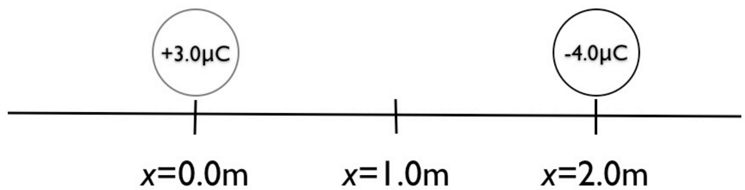
Closed book. No work needs to be shown for multiple-choice questions.

The first 10 questions are the makeup Quiz.
The remaining questions are simply additional material for people to study with for the final exam.
The actual final exam with have 20 questions.

1. Two light bulbs, one 25 Ω and the other 100 Ω, are connected in parallel to a 120 Volt battery (all three circuit elements are in parallel). In this situation:

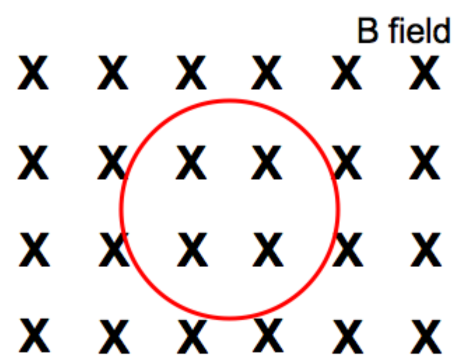
a. the current in the 100 Ω bulb is greater than that in the 25 Ω bulb.
b. the current in the 100 Ω bulb is less than that in the 25 Ω bulb.
c. both bulbs will light with equal brightness.
d. each bulb will have a potential difference of 60 Volts.
e. the current in the 100 Ω bulb is equal to that in the 25 Ω bulb.

2. A charge of +3.0 μC is placed at the origin and a charge of – 4.0 μC is placed at x = 2.0 m. Which of the following is true?



a. The only location on the x-axis where a positive charge feels no net force is to the left of the origin.
b. There are two locations on the x-axis where a positive charge feels no net force: one is to the left of the origin and one is between x = 0.0 m and x = 2.0 m.
c. There are two locations on the x-axis where a positive charge feels no net force: one is to the right of x = 2.0 m and one is between x = 0.0 m and x = 2.0 m.
d. There are two locations on the x-axis where a positive charge feels no force: one is to the right of x = 2.0 m and one is to the left of the origin.
e. There is no location on the x-axis where a positive charge feels no force.

3. A circular coil of wire is positioned perpendicular to an external magnetic field that is directed into the page. The area of the circular coil is then suddenly increased. What direction in the wire will the resulting induced current be?



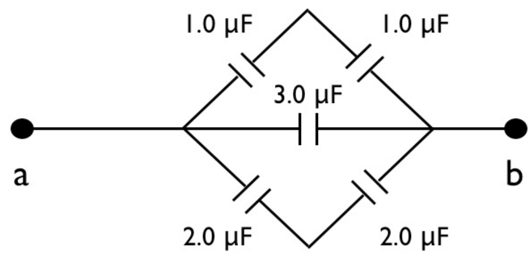
a. Clockwise.
b. Counterclockwise.
c. Out of the board.
d. Into the board.
e. There will be no current induced in the wire.

4. A weber is the same as:

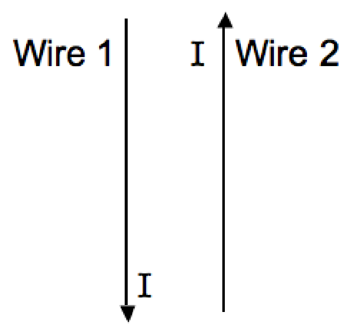
a. 1 V · s.
b. 1 T · s.
c. 1 T/m.
d. 1 V/s.
e. 1 T/m^2.

5. What is the equivalent capacitance between points **a** and **b** in the diagram to the right?

a. 0.30 μF.
b. 0.92 μF.
c. 1.1 μF.
d. 4.5 μF.
e. 6.0 μF.

