

Instructions

Read each question carefully. For Part A, choose the best answer. For Part B, write your answer in a complete sentence. For Part C, you may need to draw diagrams using the correct circuit symbols provided below.

Common Circuit Symbols

- **Wire:** _____
 - **Cell (one):** -|i-
 - **Battery (more than one cell):** -|i-|i-
 - **Bulb / Lamp:** ---(X)---
 - **Switch (Open):** ---/ ---
 - **Switch (Closed):** -----
 - **Motor:** ---(M)---
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Part A: Objective Questions

Instructions: Choose the best answer for the following questions.

Section 1: Matching

Match the component name with its correct symbol representation.

1. Component: **Cell**
2. Component: **Bulb**
3. Component: **Open Switch**
4. Component: **Battery**
5. Component: **Wire**

- A) ---/ ---
- B) _____
- C) -|i-
- D) -|i-|i-
- E) ---(X)---

Section 2: Multiple Choice

6. What is required for an electrical current to flow?
 - A. An open circuit
 - B. A closed circuit
 - C. A short circuit
 - D. No circuit
7. Which component provides the energy or voltage "push" for the electricity?
 - A. Switch
 - B. Bulb
 - C. Wire
 - D. Cell / Battery
8. What does the symbol ---(**M**)--- represent in a circuit diagram?
 - A. Motor
 - B. Meter

- C. Lamp
 - D. Magnet
9. An electrical insulator is a material that:
- A. Allows electricity to flow easily through it.
 - B. Stops or slows down the flow of electricity.
 - C. Creates electricity when heated.
 - D. Measures electrical current.
10. What is the main function of a switch?
- A. To provide power
 - B. To use up power
 - C. To open or close a circuit
 - D. To measure current
11. A continuous, unbroken path for electricity is called a(n):
- A. Open path
 - B. Short circuit
 - C. Closed circuit
 - D. Electrical symbol
12. Which of these materials would be a good **conductor** of electricity?
- A. Rubber
 - B. Plastic
 - C. Copper
 - D. Glass
13. What does the symbol **-|i|i-** represent?
- A. A single cell
 - B. Two switches
 - C. A battery (made of two or more cells)
 - D. A resistor
14. In a simple circuit with a battery, a switch, and a bulb, what happens when the switch is **open**?
- A. The bulb lights up brightly.
 - B. The current flows normally.
 - C. The circuit is broken, and the bulb does not light up.
 - D. The battery reverses its polarity.
15. The straight lines in a standard circuit diagram represent:
- A. Switches
 - B. Batteries
 - C. Wires
 - D. Light bulbs

Section 3: True or False

16. Electricity can easily flow through an open circuit.
17. The long line in the symbol for an electrical cell represents the positive (+) terminal.
18. A battery is the exact same thing as a single cell.
19. Materials like wood and plastic are good electrical conductors.
20. A circuit diagram is a simplified, universal way to represent a real circuit.

Part B: Subjective Questions

Instructions: Answer the following questions in the space provided (or on a separate sheet). Use full sentences.

1. What is the purpose of using standard symbols in circuit diagrams instead of drawing realistic pictures of the components?
 2. Explain the difference between an open circuit and a closed circuit.
 3. What is the function of a battery in an electrical circuit?
 4. Why are connecting wires in a circuit usually made of a metal like copper on the inside and coated with plastic on the outside?
 5. What would likely happen to the brightness of a bulb in a simple circuit if you replaced its single cell with a two-cell battery? Why?
 6. Define an "electrical conductor" and give two examples of materials that are good conductors.
 7. Define an "electrical insulator" and give two examples of materials that are good insulators.
 8. If the thin wire (filament) inside a light bulb breaks, the entire circuit stops working. Explain why this happens.
 9. What are the three essential components needed to create a basic, working electrical circuit that can light a bulb?
 10. What is the job of a motor in a circuit, and what is its symbol?
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Part C: Problem-Solving

Instructions: Use your knowledge of circuits and symbols to solve the following problems. Draw diagrams where requested.

