DEFINITIONS (2.0/2.0 points)

Please match the following terms with the letter of their appropriate definitions.

Voltage
C **Answer:** C

Current
D **Answer:** D

Power
A **Answer:** A

Energy
B **Answer:** B

Resistance
E **Answer:** E

A. the rate of energy change

B. defines the amount of work that can be done

C. an electrical potential

D. the flow of charge (electrons)

E. potential divided by flow

EXPLANATION

Voltage(V), Current(I), and Resistance(R) are related by Ohm's Law:

$$V = I * R$$

.

Power is given by the expressions

$$P = I^2 * R$$

and

$$P = V^2 / R$$

The time integral of power will yeild an expression of energy.

Check Hide Answer(s)

DEFINITIONS (2.0/2.0 points)

Please match the following terms with the letter of their appropriate definitions.

Ohm's Law

C **Answer:** C

Kirchhoff's Current Law (KCL)

A **Answer:** A

Kirchhoff's Voltage Law (KVL)

B **Answer:** B

A. The sum of the currents into a node equal the sum of the currents leaving a node

B. The sum of the voltages around the loop is zero

C. Voltage equals current times resistance

EXPLANATION

Kirchhoff's Voltage Law (KVL), Kirchhoff's Current Law (KCL), and Ohm's law are fundamental laws of electrical circuits, and are instrumental in circuit analysis.

Help

Check Hide Answer(s)

RESISTORS IN SERIES AND PARALLEL (3.0/3.0 points)

Calculate values for R1, R2, R1 in series with R2, and R1 in parallel with R2 as necessary to complete the following table.

R1	R2	R1 in series with R2	R1 in parallel with R2
1000	**4000**	5000 **Answer:** 5000	800 **Answer:** 800
1000	**9000**	10000 **Answer:** 10000	900 **Answer:** 900
1000	4000 **Answer:** 4000	**5000**	800 **Answer:** 800
1000	3000 **Answer:** 3000	4000 **Answer:** 4000	**750**
2000 **Answer:** 2000	2000 **Answer:** 2000	**4000**	**1000**

CALCULATING EQUIVALENT RESISTANCE

The equation for determining the equivalent resistance of two resistors, R_1 and R_2, in **series** is

$$R_{eq} = R_1 + R_2$$

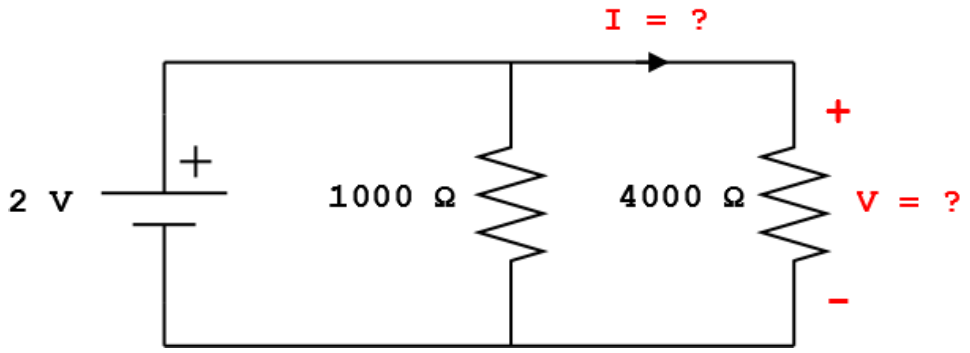
The equation for determining the equivalent resistance of two resistors, R_1 and R_2, in **parallel** is

$$R_{eq} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$$

Check Hide Answer(s)

CURRENT DIVIDERS (2/2 points)

2 V is applied across the parallel combination of a 1000Ω and a 4000Ω resistor as shown.



What is the voltage across the 4000Ω resistor, in V?

2

2

Answer: 2

What is the current through the 4000Ω resistor, in mA?

0.5

0.5

Answer: 0.5

EXPLANATION

Because the resistors are in parallel, the voltage across them will be equal. The two resistors are in parallel with the

2V source, so the voltage across them both is 2V.

To find the current through the 4000Ω resistor, we can use the current divider equation

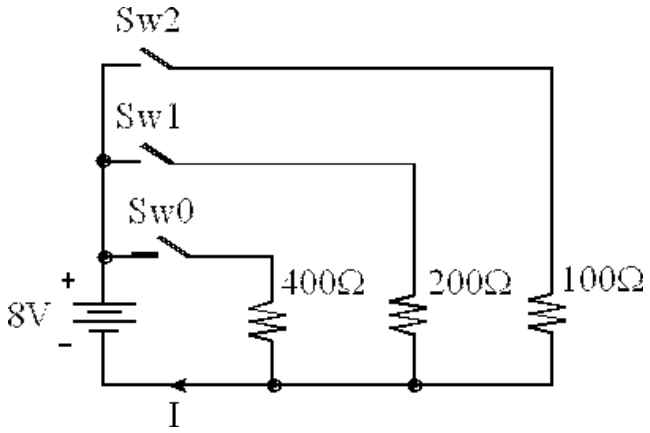
$$I_2 = I * \frac{R_1}{(R_1 + R_2}$$

. This equation is derived using Ohm's law and calculations of the equivalent resistance of resistors in parallel.

Check Hide Answer(s)

3 BIT DAC (1/1 points)

Consider this 3-bit digital to analog converter. We define the logic state of each switch as 0 or 1, where 0 means not pushed and 1 means pushed. Define a 3-bit number n (0 to 7) which specifies the three switch positions. n = 0 means none are pushed. n = 1 means Sw0 is pushed. n = 2 means Sw1 is pushed. n = 3 means Sw1 and Sw0 are pushed. n = 4 means Sw2 is pushed. n = 5 means Sw2 and Sw0 are pushed. n = 6 means Sw2 and Sw1 are pushed. n = 7 means all are pushed.



Derive a relationship between the current I and the number n.

- $I = 0$
- $I = n * 20mA$ ✔
- $I = 2n + 10mA$
- $I = 140mA$
- none of the above

Help

EXPLANATION

We use the KCL law to sum the currents from the three resistors into the current I. If SW2 is pressed the current through the 100ohm resistor will be 8V/100, which is 80mA. If SW1 is pressed the current through the 200ohm resistor will be 8V/200, which is 40mA. If SW0 is pressed the current through the 400ohm resistor will be 8V/400, which is 20mA. For each resistor the current will be zero if the corresponding switch is not pressed. Next think of the system one switch at a time. If n=001 it is just SW0, I=20mA; if n=010 it is just SW1, I=40mA; and if n=100 it is just SW2, I=80mA. Putting these three together yields the answer

$$I = n * 20mA$$

Check Hide Answer(s)