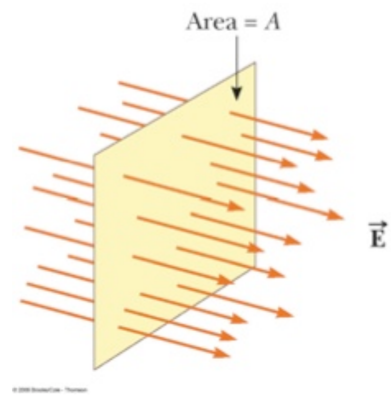


6. Two parallel current-carrying wires are placed next to each other as shown to the right. Both wires carry currents of 1.0 A. The current in wire 1 is directed down in the plane of the paper. The current in wire 2 is directed up in the plane of the paper. Which answer below best describes the force on both wires?



a. The net force on wire 1 is to the left and the net force on wire 2 is to the left.
b. The net force on wire 1 is to the left and the net force on wire 2 is to the right.
c. The net force on wire 1 is to the right and the net force on wire 2 is to the left.
d. The net force on wire 1 is to the right and the net force on wire 2 is to the right.
e. There is no net force on either wire 1 nor wire 2.

7. A flat surface of area A is placed in a uniform electric field such that the normal of the surface and the electric field are parallel to one another. Which of the following actions would cause the electric flux through the surface to decrease?



a. Decrease the area A of the flat surface.
b. Rotate the area A slightly so that its normal is no longer parallel to the electric field.
c. Decrease the strength of the uniform electric field.
d. Choices a), b), and c) would each decrease the electric flux through the surface.
e. Only choices a) and c) would decrease the electric flux through the surface.

8. A metallic conductor has a resistivity of 18×10^{-6} Ω·m. What is the resistance of a piece that is 30 m long and has a uniform cross sectional area of 3.0×10^{-6} m^2?

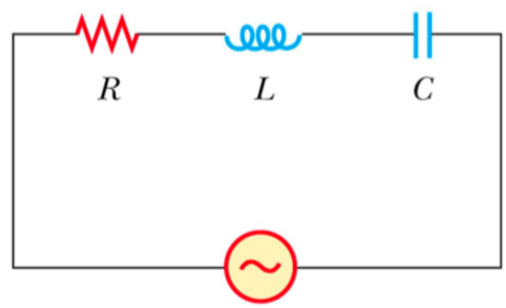
a. 0.056 Ω.
b. 180 Ω.
c. 160 Ω.
d. 90 Ω.
e. 120 Ω.

9. For an inductor in an AC circuit (where the voltage drop across the inductor is ΔV_L and the current through the inductor is I_L):

a. The voltage, ΔV_L, lags behind the current, I_L.
b. The current, I_L, and the voltage, ΔV_L, are in phase.
c. The current, I_L, lags behind the voltage, ΔV_L.
d. The voltage, ΔV_L, will be a maximum when the current, I_L, is at a maximum.
e. The voltage, ΔV_L, will be zero when the current, I_L, is zero.

10. In this *RLC* series circuit shown to the right, the resistor has a resistance, R, of 4.0 Ω, the inductor has an inductive reactance, X_L, of 3.0 Ω, and the capacitor has a capacitive reactance, X_C, of 6.0 Ω. The impedance of this circuit is:

a. 5.0 Ω.
b. 7.0 Ω.
c. 9.8 Ω.
d. 13 Ω.
e. 7.8 Ω.

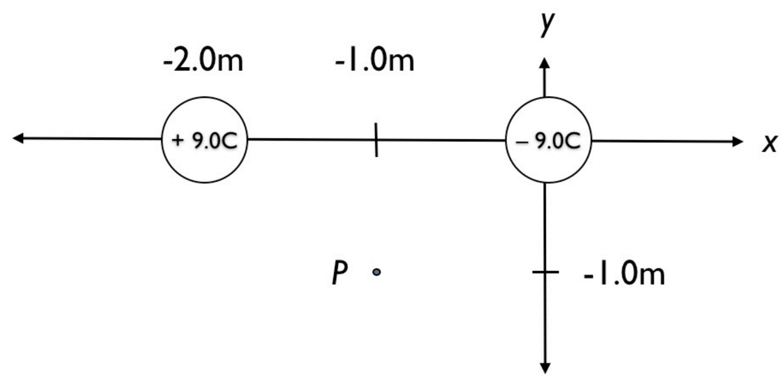


This is the end of the makeup quiz. Anything that comes below here is just practice for the final exam.

11. Current is a measure of:

a. force that moves a charge past a point.
b. resistance to the movement of a charge past a point.
c. energy used to move a charge past a point.
d. amount of charge that moves past a point per unit time.
e. speed with which a charge moves past a point.

Questions 12-15 refer to the following situation: a charge of +9.0 C is placed at $x = -2.0$ m. A second charge of –9.0 C is placed at the origin, as shown to the right. The location labeled *P* has coordinates $x = -1.0$ m, $y = -1.0$ m.



