
   (b) 28.33%
   (c) 17.4%
   (d) 12.2%
   (e) 8.33%

6. When an object is placed p = 130 cm in front of a convex mirror the image size is 40% of the object size. What is the focal length of the mirror in cm?

   (a) 152.1 cm
   (b) 65.0 cm
   (c) 12.3 cm
   (d) -55.1 cm
   (e) -86.7 cm
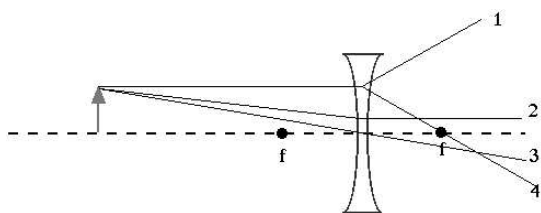
7. Which ray(s) passing through a diverging lens is(are) not properly drawn?

   (a) 1
   (b) 2
   (c) 3
   (d) 4
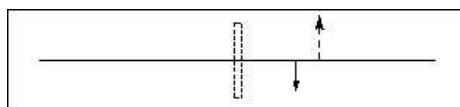   (e) 3 and 4

8. What is θ_2? DATA: $\theta_1 = 55°, n_1 = 1.0, n_2 = 1.5$

   (a) 23.1°
   (b) 28.1°
   (c) 33.1°
   (d) 38.1°
   (e) 43.1°

9. A farsighted professor can read the State News at $d = 80$ cm, but no closer. What power (in diopters) lens should he use for reading? (i.e., be able to focus at paper at distance of 25 cm)

   (a) -1.5
   (b) -0.75
   (c) 2.5
   (d) 2.75
   (e) 3.0

10. In the figure above, the object is represented by the solid arrow while the image is represented by the dashed arrow. What optical element is responsible for creating the image?

    (a) Plane mirror
    (b) Concave mirror
    (c) Convex mirror
    (d) Converging Lens
    (e) Diverging Lens
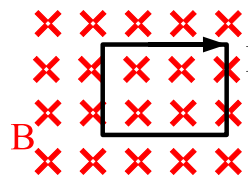
11. Consider the square coil immersed in a magnetic field as shown above. Choose the ONE FALSE statement from the list $(a - d)$. If none of statements is false, choose e.

    (a) A current will be induced in the loop by a steady magnetic field B.
    (b) A current will be induced in the loop by a decreasing magnetic field.
    (c) A current will be induced in the loop by pulling the loop out of the region where there is a field.
    (d) A current can be induced in the loop by rotating the loop.
    (e) None of these statements is false.