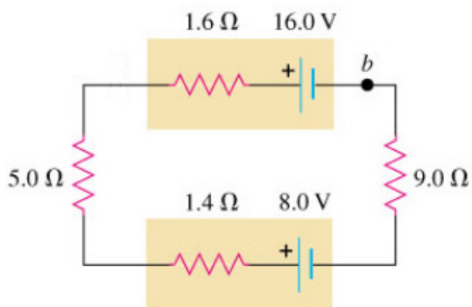
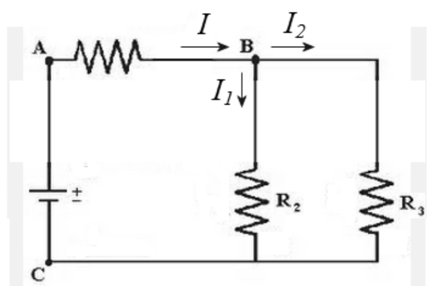
Exam 2 Practice Test

1. An electric current of 15 Amps flows through an electrical cable. How much charge flows through the cable in 10 seconds?
a) 500 C b) 150 C c) 0.67 C d) 1.5 C e) none of these ______



2. Consider the circuit shown, which features two batteries whose EMFs and internal resistances are given (in shaded regions). How much current flows in this circuit? [Hint: Use Kirchhoff's Loop Rule.]
a) 27 Amps b) 0.47 Amps c) 1.53 Amps d) 11.4 Amps
e) none of these ______

3. A current of 3 Amps flows through of resistor whose resistance is 9 Ohms. What is the potential difference between the two ends of the resistor? a) 12 V b) 0.33 V c) 3 V d) 27 V e) none of these ______



4. For the circuit shown, which of the following expresses the current I_1 in terms of the current I and the resistances R_1 and R_2? [Hint: Use Kirchhoff's Junction Rule and the fact that the voltage drop between B and C is the same for either path.]

a) $I_1 = \dfrac{IR_2}{R_1 + R_2}$ b) $I_1 = \dfrac{IR_1}{R_1 + R_2}$ c) $I_1 = I\dfrac{R_1 R_2}{R_1^{\ 2} + R_2^{\ 2}}$

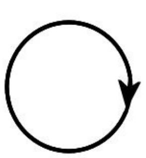
d) $I_1 = \dfrac{I(R_2 - R_1)}{R_1 + R_2}$ e) none of these ______

5. Suppose that a uniform magnetic field points **out** of this sheet of paper. If a negatively charged particle moves from left to right (→), in what direction does the field exert a force on the particle?

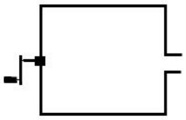
a) ← b) ↑ c) → d) ↓ e) into this sheet d) out of this sheet ______

6. A current of 30 Amps flows through a circular loop of wire. If the current is increased to 60 Amps and the area enclosed by the loop is halved, the magnetic moment of the wire will have
a) increase by a factor of 2 b) decreased by a factor of 2
c) increased by a factor of 4 d) remained unchanged e) none of these ______

7. Imagine a straight wire that is perpendicular to this page. If a current flows in the wire in a direction that is **into** this page (away from you), the magnetic field of the wire will be
a) radial and point away from the wire. b) radial and point toward the wire
c) circles centered on the wire and point counter clockwise
d) circles centered on the wire and point clockwise ______

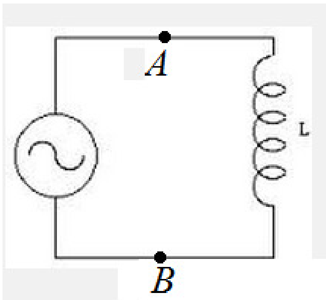


8. A current flows in a circular loop as shown. The magnetic field at the center of the loop points
a) into the page b) out of the page c) left d) right e) none of these ______



9. A uniform magnetic field points into the page. The square current loop shown is rotated in this field by turning the crank on its left. As a result an alternating current emerges from the terminals on the right. This device is a
a) motor b) generator (dynamo) c) transformer d) inductor ______

10. A flexible loop of wire is the plane of this page. A uniform magnetic field points **out of** this page. If the wire loop is squeezed so that the area within the loop is decreased, in what direction will the current induced in the loop flow? a) clockwise b) counter clockwise ______

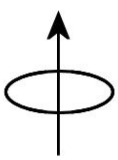


11. An AC current pass through an inductor as shown. How does the phase of the voltage at point B compare with that of the current at A? [i.e if $i_A(t) = I_{Peak}\cos(\omega t)$ and $v_B = \omega L I_{Peak}\cos(\omega t + \varphi)$, what is the phase φ ?]

a) phase lags by 90º ($\varphi = -\frac{\pi}{2}$) b) phase is the same ($\varphi = 0$)

c) phase leads by 90º ($\varphi = \frac{\pi}{2}$) d) phase leads by 180º ($\varphi = \pi$) e) none of these

______



12. A wire carrying an electric current of passes through a circular loop as shown. If the magnetic field is 0.02 Tesla at a distance of 0.01 meters from the wire, how strong is the magnetic field at distance of 0.04 meters?
a) 0.02 T b) 0.01 T c) 0.005 d) 0.001 T e) none of these ______