12. What is the magnitude of the electric potential (*i.e*. voltage) at point *P*?

a. 0 V.
b. 4.0×10^{10} V.
c. 5.7×10^{10} V.
d. 8.1×10^{10} V.
e. 1.1×10^{11} V.

13. The direction of the electric potential (*i.e*. voltage) at point *P* is:

a. in the direction of the negative y-axis.
b. in the direction of the positive x-axis.
c. in the direction 45° below the positive x-axis.
d. in the direction 45° below the negative x-axis.
e. there will be no direction of the net electric potential at point *P*.

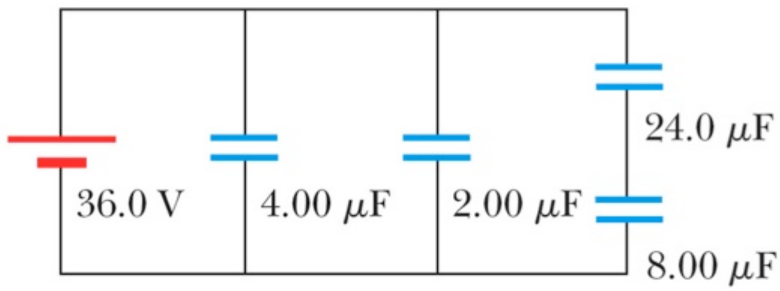
14. What is the magnitude of the electric field at point *P*?

a. 0 N/C.
b. 4.0×10^{10} N/C.
c. 5.7×10^{10} N/C.
d. 8.1×10^{10} N/C.
e. 1.1×10^{11} N/C.

15. The direction of the electric field at point *P* is:

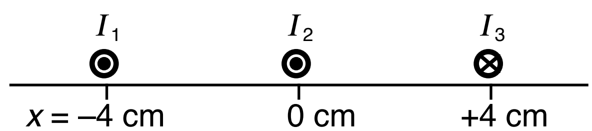
a. in the direction of the negative y-axis.
b. in the direction of the positive x-axis.
c. in the direction 45° below the positive x-axis.
d. in the direction 45° below the negative x-axis.
e. there will be no direction of the net electric field at point *P*.

16. A group of capacitors is connected to a voltage source as shown to the right. Which of the following pairs of capacitors have the same amount of charge?



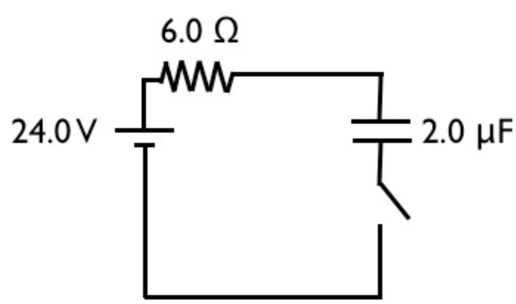
a. The 4.00 μF capacitor and the 2.00 μF capacitor.
b. The 4.00 μF capacitor and the 8.00 μF capacitor.
c. The 24.0 μF capacitor and the 2.00 μF capacitor.
d. The 24.0 μF capacitor and the 8.00 μF capacitor.
e. The 24.0 μF capacitor and the 4.00 μF capacitor.

17. Three parallel wires all with the same magnitude of current ($I_1 = I_2 = I_3$) are perpendicular to the plane of this page. In two of the wires, the current is directed out of the page, while in the remaining wire the current is directed into the page. The two outermost wires are rigidly held in place. In which direction will the middle wire move?



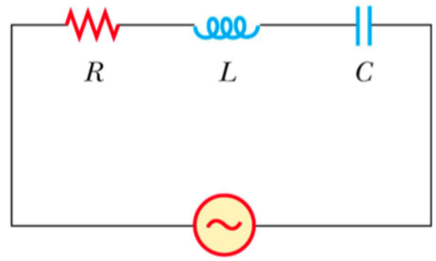
a. up.
b. down.
c. left.
d. right.
e. the middle wire will not move.

18. The RC circuit shown to the right includes an initially uncharged 2.0 μF capacitor and a 6.0 Ω resistor in a series circuit with a 24.0 V battery. The switch is initially open. How many seconds after the switch is closed does it take until the voltage across the capacitor is 18.0 V?



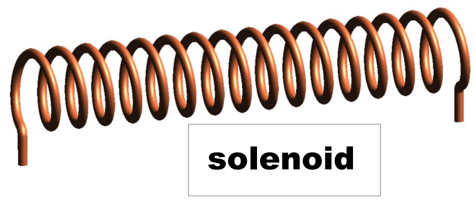
a. 3.5 μs.
b. 8.3 μs.
c. 9.0 μs.
d. 12 μs.
e. 17 μs.

