

Halliday/Resnick/Walker
Fundamentals of Physics 8th edition

Classroom Response System Questions

Chapter 27 Circuits

Reading Quiz Questions

27.2.1. Which one of the following statements concerning emf is true?

- a) Emf is the work done in moving the current from one terminal to the other of an emf device.
- b) Emf is the work done in moving a single charge from one terminal to the other of an emf device.
- c) Emf is the force exerted on a single charge to move it from one terminal to the other of an emf device.
- d) Emf is the total charge moving from one terminal to the other of an emf device.
- e) Emf is the electromagnetic force that is exerted between the terminals of an emf device.

27.3.1. What is the primary difference between an ideal emf device and a real emf device?

- a) The electric potential of a real emf device is limited.
- b) The resistance of a real emf device is finite, but the resistance of an ideal emf device is assumed to be infinite.
- c) A real emf device can carry an electric current, but an ideal emf device does not.
- d) A real emf device has an internal resistance, but an ideal emf device does not.
- e) A real emf device has a potential difference across its terminals, but an ideal emf device does not.

27.3.2. Which one of the following units is the correct SI unit for the electromotive force (emf)?

- a) newtons (N)
- b) coulombs (C)
- c) joules (J).
- d) amperes (A)
- e) volts (V)

27.3.3. The positive terminal of a battery in a minivan has an electric potential that is a maximum of 12 V higher than the negative terminal. Complete the following sentence: When wires are connected to the battery from the various electrical circuits within the minivan, the potential difference between the two terminals is

- a) equal to 12 V.
- b) less than 12 V.
- c) greater than 12 V.
- d) equal to zero V.

27.3.4. Which one of the following terms describes the resistance that a battery (or other emf device) has in a circuit?

- a) super resistance
- b) critical resistance
- c) internal resistance
- d) terminal resistance
- e) electroresistance

27.4.1. In analyzing electric circuits containing a battery and at least one resistor, what is the change in potential across a resistor as one moves through it in the direction of the current?

- a) $+i^2R$
- b) $-i^2R$
- c) $+iR$
- d) $-iR$
- e) zero

27.4.2. In analyzing electric circuits containing an ideal emf device that has an emf \mathcal{E} and at least one resistor, what is the change in potential across the emf device as one moves through it in the direction of the emf arrow?

- a) $+\mathcal{E}$
- b) $-\mathcal{E}$
- c) $+\mathcal{E}/R$
- d) $-\mathcal{E}/R$
- e) zero

27.4.3. Complete the following statement: Around any closed-circuit loop, the sum of the potential drops

- a) dramatically with the addition of each resistor.
- b) in each loop is the same.
- c) equals the sum of the potential rises.
- d) equals the emf of the battery.
- e) increases with the addition of each resistor.

27.5.1. Which one of the following statements is true concerning resistors connected in series within an electric circuit?

- a) The potential difference across each of the resistors is the same.
- b) The current through each of the resistors is the same.
- c) The energy dissipated by each of the resistors is the same.
- d) The resistance of each of the resistors is the same.
- e) The resistivity of each of the resistors is the same.

27.5.2. Two identical resistors are connected in series across the terminals of a battery with a voltage V and a current i flows through the circuit. If one of the resistors is removed from the circuit and the remaining one connected across the terminals of the battery, how much current would flow through the circuit?

- a) $4i$
- b) $2i$
- c) i
- d) $i/2$
- e) $i/4$

27.5.3. One end of resistor A is connected to the positive terminal of a battery and the other end is connected to resistor B. The opposite end of resistor B is connected to the negative terminal of the battery. If resistor A has resistance R and B has a resistance $2R$, what is the equivalent resistance of this circuit?

- a) R
- b) $3R/2$
- c) $2R$
- d) $2R/3$
- e) $3R$

27.6.1. Which of the following occurs when part of an electric circuit is connected to ground?

- a) The ground acts like a battery, so the current in the circuit increases.
- b) Any current in the circuit flows to the ground.
- c) The electric potential at the connection point is equal to zero volts.
- d) The electric potential difference across the terminals of any batteries in the circuit is equal to zero volts.
- e) The ground provides a source for more electrons to flow into the circuit.

27.7.1. While analyzing the currents within a circuit containing multiple components (such as batteries, resistors, etc.), which of the following statements concerning currents flowing into a single junction must be true?

- a) The sum of the currents entering the junction must equal the total current through the battery.
- b) The sum of the currents entering the junction must equal zero.
- c) The sum of the currents entering the junction must equal the sum of the currents exiting the junction.
- d) The currents entering the junction must follow only one of the possible exit paths.
- e) The currents entering the junction may exit back along the path from which they entered.

27.7.2. The fact that the sum of the currents entering any junction in an electric circuit must be equal to the sum of the currents leaving the junction is an expression of what principle?

- a) conservation of energy
- b) Heisenberg uncertainty principle
- c) conservation of momentum
- d) Archimedes' Principle
- e) conservation of charge

27.7.3. Which one of the following statements is true concerning resistors connected in parallel within an electric circuit?

- a) The potential difference across each of the resistors is the same.
- b) The current through each of the resistors is the same.
- c) The energy dissipated by each of the resistors is the same.
- d) The resistance of each of the resistors is the same.
- e) The resistivity of each of the resistors is the same.

