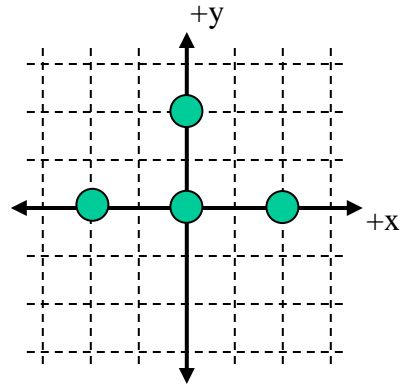


Four charges, all with a charge of $-6 \mu\text{C}$ ($-6 \times 10^{-6} \text{ C}$) are situated as shown in the diagram (each grid line is separated by 1 meter). The point (0, 1) is located half-way between the two charges on the y-axis.



- 1) What is the direction of the net electric field at the point (0, 1)?
 - 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, 1)?
 - a) 0 N/C
 - b) 4,830 N/C
 - c) 9,660 N/C
 - d) 10,800 N/C
 - e) 21,600 N/C

- 3) What is the net electric potential at the point (0, 1)?
 - a) 0 V
 - b) -58,700 V
 - c) -96,600 V
 - d) -156,300 V
 - e) -216,300 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

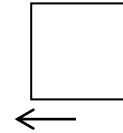
- 5) What is the magnitude of the net force on the charge at the origin due to the other three?
 - a) 0 N
 - b) 0.081 N
 - c) 0.162 N
 - d) 0.243 N
 - e) 0.324 N

- 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) 0.162 J
 - b) 0.324 J
 - c) 0.486 J
 - d) 0.648 J
 - e) 0.810 J

A square loop of wire is pulled to the left away from a long straight vertical wire with current (with unknown direction) as shown in the diagram. While being pulled, there is current induced in the loop in a clockwise direction (CW).

7) What is the direction of the current in the long straight vertical wire?

- a) up
- b) down**
- c) zero



8) Describe the direction of the magnetic field created by the induced current IN THE LOOP.

- a) out of the page through the loop, into the page outside the loop
- b) into the page through the loop, out of the page outside the loop**
- c) out of the page through the loop, out of the page outside the loop
- d) into the page through the loop, into the page outside the loop
- e) zero everywhere

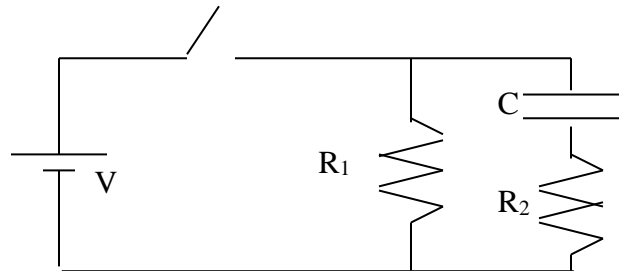
9) If the loop was being pulled to the right instead (but still on the left side of the vertical wire) and pulled faster than above, how would the induced current in the loop compare to the above situation?

- 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

You are given the following circuit with $V = 24 \text{ V}$, $R_1 = 2 \Omega$, $R_2 = 4 \Omega$, $C = 5 \text{ F}$.

10) Immediately after the switch is closed, compare the magnitude of the potential difference across R_1 and R_2 .

- a) $|V_1| < |V_2|$
- b) $|V_1| = |V_2|$
- c) $|V_1| > |V_2|$



11) After the switch has been closed a long time, compare the magnitude of the potential difference across R_1 and R_2 .

- a) $|V_1| < |V_2|$
- b) $|V_1| = |V_2|$
- c) $|V_1| > |V_2|$

12) After the switch is closed for a long time, it is now opened. Immediately after it is opened, compare the magnitude of the potential difference across R_1 and R_2 .

- a) $|V_1| < |V_2|$
- b) $|V_1| = |V_2|$
- c) $|V_1| > |V_2|$

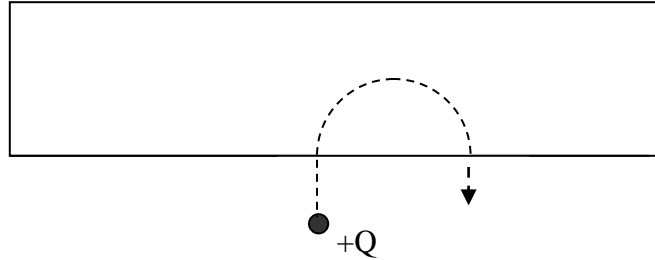
Two vertical wires carry current straight up as shown in the diagram:

13) If a third wire with current moving down is placed first to the left of both wires and then to the right of both wires, what will be true about the net force on the third wire? (in the order described above)

- a) first out of the page, then into the page
- b) first into the page, then out of the page
- c) first to the left, then right
- d) first to the right, then left
- e) zero in both positions



A single charge $Q = +2 \mu\text{C}$ moves upward into a box with a magnetic field of 6 T and follows the path shown in the diagram. The mass of the particle is 0.0030 g (note the units are grams) and the particle moves with a speed of 183 m/s.