19. When the frequency of an AC voltage source in a series RLC circuit is doubled:



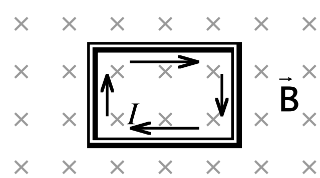
a. the capacitive reactance of the circuit is halved.
b. the capacitive reactance of the circuit is doubled.
c. the impedance of the circuit is doubled.
d. the inductive reactance of the circuit is halved.
e. the resistance of the resistor *R* is doubled.

20. Calculate the inductance of a solenoid containing 300 turns if the length of the solenoid is 25.0 cm and its cross-sectional area is 4.00 x 10^{-4} m^2.



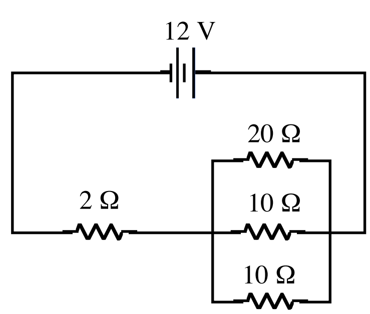
a. 2.02 x 10^{-9} H.
b. 6.03 x 10^{-7} H.
c. 0.452 H.
d. 5.44 x 10^{-2} H.
e. 1.81 x 10^{-4} H.

21. Consider one rectangular loop of wire, 0.240 m by 0.360 m that carries a current of 0.750 Amps, oriented with the plane of its loop perpendicular to a uniform 2.00 Tesla magnetic field, as shown at right. Which one of the following choices best corresponds to the magnitude of the torque exerted on this rectangular loop by the magnetic field?



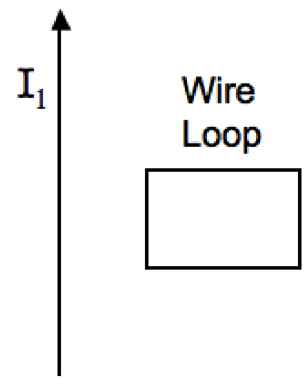
a. 0 N·m.
b. 0.130 N·m.
c. 0.360 N·m.
d. 0.540 N·m.
e. 0.260 N·m.

22. How much current is flowing in the 2 Ω resistor?



a. 0.80 A.
b. 2.0 A.
c. 1.6 A.
d. 2.4 A.
e. 0.40 A.

23. In the sketch to the right, a long straight wire is in the plane of a rectangular conducting wire loop. The current in the straight wire is up. At some point the current in the straight wire starts to increase in magnitude. This increased current leads to an induced current in the wire loop. In which direction will the induced current in the wire loop be?

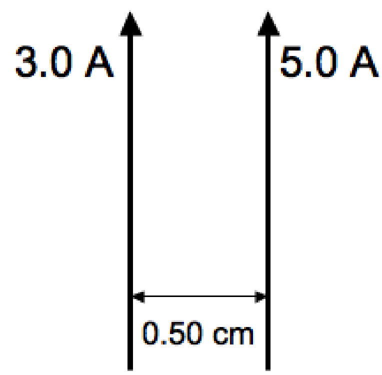


a. Clockwise.
b. Counterclockwise.
c. Out of the page.
d. Into the page.
e. Clockwise in the left section of the loop and counterclockwise in the right section of the loop.

24. A proton moves perpendicularly to a uniform magnetic field, ***B***, at 1.0×10^7 m/s. It moves to the right from your vantage point. When in the magnetic field, the proton exhibits an acceleration of 2.0×10^{13} m/s^2 into the plane of the paper. What is the magnitude of the magnetic field?

a. 1.1×10^{-5} T.
b. 5.0×10^{-7} T.
c. 48 T.
d. 8.4×10^{-14} T.
e. 0.021 T.

25. Two long straight wires are parallel and carry current in the same direction. The currents are 3.0 Amps and 5.0 Amps and the wires are separated by 0.50 cm. The magnetic field at a point midway between the wires is:



a. 0.
b. 1.6×10^{-4} T.
c. 6.4×10^{-4} T.
d. 8.0×10^{-5} T.
e. 3.2×10^{-4} T.

26. In the circuit shown to the right, what is the power dissipated by the 6.0 Ω resistor?

a. 12 W.
b. 24 W.
c. 36 W.
d. 48 W.
e. 110 W.