

Last Name: _____

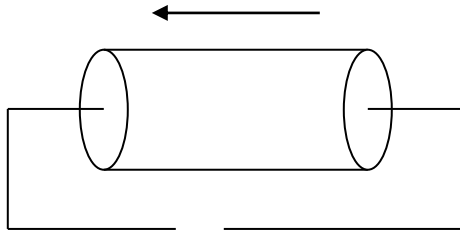
First Name: _____

1	2	3	4	5	6	7

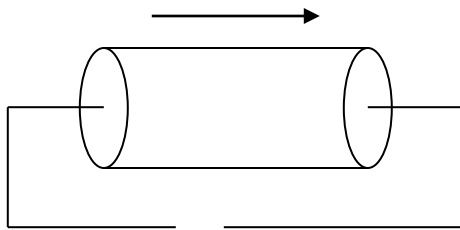
1. The vector shown in each figure is the electric field.

a. Show the vectors: force, acceleration, velocity, and current density for the positive and negative charges shown below.

b. Show the polarity (positive and negative sides) of the battery that gives the electric field shown.



Positive Charge



Negative Charge

2. Calculate the current through the resistors shown as rectangles and the batteries in the circuit below.

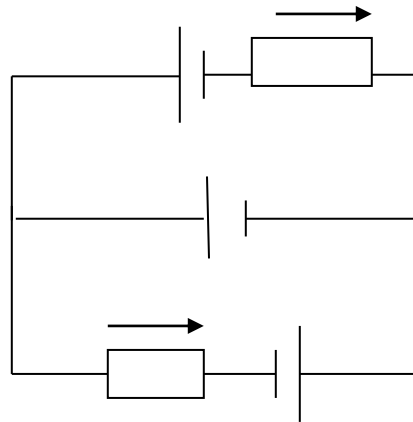
Top line: $R_1 = 10$ Ohms and $\varepsilon_1 = 5$ volts. The arrow represents current I_1 .

Middle line: $\varepsilon_2 = 25$ volts.

Bottom line $R_3 = 20$ Ohms and $\varepsilon_3 = 5$ volts. The arrow represents current I_3 .

Consider current through top to bottom row I_1 , I_2 and I_3 respectively.

	Direction	ε_1	R_1	ε_2	R_3	ε_3
I_1 (Amp)				XXXXXX	XXXXXX	XXXXXX
I_2 (Amp)		XXXXXX	XXXXXX		XXXXXX	XXXXXX
I_3 (Amp)		XXXXXX	XXXXXX	XXXXXX		



3. A 12-volt battery is connected in series with a resistor $R = 10,000$ Ohms, and a capacitor with capacitance $C = 20 \mu\text{F}$.

a. At what time after the battery is connected does the charge is half maximum value?

b. At what time after the battery is connected does the current through resistor equals $1/3$ of maximum value?

4. A proton and an alpha particle (2 protons plus 2 neutrons) both with same velocity v enter a region of magnetic field B where direction of B is perpendicular to direction of v .

a. Calculate the ratio of radius of circular path of alpha particle to that of proton.

a. Calculate the ratio of period of the circular path of alpha particle to that of proton.

5. Calculate the expression of magnetic field B due to a circular coil with current I , radius R and number of turns N at the center of the coil as a function of I , N , and R .

6. In a parallel plate capacitor the charge on each plate is $20\ \mu\text{C}$. The area of each plate is $10\ \text{cm}^2$, and the spacing between plates is $1\ \mu\text{m}$.

a. Calculate the magnitude of electric field inside the capacitor.

b. Calculate the electric potential difference between the plates.

c. Calculate the capacitance of the capacitor.

d. Energy stored in the capacitor.

7. Write T (true) or F (False) before each statement.

_____ The electric field inside a fully charge capacitor is at its maximum.

_____ When we connect two resistors in parallel the equivalent resistance is less than both resistances.

_____ When we connect two capacitors in parallel the equivalent capacitance is less than both capacitances.

_____ Positive charge is accelerated toward lower potential.

_____ Negative charge is accelerated toward higher potential.

_____ The larger the magnetic field the smaller the radius of circular motion of a moving