- 14) What is the direction of the magnetic field in the box?
- a) up
 - b) down
 - c) into the page
 - d) out of the page
 - e) zero
- 15) What is the magnitude of the magnetic force on the particle while in the magnetic field?
- a) .001456 N
 - b) .001789 N
 - c) .002020 N
 - d) .002196 N
 - e) .002395 N
- 16) What is the distance between the points where the charge enters and exits the magnetic field?
- a) 52 m
 - b) 62 m
 - c) 72 m
 - d) 82 m
 - e) 92 m
- 17) If the charge of the particle was increased, how would the radius of curvature of the particle in the field change?
- a) increase
 - b) decrease
 - c) remain the same

You set up two different circuits. In circuit I, you have three resistors (with values $1\ \Omega$, $2\ \Omega$, and $3\ \Omega$) in series. In circuit II, you have three resistors (with values $1\ \Omega$, $2\ \Omega$, and $3\ \Omega$) in parallel. Each circuit is connected to separate $6\ \text{V}$ batteries.

18) Which circuit has a greater total equivalent resistance?

- a) Circuit I
- b) Circuit II
- c) they are the same

19) Which circuit has a greater total current drawn from the battery?

- a) Circuit I
- b) Circuit II
- c) they are the same

20) Which circuit has a greater total power dissipated in the resistors?

- a) Circuit I
- b) Circuit II
- c) they are the same

You set up two different circuits. In circuit I, you have three capacitors (with values $1\ \mu\text{F}$, $2\ \mu\text{F}$, and $3\ \mu\text{F}$) in series. In circuit II, you have three capacitors (with values $1\ \mu\text{F}$, $2\ \mu\text{F}$, and $3\ \mu\text{F}$) in parallel. Both circuits are connected to separate $6\ \text{V}$ batteries.

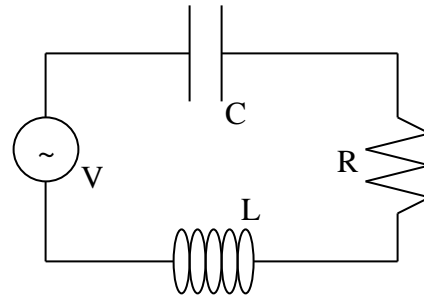
21) Calculate the charge stored on the $2\ \mu\text{F}$ capacitor in each circuit. (first Circuit I and then Circuit II)

- a) $2.87\ \mu\text{C}$ and $1.0\ \mu\text{C}$
- b) $4.18\ \mu\text{C}$ and $9.21\ \mu\text{C}$
- c) $1.29\ \mu\text{C}$ and $6.58\ \mu\text{C}$
- d) $3.27\ \mu\text{C}$ and $12.0\ \mu\text{C}$
- e) $1.0\ \mu\text{C}$ and $8.28\ \mu\text{C}$

Shown below is an LRC circuit connected to an AC generator with $L = 58 \text{ mH}$, $C = 16 \text{ }\mu\text{F}$, and R unknown. The maximum generator voltage of 16 V oscillates at a frequency of 140 Hz . The impedance of the circuit is $45 \text{ }\Omega$.

22) The current through the inductor _____ the voltage across the inductor and the current through the resistor _____ the voltage across the resistor.

- 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



23) What is the maximum current in the circuit?

- a) 0.16 A
- b) 0.26 A
- c) 0.36 A
- d) 0.46 A
- e) 0.56 A

24) What is the value of the resistance R ?

- a) $10 \text{ }\Omega$
- b) $20 \text{ }\Omega$
- c) $30 \text{ }\Omega$
- d) $40 \text{ }\Omega$
- e) $50 \text{ }\Omega$

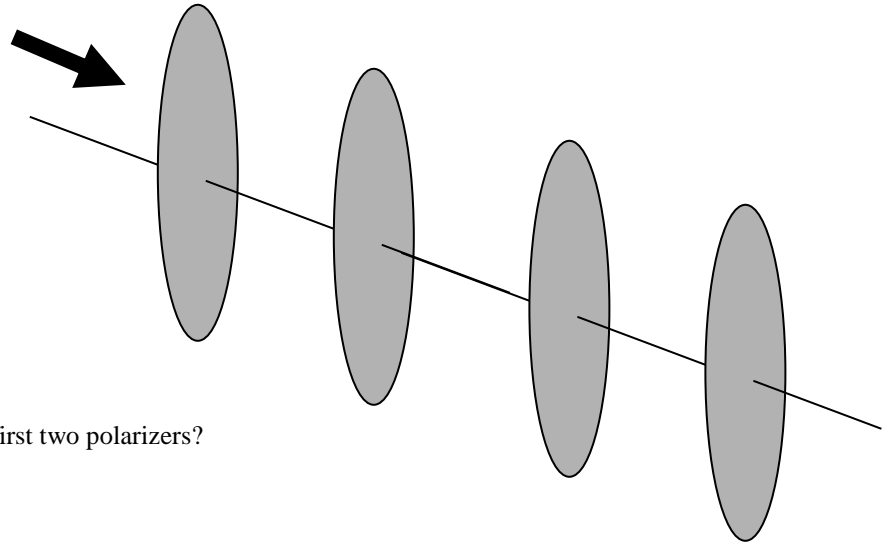
25) What is the maximum voltage across the capacitor?

