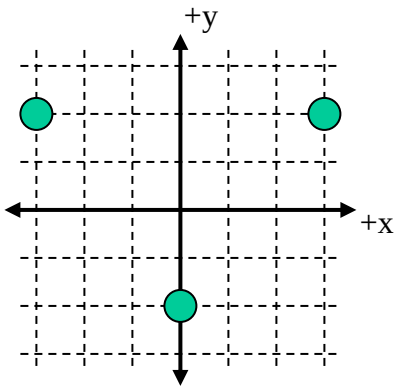
Three charges, all with a charge of –10 μC are situated as shown (each grid line is separated by 1 meter).

1) What is the net work needed to assemble this charge distribution?



a) +0.51 J
b) +0.18 J
c) 0 J
d) -0.18 J
e) -0.51 J

2) What is the electric potential at the origin?

a) +94,900 V
b) +45,000 V
c) 0 V
d) -45,000 V
e) -94,900 V

3) What is the magnitude of the net force on the lower charge due to the two upper charges?

a) .072 N
b) .058 N
c) .036 N
d) .029 N
e) 0 N

4) What is the direction of the force on the upper left charge due to the other two?

a) up and to the right
b) up and to the left
c) down and to the right
d) down and to the left
e) zero

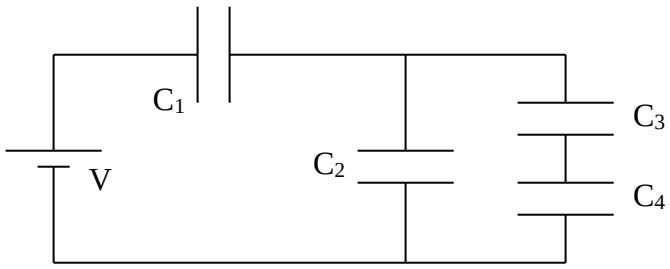
5) What is the direction of the net electric field at the origin?

a) up
b) down
c) left
d) right
e) zero

You are given the following circuit with four capacitors and a battery (where $C_1 > C_2 > C_3 > C_4$).

6) What is true about the total capacitance of the circuit compared to C_1?

a) C_{total} is greater than C_1
b) C_{total} is less than C_1
c) C_{total} is equal to C_1
d) it depends on the values of the capacitances
e) it depends on the value of the battery voltage



7) Compare the charge on capacitors 1, 3, and 4.

a) $Q_1 = Q_3 = Q_4$
b) $Q_1 = Q_3 > Q_4$
c) $Q_1 > Q_3 = Q_4$
d) $Q_1 < Q_3 = Q_4$
e) $Q_1 = Q_3 < Q_4$

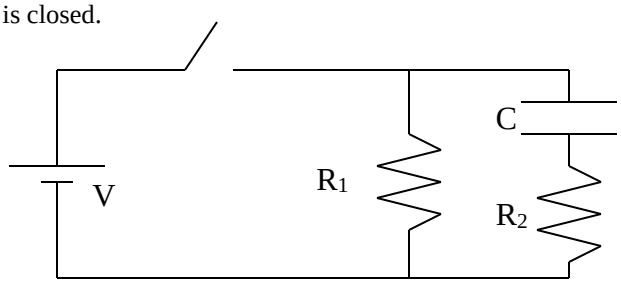
8) Compare the voltage drop across capacitors 2, 3, and 4.

a) $V_2 = V_4 > V_3$
b) $V_2 > V_4 = V_3$
c) $V_2 > V_4 > V_3$
d) $V_2 < V_4 = V_3$
e) $V_2 = V_4 = V_3$

You are given the following circuit with V = 12 V, $R_1 = 3\ \Omega$, $R_2 = 6\ \Omega$, and C = 1 μF (the switch has been opened for a long time):

9) Calculate the current through the battery right after the switch is closed.

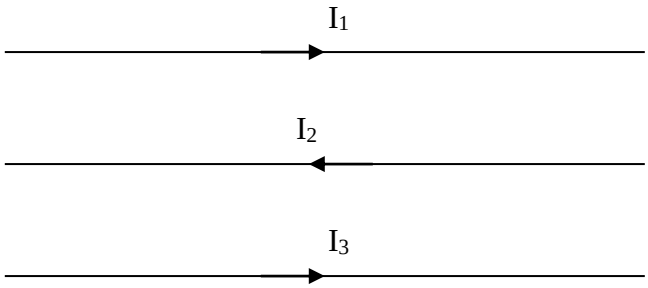
a) 6.0 A
b) 4.0 A
c) 3.0 A
d) 2.0 A
e) 0 A



10) Calculate the current through the battery after the switch has been closed a long time.

a) 6.0 A
b) 4.0 A
c) 3.0 A
d) 2.0 A
e) 0 A

Given following setup of three wires in the plane of the page with I_1 = 1 A, I_2 = 2 A, I_3 = 3 A (directions shown by the arrows) and each wire is separated by 4 m.