27.7.4. Which of the following statements concerning resistors that are wired in parallel is true?

- a) The current through each resistor is necessarily the same.
- b) The equivalent resistance for the resistors in the circuit is the sum of the individual resistances.
- c) The voltage across each resistor is necessarily the same.
- d) The equivalent resistance for the resistors in the circuit is the product of the individual resistances.
- e) The equivalent resistance for the resistors in the circuit is the average of the individual resistances.

27.7.5. Two resistors can be either connected to a battery in series or in parallel. In which case, if either, is the equivalent resistance the smallest?

- a) When the two resistors are wired in parallel, the equivalent resistance is less than if they are wired in series.
- b) When the two resistors are wired in series, the equivalent resistance is less than if they are wired in parallel.
- c) Both series and parallel wiring will result in the same equivalent resistance.
- d) It is not possible to know which method of wiring will result in the lowest equivalent resistance without knowing the values of the two resistances.

27.7.6. In analyzing circuits in which resistors are wired partially in series and partially in parallel, which one of the following statements describes the preferred approach to take to determine the equivalent resistance in the circuit?

- a) Find the sum of all the resistors. This is the equivalent resistance for the circuit.
- b) Break the circuit into smaller parts and find an equivalent resistance for each part. Then continue this process until all of the parts are added together correctly either in series or parallel until a single equivalent resistance is found.
- c) All together all of the resistors in series, ignoring any wired in parallel as they do not significantly add to the equivalent resistance of the circuit. The sum of the resistors in series is the equivalent resistance.
- d) All together all of the resistors in parallel, ignoring any wired in series as they do not significantly add to the equivalent resistance of the circuit. The sum of the resistors in parallel is the equivalent resistance.

27.7.7. Which one of the following choices is not one of Kirchoff's rules?

- a) junction rule
- b) emf rule
- c) loop rule
- d) slide rule
- e) resistance rule

27.7.8. Complete the following statement: The sum of the magnitudes of the currents directed into a junction

- a) equals the sum of the magnitudes of the currents directed out of the junction.
- b) is less than the total current directed out of the junction.
- c) equals the current that is directed along one of the lines out of the junction.
- d) is divided equally among the number of lines directed out of the junction.
- e) is greater than the total current directed out of the junction.

27.8.1. Which of the following devices is placed into a circuit to measure the current that passes through it?

- a) ammeter
- b) gaussmeter
- c) voltmeter
- d) diffractometer
- e) flowmeter

27.8.2. Which one of the following statements is not a characteristic of a voltmeter?

- a) The voltmeter measures the voltage between two points in a circuit.
- b) The voltmeter is designed to measure nearly the same voltage that is present when the meter is not connected.
- c) The voltmeter is not placed directly into a circuit.
- d) The voltmeter is designed to draw very little current from the circuit being measured.
- e) An ideal voltmeter has almost no resistance.

27.9.1. When does a charging capacitor stop charging?

- a) when the amount of charge on the two plates is equal
- b) when the potential difference across the plates of the capacitor is equal to zero volts
- c) when the amount of charge on the two plates is infinitely large
- d) when the potential difference across the plates of the capacitor is equal to the emf of the battery
- e) when all of the charge available in the circuit has been forced to collect on the plates of the capacitor

27.9.2. What effect, if any, does increasing the resistance in an RC circuit have on the charging of the capacitor?

- a) The resistance has no effect on the charging of the capacitor, which is determined by the emf of the battery and the capacitance of the capacitor.
- b) Increasing the resistance causes the charging time to increase since the rate at which charges are moving to the capacitor increases.
- c) The charging time will decrease as the resistance is increased because the rate at which charges are moving to the capacitor decreases.
- d) Increasing the resistance increases the charging time since the emf of the battery will be reduced.
- e) Increasing the resistance decreases the charging time since the emf of the battery will be reduced.

27.9.3. What effect, if any, does increasing the capacitance in an RC circuit have on the charging of the capacitor?

- a) The capacitance has no effect on the charging of the capacitor, which is determined by the emf of the battery and the circuit resistance.
- b) Increasing the capacitance causes the charging time to increase since the rate at which charges are moving to the capacitor increases.
- c) The charging time will decrease as the capacitance is increased because the rate at which charges are moving to the capacitor decreases.
- d) Increasing the capacitance increases the charging time since the capacitor can hold more charge.
- e) Increasing the capacitance decreases the charging time since the emf of the battery will be reduced.

27.9.4. Which of the following quantities is equal to the time constant for a charging capacitor?

- a) the time it takes a capacitor to reach 33 % of its maximum charge
- b) the time it takes a capacitor to reach 50 % of its maximum charge
- c) the time it takes a capacitor to reach 66 % of its maximum charge
- d) the time it takes a capacitor to reach 75 % of its maximum charge
- e) the time it takes a capacitor to reach its maximum charge

27.9.5. Consider each of the graphs shown. Which of these graphs represents the charge on a capacitor as it is being charged in a circuit containing a resistor and a capacitor in series shortly after they are connected to a battery?

- a) A
 - b) B
 - c) C
 - d) D
 - e) E
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27.9.6. A circuit contains a capacitor with a capacitance C and a resistor with a resistance R connected in series with a battery. Which one of the following mathematical expressions correctly represents the time constant for this circuit?

a) $\tau = \frac{1}{2}RC^2$

b) $\tau = \frac{R}{C}$

c) $\tau = RC$

d) $\tau = \frac{1}{2}RC$

e) $\tau = \frac{C}{R}$