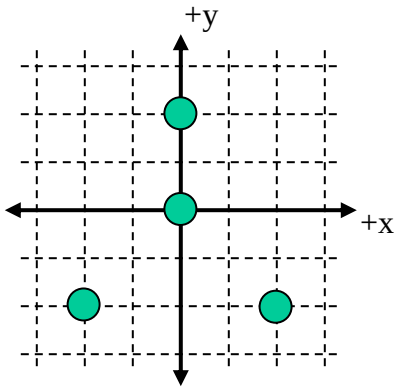
Three charges with a charge of +2 μC ($+2\times10^{-6}$ C) and one charge with a charge of -2 μC are situated as shown in the diagram with THE NEGATIVE CHARGE AT THE ORIGIN (each grid line is separated by 1 meter). The point (0, -2) is located half-way between the lower two charges on the y-axis.



1) What is the direction of the net electric field at the point (0, -2)?

a) up
b) down
c) left
d) right
e) the electric field is zero

2) What is the magnitude of the net electric field at the point (0, -2)?

a) 0 N/C
b) 2813 N/C
c) 3375 N/C
d) 5625 N/C
e) 6750 N/C

3) What is the net electric potential at the point (0, -2)?

a) 0 V
b) 6750 V
c) 13500 V
d) 20250 V
e) 27000 V

4) What is the direction of the net force on the charge at the origin due to the other three?

a) up
b) down
c) left
d) right
e) the electric force is zero

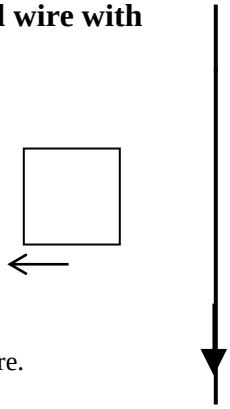
5) What is the magnitude of the net force on the charge at the origin due to the other three?

a) 0 N
b) 0.0026 N
c) 0.0053 N
d) 0.0079 N
e) 0.0105 N

6) What would be the magnitude of the change in potential energy of the system if the charge at the origin was taken very far away (to infinity)?

a) 0.043 J
b) 0.087 J
c) 0.174 J
d) 0.348 J
e) 0.695 J

A square loop of wire is pulled to the left away from a long straight vertical wire with current directed downwards as shown in the diagram.



7) What is the direction of the current induced in the loop?

a) clockwise
b) counterclockwise
c) zero

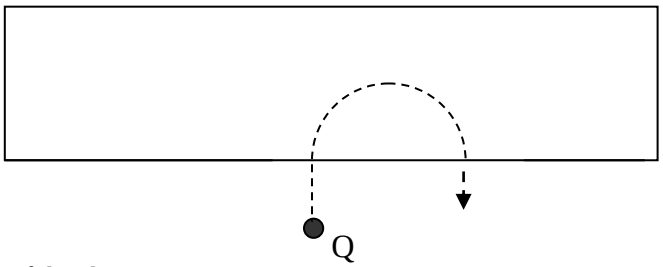
8) Describe the direction of the magnetic force on the loop due to the long straight vertical wire.

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

9) If the loop was being pulled straight upwards (but still on the LEFT side of the long straight wire) and pulled slower than above, how would the induced current in the loop compare to the above situation?

a) it would be CW and be greater in magnitude
b) it would be CW and be less in magnitude
c) it would be CCW and be greater in magnitude
d) it would be CCW and be less in magnitude
e) there would be no induced current

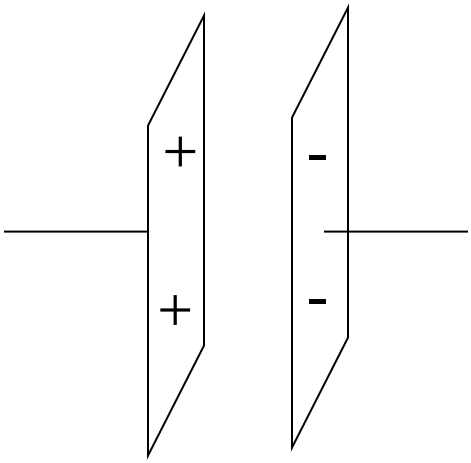
A single charge moves upward into a box with a magnetic field pointing OUT OF THE PAGE and follows the path shown in the diagram.