11) What is the direction of the magnetic field at wire 3 due to wires 1 and 2?

a) up
b) down
c) into the page
d) out of the page
e) zero

12) What is the direction of the force on wire 3 due to wires 1 and 2?

a) up
b) down
c) into the page
d) out of the page
e) zero

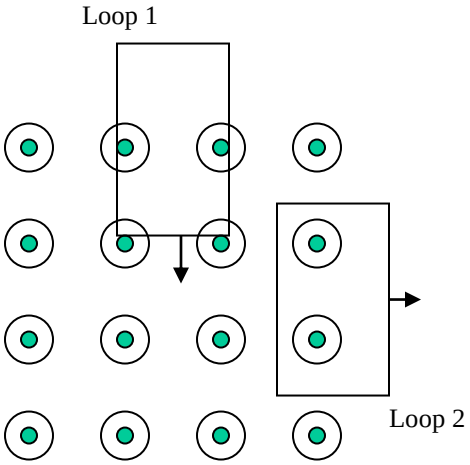
13) What is the magnitude of the field at the location of wire 3 due to wires 1 and 2?

a) 3.5×10^{-8} T
b) 4.5×10^{-8} T
c) 5.5×10^{-8} T
d) 6.5×10^{-8} T
e) 7.5×10^{-8} T

14) What is the magnitude of the force on 1 m of wire 3 due to wires 1 and 2?

a) 5.25×10^{-7} N
b) 4.25×10^{-7} N
c) 3.25×10^{-7} N
d) 2.25×10^{-7} N
e) 1.25×10^{-7} N

Given two loops moving in/out of a magnetic field as shown (when shown, the loops are partially in and partially out of the field and moving in the direction shown). The field points out of the page and the loops are moving in the plane of the page. The loops are identical (with the same resistance) with the lengths being twice as big as the widths. They both move with the same velocity.



15) What are the directions of the currents induced?

a) both are CW
b) both are CCW
c) both are zero
d) loop 1 is CW, loop 2 is CCW
e) loop 1 is CCW, loop 2 is CW

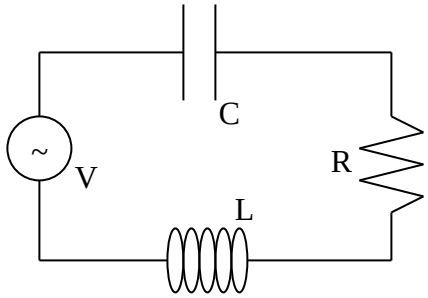
16) Compare the magnitude of the voltages induced.

a) loop 1 has a greater induced voltage
b) loop 2 has a greater induced voltage
c) neither loop has an induced voltage
d) they have the same induced voltage
e) one must know the length of the loop, the velocity, and field strength to answer this question

17) What is the direction of the magnetic force on loop 1 as it enters the field?

a) up
b) down
c) left
d) right
e) zero

Given an LRC circuit connected to an AC generator as shown with R = 22 Ω, L = 58 mH, and C unknown. The generator voltage oscillates at a frequency of 60 Hz.



18) What is X_L?

a) 12 Ω
b) 22 Ω
c) 32 Ω
d) 42 Ω
e) 52 Ω

19) If the circuit is at its resonance frequency, what is C?

a) 101 μF
b) 111 μF
c) 121 μF
d) 131 μF
e) 141 μF

20) At this resonance frequency, what is the impedance Z?

a) 12 Ω
b) 22 Ω
c) 32 Ω
d) 42 Ω
e) 52 Ω

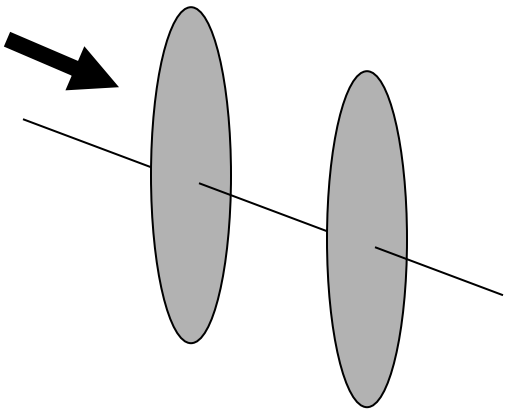
21) What describes the current through the generator and the voltage across the generator?

a) the current leads the voltage across the generator
b) the current lags the voltage across the generator
c) the current is in phase with the voltage across the generator
d) it depends on the current in the circuit
e) there is no current in the circuit

22) If the frequency is reduced, what will happen to the above answer?

a) now the current leads the voltage across the generator
b) now the current lags the voltage across the generator
c) now the current is in phase with the voltage across the generator
d) now it depends on the current in the circuit
e) now there is no current in the circuit

Unpolarized light with initial intensity of I_o goes through two linear polarizers. The first polarizer has a transmission axis at an angle of 30° with respect to the vertical and the second polarizer has a transmission axis at an angle of 60° with respect to the vertical.