- a) 16 V
- b) 25 V
- c) 34 V
- d) 43 V
- e) 52 V

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

- a) $4 \text{ }\Omega$
- b) $24 \text{ }\Omega$
- c) $44 \text{ }\Omega$
- d) $84 \text{ }\Omega$
- e) $124 \text{ }\Omega$

Unpolarized light with initial intensity of 100 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 $+30^\circ$ with respect to the vertical, the third polarizer has a transmission axis at an angle of $+60^\circ$ with respect to the vertical, and the fourth polarizer has a transmission axis at an angle of $+90^\circ$ with respect to the vertical.



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

- a) 100 W/m^2
- b) 75 W/m^2
- c) 50 W/m^2
- d) 37.5 W/m^2
- e) 28.1 W/m^2

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

- a) 100 W/m^2
- b) 50 W/m^2
- c) 37.5 W/m^2
- d) 21.1 W/m^2
- e) 0 W/m^2

29) Removing which two polarizers would minimize the final intensity of light?

- a) the 1st and 3rd OR the 2nd and 4th
- b) the 1st and 2nd
- c) the 1st and 4th
- d) the 2nd and 3rd
- e) the 3rd and 4th

30) This light has a frequency of $6 \times 10^{14} \text{ Hz}$. 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

| | | | |
|--|---|-------------------------------------|---|
| $F = ma$ | $F = \frac{kq_1q_2}{r^2}$ | $E = \frac{F}{q_o}$ | $E = \frac{kq}{r^2}$ |
| $U = \frac{kq_1q_2}{r}$ | $V = \frac{U}{q_o}$ | $V = \frac{kq}{r}$ | $E = \frac{V}{d}$ |
| $C = \epsilon_o \frac{A}{d}$ | $C = \frac{Q}{V}$ | $U = \frac{1}{2}QV$ | $I = \frac{Q}{t}$ |
| $C_p = C_1 + C_2$ | $\frac{1}{C_s} = \frac{1}{C_1} + \frac{1}{C_2}$ | $R_s = R_1 + R_2$ | $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$ |
| $R = \rho \frac{L}{A}$ | $V = IR$ | $P = IV$ | $Q = Q_o e^{-\frac{t}{RC}}$ |
| $Q = Q_o \left(1 - e^{-\frac{t}{RC}}\right)$ | $F = qvB \sin \theta$ | $F = ILB \sin \theta$ | $B = \frac{\mu_o I}{2\pi r}$ |
| $B = \mu_o nI$ | $r = \frac{mv}{qB}$ | $\Phi_B = BA \cos \phi$ | $emf = vBL$ |
| $emf = -N \frac{\Delta \Phi_B}{\Delta t}$ | $U = \frac{1}{2}LI^2$ | $\frac{V_s}{V_p} = \frac{N_s}{N_p}$ | $V_{rms} = I_{rms}Z$ |
| $Z = \sqrt{R^2 + (X_L - X_C)^2}$ | | $X_c = \frac{1}{2\pi fC}$ | $X_L = 2\pi fL$ |
| $\bar{P} = V_{rms} I_{rms} \cos \phi$ | $\tan \phi = \frac{X_L - X_C}{R}$ | $f_o = \frac{1}{2\pi \sqrt{LC}}$ | $c = \lambda f$ |
| $c = \frac{1}{\sqrt{\epsilon_o \mu_o}}$ | $U = \frac{1}{2} \epsilon_o E^2 + \frac{1}{2\mu_o} B^2$ | | $E = cB$ |
| $I = I_o \cos^2 \theta$ | | | |

$$k = 8.99 \times 10^9 \text{ Nm}^2 / \text{C}^2$$

$$\epsilon_o = 8.85 \times 10^{-12} \text{ C}^2 / \text{m}^2 \text{ N}$$

$$q_e = 1.60 \times 10^{-19} \text{ C}$$

$$\mu_o = 4\pi \times 10^{-7} \text{ Tm} / \text{A}$$

$$c = 3 \times 10^8 \text{ m} / \text{s}$$

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 - 30 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 = 156 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)