Name: _____ Class: _____ Date: _____ ID: A

# Preliminary quiz Circuits and voltage

## Multiple Choice

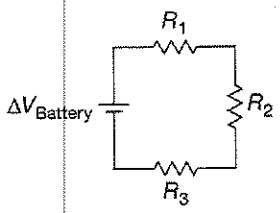
*Identify the choice that best completes the statement or answers the question.*

| Circuit Element | Current That Flows into the Circuit Element (A) | Potential Difference Across the Circuit Element(V) | Resistance of Circuit Element ($\Omega$) | Rate of Energy Dissipated by the Circuit Element ($\frac{J}{s}$) |
|---|---|---|---|---|
| Battery | 1.67 | 10.00 | Negligible | Nonapplicable |
| Lightbulb 1 | 1.67 | 1.67 | 1 | 2.79 |
| Lightbulb 2 | 1.67 | 3.34 | 2 | 5.58 |
| Lightbulb 3 | 1.67 | 5.00 | 3 | 8.37 |

a 1. (#9-4) A student collects data about different circuit elements that are arranged in a circuit, as shown in the table. Which column of data can the student use to determine if the conservation of charge applies to this circuit?

a. Current that flows into the circuit element, because all of the values of current are the same for the battery and all lightbulbs.
b. Potential difference across the circuit element, because the sum of the potential difference across the lightbulbs is equal to the potential difference of the battery.
c. Resistance of the circuit elements, because the equivalent resistance of the circuit can be used to treat the circuit as a single battery in series with a single lightbulb that has a resistance equal to the circuit's equivalent resistance.
d. Rate of energy dissipated by the circuit element, because the brightness of the lightbulbs is determined by how they are arranged in a series and parallel circuit.

b 2.




(#9-3)A student creates a circuit that consists of a single battery and three resistors of unknown resistances that are arranged as shown. Which of the following procedures can the student use to verify the law of conservation of energy in the circuit?

a. Use an ammeter to measure the current that flows from the battery, flows into each resistor, and flows back into the battery.
b. Use a voltmeter to measure the potential difference across the battery and each resistor.
c. Use an ohmmeter to measure the resistance of each resistor.
d. Use a stopwatch to determine the length of time that the battery runs.

$V = \frac{\text{energy}}{\text{charge}}$

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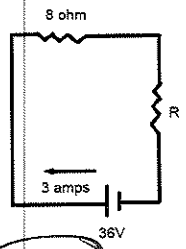
___ 3. (#8-3) In an electric field, 0.90J of work is required to bring 0.45coulmbs of charge from pont A to point B. What is the electric potential difference between points A and B?

a. 5V
b. 2V
c. 0.5V

$\frac{0.9V}{0.45C} = 2V$

___ 4. What is the value of resistor R in the circuit shown below?



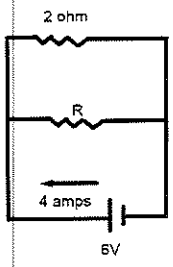

$V = IR$
$V = 3 \cdot 8$
$= 24$

$36 - 24 = 12$

$12 = 3R \quad R = 4$
$V = IR$

a. 20
b. 2
c. 4
d. 12

___ 5.




$V = IR$
$6 = I2$
$I = 3$

$4 - 3 = 1$
$P = V \cdot I$
$6 \cdot 1 = 6$

If the current in the circuit above is 4A, then the power generated by resistor R is

a. 6W
b. 18W
c. 24W
d. 7W

___ 6. A 20Ω resistorhas a 10A of current in it. The power generated is

a. 2,000W
b. 2 W
c. 200W
d. 4000 W

$P = VI \quad P = I^2R$
$V = IR$
Sub in
$10^2 \cdot 20 = 2000W$

___ 7. How much electrical energy is generated by a 100W lightbulb turned on for 5 min?

a. 20J
b. 500J
c. 3,000 J
d. 30,000 J

$5 min \cdot \frac{60 sec}{1} \cdot \frac{100 J}{1 sec} = 30{,}000 J$

**Short Answer**

8. A 110 volt toaster oven draws a current of 6 amps on its hightest setting as it converts electrical energy into thermal energy. What is the toaster's maximum power rating?

$P = IV$
$6 \cdot 110 = 660V$

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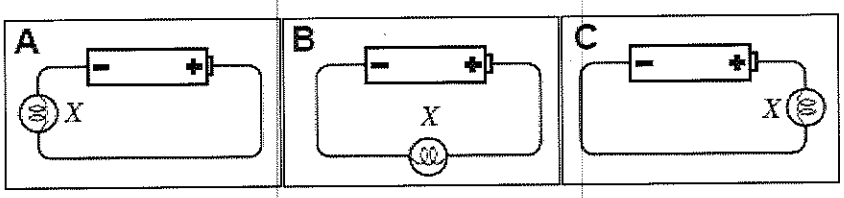
For the three items below, rank the brightness of the bulb labeled *X*.

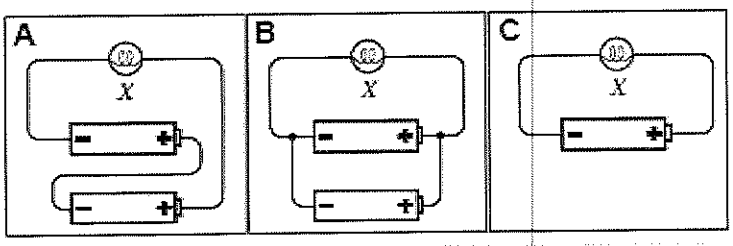
(a)




| 1 Greatest | 2 | 3 Least | OR | All the same | All zero | Cannot determine |
|---|---|---|---|---|---|---|
| | | | | X | | |

9. _ - - -

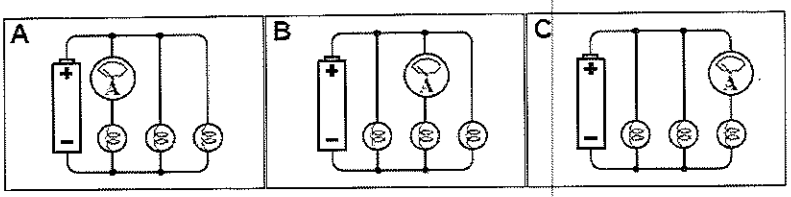
10. a. In the picture below, rank the brightness of the light bulb marked "x".




| 1 Greatest | 2 | 3 Least | OR | All the same | All zero | Cannot determine |
|---|---|---|---|---|---|---|
| A | B = C | | | | | |

B, will run for a longer time, but same voltage as "C".

b. In the picture below rank the value of the ampmeter marked A.




| 1 Greatest | 2 | 3 Least | OR | All the same | All zero | Cannot determine |
|---|---|---|---|---|---|---|
| | | | | X | | |

assuming all resistors are equal

11. An electron is pushed 10cm in a constant electric field of 4.05E13N/C. Answer the following questions.

a. What force is exerted on the electron?

$F = Eq$ $4.05E13 \frac{N}{C} \cdot 1.6E-19C = 6.48E-6N$

b. How much work is done on the electron?

$F \cdot d = \text{Energy}$ $6.48E-6N \cdot 0.1 = 6.45E-7J$

c. What is the voltage across the 10cm?

$\frac{6.45E-7J}{1.6E-19} = 4.0E12V$

d. How fast is the electron moving?

$PE = KE$

$= \frac{1}{2}mv^2$ $\frac{1}{2}(9.11E-31kg)(v^2) = 6.45E-7J$

$v = 1.18E12 m/s$

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