10) What is the sign of the charge?

a) positive
b) negative
c) zero

A capacitor is constructed from two metal sheets placed 1.7 mm apart. The total capacitance is 22 pF (22×10^{-12} F). A 14 V battery is used to charge the capacitor. The positive and negative plates are shown:



11) What area of plates was needed to construct this capacitor?

a) 0.0012 m^2
b) 0.0022 m^2
c) 0.0032 m^2
d) 0.0042 m^2
e) 0.0052 m^2

12) What is the charge stored on the capacitor?

a) 308 pC
b) 408 pC
c) 508 pC
d) 608 pC
e) 708 pC

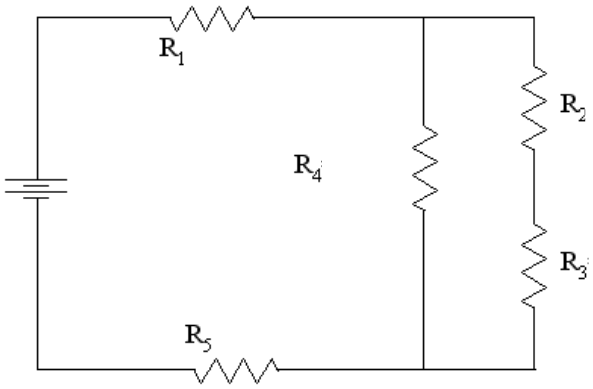
13) If the plates were pulled farther apart, how would the charge change?

a) increase
b) decrease
c) remain the same

14) If 3 of these capacitors are connected in series and then this combination is connected in parallel with a fourth capacitor, what is the net capacitance of the combination?

a) 5.5 pF
b) 16.5 pF
c) 22 pF
d) 29.3 pF
e) 88 pF

The following circuit has the values: V = 6 V, $R_1 = 2\ \Omega$, $R_2 = 4\ \Omega$, $R_3 = 1\ \Omega$, $R_4 = 3\ \Omega$, $R_5 = 1\ \Omega$.



15) Compare the current through R_2, R_3, and R_4.

a) $I_2 < I_3 < I_4$
b) $I_2 < I_3 = I_4$
c) $I_2 = I_3 < I_4$
d) $I_2 = I_3 = I_4$
e) $I_2 < I_3 < I_4$

16) Compare the voltage drop across R_2, R_4, and R_5.

a) $V_4 < V_2 < V_5$
b) $V_4 > V_2 = V_5$
c) $V_4 > V_2 > V_5$
d) $V_4 = V_2 = V_5$
e) $V_4 = V_2 > V_5$

17) Calculate the current through R_5.

a) 1.23 A
b) 1.85 A
c) 2.37 A
d) 2.92 A
e) 3.55 A

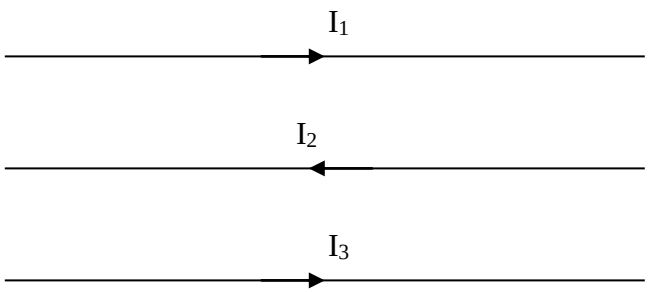
18) Calculate the voltage drop across R_4.

a) 0.69 V
b) 1.23 V
c) 1.67 V
d) 2.01 V
e) 2.31 V

19) Calculate the power dissipated in R_3.

a) 0.21 W
b) 0.82 W
c) 1.52 W
d) 2.28 W
e) 2.82 W

Given following setup of three wires in the plane of the page with I_1 = 2.3 A, I_2 = 3.7 A, I_3 = 1.8 A (directions shown by the arrows) and each wire is separated by 4 m.



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

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

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

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

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

a) 2.5×10^{-8} T
b) 3.5×10^{-8} T
c) 4.5×10^{-8} T
d) 5.5×10^{-8} T
e) 6.5×10^{-8} T

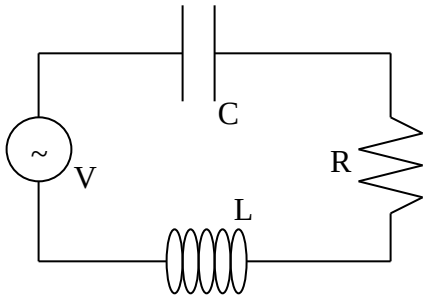
23) What is the magnitude of the force on 1 m of wire 2 due to wires 1 and 3?

a) 5.25×10^{-8} N
b) 6.25×10^{-8} N
c) 7.25×10^{-8} N
d) 8.25×10^{-8} N
e) 9.25×10^{-8} N

Shown below is an LRC circuit connected to an AC generator with L unknown, C = 16 μF, and R = 18 Ω. The maximum generator voltage of 120 V oscillates at its resonant frequency of 60 Hz.

