Pratt, Scott **Section 999**

–Introductory Physics II - EXAM 2 - Feb. 26, 1996

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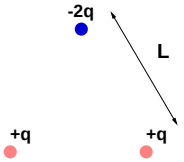

1. [1pt] Consider three charges arranged in an equilateral triangle of length $L = 1.70 \times 10^{-2}\ m$. How much work (in J) is required to move the negative charge to infinity? DATA: $q = 3.70 \times 10^{-6}\ C$.

A) 2.32×10^{1} B) 2.90×10^{1} C) 3.62×10^{1} D) 4.52×10^{1}
E) 5.66×10^{1} F) 7.07×10^{1} G) 8.84×10^{1} H) 1.10×10^{2}

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2. [1pt] A long cylindrical solenoid of length ℓ has N turns and carries a steady current I. Which of the following statements are true? (Give ALL correct answers)

A) If N is doubled while ℓ and I stay constant, the magnetic field inside the solenoid doubles.

B) Inside the solenoid, the magnetic field is directed along the axis of the solenoid.

C) If the current is doubled the magnetic field inside the solenoid doubles.

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3. [1pt] A proton moves in a circular orbit of radius R through a magnetic field B. What is the momentum (in $kg\ m/s$) of the proton? DATA: $R = 6.46 \times 10^{-2}\ m$. $B = 1.50\ T$. $e = 1.602 \times 10^{-19}\ C$. $m_p = 1.67 \times 10^{-27}\ kg$.

A) 7.95×10^{-21} B) 9.94×10^{-21} C) 1.24×10^{-20} D) 1.55×10^{-20}
E) 1.94×10^{-20} F) 2.43×10^{-20} G) 3.03×10^{-20} H) 3.79×10^{-20}

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4. [1pt] A long straight wire carries a current I. Which of the following are true? (Give ALL correct answers)

A) If one doubles the current the magnetic field at any point doubles.

B) The observed magnetic field falls by a factor of one fourth when the distance from the wire is doubled.

C) At any point the magnetic field is directed towards the wire.

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5. [1pt] Calculate the average induced voltage (in V) between the tips of the wings of an airplane flying at 235 m/s, due to a vertical component of the earth's magnetic field of $0.7 \times 10^{-4}\ T$. Assume the wingspan is 60 meters.

A) 9.87×10^{-1} B) 1.23 C) 1.54 D) 1.93
E) 2.41 F) 3.01 G) 3.77 H) 4.71

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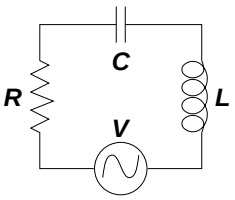
6. [1pt] A circular loop (radius $r = 0.021\ m$) has a resistance $R = 9.0\ \Omega$. A magnetic field, directed perpendicular to the loop, rises from zero to 0.19 T in 0.025 s. What is the average induced current (in A) during that time?

A) 8.07×10^{-4} B) 1.17×10^{-3} C) 1.70×10^{-3} D) 2.46×10^{-3}
E) 3.57×10^{-3} F) 5.17×10^{-3} G) 7.50×10^{-3} H) 1.09×10^{-2}



7. [1pt] Regarding the diagram above, which of the following statements are true? (Give ALL correct answers)

A) Energy is dissipated in the resistor but not in either the capacitor or the inductor.

B) The voltage drop across the resistor is the same as the voltage drop across the inductor at all times.

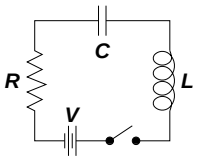
C) The current through the inductor is the same as the current through the resistor at all times.

8. [1pt] Choose the value for the inductance L (in H) such that the above circuit carries the largest current. DATA: $R = 280\ \Omega$. $f = 1.83 \times 10^{3}\ Hz$. $C = 6.10 \times 10^{-3}\ F$. $V_{rms} = 75\ V$.

A) 5.96×10^{-7} B) 6.73×10^{-7} C) 7.60×10^{-7} D) 8.59×10^{-7}
E) 9.71×10^{-7} F) 1.10×10^{-6} G) 1.24×10^{-6} H) 1.40×10^{-6}

9. [1pt] Using the inductance found in the previous problem, what is the impedance (in Ω) seen by the voltage source?

A) 9.33×10^{1} B) 1.09×10^{2} C) 1.28×10^{2} D) 1.49×10^{2}
E) 1.75×10^{2} F) 2.05×10^{2} G) 2.39×10^{2} H) 2.80×10^{2}

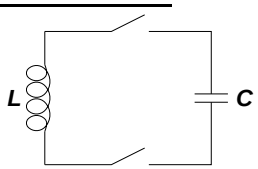


10. [1pt] The switch in the above diagram is closed after being open a long time. Which of the following statements are true? (Give ALL correct answers)

A) In the instant after the switch is closed, the voltage across the inductor equals the voltage across the battery.

B) In the instant after the switch is closed, the current through the resistor is zero.

C) A long time after the switch is closed, the current through the resistor is zero.



11. [1pt] Consider the LC circuit above. The capacitor is initially charged with $2.70 \times 10^{-6}\ C$. At a time $t = 0$, the capacitor is connected to an inductor by closing both switches. What is the maximum current (in A) through the circuit? DATA: $C = 6.40 \times 10^{-4}\ F$. $L = 5.20 \times 10^{-3}\ H$. HINT: Use energy conservation.

A) 6.29×10^{-4} B) 8.37×10^{-4} C) 1.11×10^{-3} D) 1.48×10^{-3}
E) 1.97×10^{-3} F) 2.62×10^{-3} G) 3.48×10^{-3} H) 4.63×10^{-3}