13. A magnetic field of 2 Tesla points out of this page. A loop of wire is in the plane of this page. The area within the loop of wire is 0.10 meter^2. What is the magnetic flux through the wire? [Hint: 1 Weber = (1 Tesla) x (1 meter^2)]
a) 2 Weber b) 0.02 Weber c) 20 Weber d) 0.2 Weber e) none of these ______

14. Consider two coils. The degree to which a changing current in either of the coils is able to induce an EMF in the other coil is called a) capacitance b) mutual inductance c) impedance d) self inductance. ______

15. A coil has a self inductance of 20 Henry. If the current through the coil changes at a rate of 6 Amps per second, how much EMF will be induced in the coil?
a) 26 Volts b) 0.30 Volts c) 3.33 Volts d) 120 Volts e) none of these ______

16. A constant magnetic field of 0.02 T passes through a circular loop wire of radius 0.4 meters. What is the magnitude of the EMF induced in the wire loop?
a) 0.008 V b) 0.05 V c) 20 V d) 0 V e) none of these ______

17. The input coil of a transformer has 100 windings. The output coil has 20 windings. If an AC current whose peak voltage is 120 volts is applied to the input coil, what will be the peak voltage at the output coil?
a) 24 V b) 48 V c) 600 V d) 120 V e) none of these ______

18. The switch in a R-L circuit is closed allowing current to flow from a 6 volt battery. If the resistor has a value of 200 Ohms and the inductor a value of 5 Henry, what value will the current eventually reach?
a) 0.12 Amps b) 0.03 Amps c) 3 Amps d) 30 Amps e) none of these ______

19. About how long will it take for the circuit of Problem #18 to reach its final current?

a) 30 sec b) 1000 sec c) 0.025 sec d) 40 seconds e) none of these ______

20. The electric motor and the dynamo are a consequence of

a) Gauss' Law b) Faraday's Law c) Gauss' Law for magnetism d) Ampere's Law ______

21. Which circuit element has a reactance that increases with the frequency of the AC current.

a) inductor b) resistor c) capacitor d) none of these ______

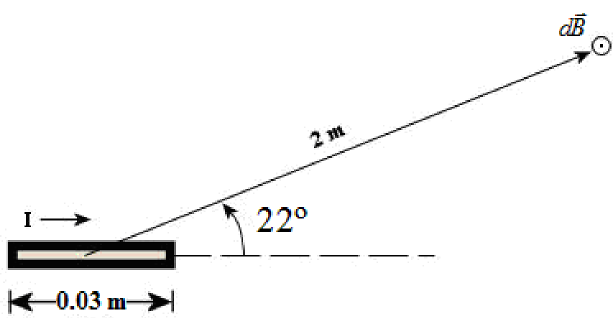
22. "The magnetic field along a loop is proportional to the current that passes through the loop." This is a statement of

a) Gauss' Law b) Faraday's Law c) Gauss' Law for magnetism d) Ampere's Law ______

23. The reactance of a 8 Henry inductor in an AC circuit is 96 Ohms. What is the circular frequency of the AC current?

a) 1.91 rad/sec b) 12 rad/sec c) 768 rad/sec 24 rad/sec e) none of these ______

24. What is the contribution to the magnetic field produced by a 0.03 meter segment of wire carrying a current of 4 Amps at a distance of 2 meters at an angle of 22 degrees away from the segment ? [$\mu_0 = 4\pi \times 10^{-7}$ Tesla-meters/Ampere]



a) 3.75×10^{-10} T b) 1.12×10^{-9} T c) 48.2×10^{-15} T d) 42.9 T e) none of these ______

25. In a particular R-L-C circuit the ratio of the peak voltage is 3000 volts and the peak current is 500 Amps. What is the impedance of the circuit?

a) 6 Ohms b) 1/6 Ohms c) 22.5 Ohms d) 1500000 Ohms e) none of these ______

26. Two straight wires hang side by side from a ceiling. The wires make no contact. A large electric current is passed downward in each wire. Do the wires attract or repel each other?

a) attract b) repel c) neither d) none of these ______

27. Consider

1) B_1 = the magnetic field at the center of a circular wire loop of radius R that results from a current I in the wire, and

2) B_2 = the magnetic field at a distance R from a straight wire that results for a current I in the wire.

The ratio B_1/B_2 is

a) 2π b) $1/\pi$ c) 2 d) π e) none of these _____

28. The magnetic field in the central chamber of an MRI machine is 4 times stronger than that near its entrance of the chamber. How does the energy density, u_C, within the central chamber compare with that, u_E, near its entrance?

a) $u_C = 4u_E$ b) $u_C = 8u_E$ c) $u_C = 16u_E$ d) $u_C = u_E/16$ e) none of these _____

29. If the current passing through an inductor is doubled, how does the energy stored within the inductor change?
a) increase by a factor of 2 b) increased by a factor of 4 c) increased by a factor of 16
d) reduced by a factor of 4 _____

30. Assume that the earth has a dipole magnetic field that averages 0.5×10^{-4} T and that the earth is a perfect sphere of radius 6300 km, whose rotation rate is 6.28 radians/day. Assume further that the interior of the earth can be modeled as a fluid of uniform density, whose resistivity is 1200 Ohm-meters with a mean electric charge density of -0.178 C/m^3. What is the density of magnetic monopole within the earth?
a) 0.388 monopoles/m^3 b) 27.1 monopoles/m^3 c) 1.61×10^{19} monopoles/m^3
d) 2017 monopoles/m^3 e) none of these _____