24) The current through the capacitor _____ the voltage across the capacitor and the current through the generator _____ the voltage across the generator.

a) leads, lags
b) lags, leads
c) leads, is in phase with
d) lags, is in phase with
e) is in phase with, is in phase with



25) What is the maximum current in the circuit?

a) 0.67 A
b) 2.67 A
c) 4.67 A
d) 6.67 A
e) 8.67 A

26) What is the value of the inductance L?

a) 40 mH
b) 240 mH
c) 440 mH
d) 640 mH
e) 840 mH

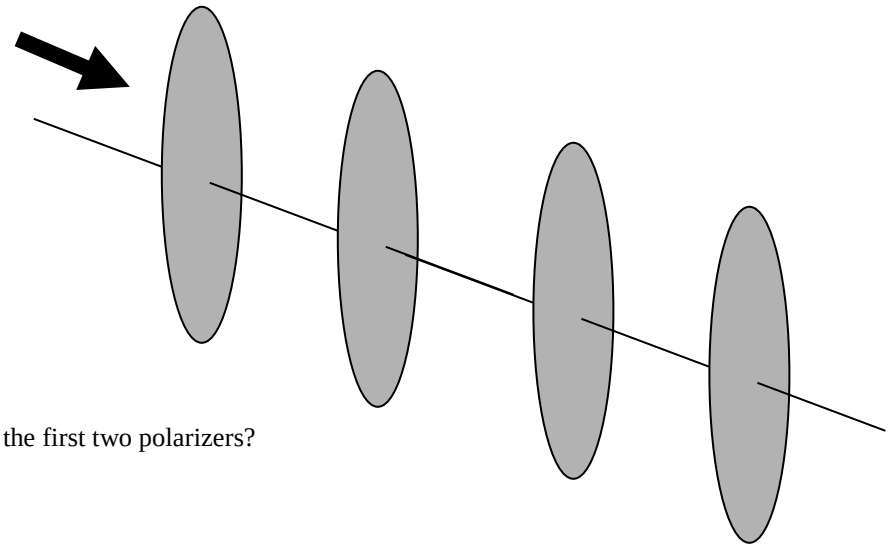
27) What is the maximum voltage across the capacitor?

a) 506 V
b) 706 V
c) 906 V
d) 1106 V
e) 1306 V

28) The frequency is changed to now be 70 Hz. What is the impedance of the circuit?

a) 14 Ω
b) 34 Ω
c) 54 Ω
d) 74 Ω
e) 94 Ω

Unpolarized light with initial intensity of 50 W/m^2 goes through four linear polarizers. The first polarizer has a transmission axis at an angle of 0° with respect to the vertical, the second polarizer has a transmission axis at an angle of 0° with respect to the vertical, the third polarizer has a transmission axis at an angle of +45° with respect to the vertical, and the fourth polarizer has a transmission axis at an angle of +90° with respect to the vertical.



29) What is the intensity of light after the first two polarizers?

a) 50 W/m^2
b) 25 W/m^2
c) 12.5 W/m^2
d) 6.25 W/m^2
e) 0 W/m^2

30) What is the intensity of light after the fourth and last polarizer?

a) 50 W/m^2
b) 25 W/m^2
c) 12.5 W/m^2
d) 6.25 W/m^2
e) 0 W/m^2

31) Rotating the first polarizer by just a small angle will do what to the final intensity of light?

a) increase it
b) decrease it
c) it will not change it

32) This light has a frequency of 5x10^{14} Hz. What is the wavelength of the light?

a) 400 nm
b) 500 nm
c) 600 nm
d) 700 nm
e) 800 nm

Online Physics 122 Formulas

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

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

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

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

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

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

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

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

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

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

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

$I = I_o\cos^2\theta$

$k = 8.99\times10^9\, Nm^2/C^2$

$\varepsilon_o = 8.85\times10^{-12}\, C^2/m^2N$

$q_e = 1.60\times10^{-19}\, C$

$\mu_o = 4\pi\times10^{-7}\, Tm/A$

$c = 3\times10^8\, m/s$

ON-LINE PHYSICS 122
EXAM #1
MR. POTTER

Name: _____ Date: _____

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

2) This Exam is 90 min long - 32 multiple-choice questions. Choose the one BEST answer for each question. You are not penalized for guessing. Watch your time! (Answer all questions.)

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

4) 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!

5) 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 = 180 pts.

6) This is test form ____. Be sure to FILL THIS IN on your scantron form. All forms are "equivalent" tests (only numbers have been changed.)

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

Good Luck!

DID YOU BUBBLE IN AN ID NUMBER AND TEST FORM ON THE SCANTRON?

(see front page for instructions)