23) What is the final intensity of light?

a) 0.75 I_o
b) 0.625 I_o
c) 0.5 I_o
d) 0.375 I_o
e) 0

24) If a third polarizer with a transmission axis at an angle of 70° to the vertical, where should it be placed to maximize the intensity of transmitted light?

a) before the first polarizer
b) between the polarizers
c) after the second polarizer
d) it does not matter
e) it depends on I_o

25) Where should this third polarizer be placed to minimize the intensity of transmitted light?

a) before the first polarizer
b) between the polarizers
c) after the second polarizer
d) it does not matter
e) it depends on I_o

Online Physics 122 Formulas

$$F = ma \qquad F = \frac{kq_1q_2}{r^2} \qquad E = \frac{F}{q_o} \qquad E = \frac{kq}{r^2}$$

$$U = \frac{kq_1q_2}{r} \qquad V = \frac{U}{q_o} \qquad V = \frac{kq}{r} \qquad E = \frac{V}{d}$$

$$C = \varepsilon_o \frac{A}{d} \qquad C = \frac{Q}{V} \qquad U = \frac{1}{2}QV \qquad I = \frac{Q}{t}$$

$$C_p = C_1 + C_2 \qquad \frac{1}{C_s} = \frac{1}{C_1} + \frac{1}{C_2} \qquad R_s = R_1 + R_2 \qquad \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$R = \rho \frac{L}{A} \qquad V = IR \qquad P = IV \qquad Q = Q_o e^{\frac{-t}{RC}}$$

$$Q = Q_o\left(1 - e^{\frac{-t}{RC}}\right) \qquad F = qvB\sin\theta \qquad F = ILB\sin\theta \qquad B = \frac{\mu_o I}{2\pi r}$$

$$B = \mu_o nI \qquad r = \frac{mv}{qB} \qquad \Phi_B = BA\cos\phi \qquad emf = vBL$$

$$emf = -N\frac{\Delta\Phi_B}{\Delta t} \qquad U = \frac{1}{2}LI^2 \qquad \frac{V_s}{V_p} = \frac{N_s}{N_p} \qquad V_{rms} = I_{rms}Z$$

$$Z = \sqrt{R^2 + \left(X_L - X_C\right)^2} \qquad X_c = \frac{1}{2\pi fC} \qquad X_L = 2\pi fL$$

$$\overline{P} = V_{rms}I_{rms}\cos\phi \qquad \tan\phi = \frac{X_L - X_C}{R} \qquad f_o = \frac{1}{2\pi\sqrt{LC}} \qquad c = \lambda f$$

$$c = \frac{1}{\sqrt{\varepsilon_o\mu_o}} \qquad U = \frac{1}{2}\varepsilon_o E^2 + \frac{1}{2\mu_o}B^2 \qquad E = cB$$

$$I = I_o\cos^2\theta$$

$$k = 8.99\times10^9\, Nm^2/C^2$$
$$\varepsilon_o = 8.85\times10^{-12}\, C^2/m^2N$$
$$q_e = 1.60\times10^{-19}\, C$$
$$\mu_o = 4\pi\times10^{-7}\, Tm/A$$
$$c = 3\times10^8\, m/s$$

ON-LINE PHYSICS 122
EXAM #1
MR. POTTER

Name: _____ Date: _____

1) Bubble in the ID number section of the scantron.

2) You may use only a pencil and calculator. (Formula sheet is provided.)

3) Use the test as scratch paper (or the paper provided by the testing center). Hand EVERYTHING back in or you will receive a 0 on the exam!

4) Scoring: all 5 answer choice questions are 6 pts. each, all 3 answer choice questions are 3 pts. each, all 2 answer choice questions are 2 pts. each. Total possible points = 150 pts.

5) This is test form ____. Be sure to write this on your scantron form. All forms are "equivalent" tests (only numbers have been changed.)

6) Also, write your name, the class, the date, and my name on the scantron form.

Good Luck!