1. **Draw a circuit diagram** using correct symbols. The circuit must contain one battery (made of two cells), one **open** switch, and two bulbs connected one after another in a single loop.
 2. Look at the circuit diagram you drew for question 1. What single action must you take to make both bulbs light up?
 3. Imagine a circuit with a battery connected to Switch A, which is then connected to Switch B, which is finally connected to a motor. For the motor to spin, both switches must be closed. Why won't the motor spin if only Switch A is closed?
 4. **Draw a circuit diagram** for a system that uses one battery to power two separate bulbs, where each bulb can be turned on and off independently by its own switch.
 5. Imagine a simple, closed circuit with one battery and one bulb, and the bulb is lit. What do you predict would happen to the brightness of the first bulb if you added a second bulb into the same loop? Explain your reasoning.
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Answer Key

Part A: Objective Questions

Section 1: Matching

1. **C)** -|i-
2. **E)** ---(X)---
3. **A)** ---/ ---
4. **D)** -|i-|i-
5. **B)** _____

Section 2: Multiple Choice

6. **B.** A closed circuit
7. **D.** Cell / Battery
8. **A.** Motor
9. **B.** Stops or slows down the flow of electricity.
10. **C.** To open or close a circuit
11. **C.** Closed circuit
12. **C.** Copper
13. **C.** A battery (made of two or more cells)
14. **C.** The circuit is broken, and the bulb does not light up.
15. **C.** Wires

Section 3: True or False

16. **False.** Electricity needs a closed, complete path to flow.
17. **True.** The long line is positive (+), and the short line is negative (-).
18. **False.** A battery is made of two or more cells connected together.
19. **False.** They are good electrical insulators.
20. **True.** This allows scientists and electricians everywhere to understand them easily.

Part B: Subjective Questions

1. Using standard symbols makes circuit diagrams clear, simple, and universally understood by anyone who has studied electricity, regardless of language.
2. A closed circuit is a complete, unbroken path that allows electricity to flow. An open circuit has a break or gap (like an open switch), which stops the flow of electricity.
3. A battery acts as the power source. It provides the voltage, or "push," that makes the electrical current move through the circuit.
4. Copper is used on the inside because it is an excellent electrical conductor, allowing electricity to flow easily. Plastic is used on the outside because it is an excellent electrical insulator, which keeps the electricity safely inside the wire and prevents shocks.
5. The bulb would likely get brighter. A two-cell battery provides more voltage ("push") than a single cell, causing more current to flow through the bulb.
6. An electrical conductor is a material that allows electricity to pass through it easily. Examples include copper, aluminum, silver, gold, and steel.
7. An electrical insulator is a material that does not allow electricity to pass through it easily. Examples include plastic, rubber, wood, and glass.

8. When the filament inside the bulb breaks, it creates a gap in the path of the electricity. This turns the closed circuit into an open circuit, and the current can no longer flow.
 9. The three essential components are: 1) A power source (like a cell or battery), 2) A load/output device (like a bulb or motor), and 3) A complete conductive path (wires).
 10. A motor is a component that converts electrical energy into mechanical energy (motion/spinning). Its symbol is a circle with the letter 'M' inside: ---(M)---
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Part C: Problem-Solving

1. The drawing should show the symbol for a battery (-|i-|i-) connected by a line (wire) to the symbol for an open switch (---/ ---). This is then connected by a line to two bulb symbols (---(X)---) one after the other. The last bulb is connected by a line back to the other end of the battery, forming a complete loop.
2. You must close the switch. This completes the circuit, allowing current to flow through both bulbs.
3. The circuit is a series circuit, meaning the electricity must flow through all components in order. If Switch A is closed but Switch B is open, there is still a break in the circuit, so the path is not complete and no current can flow to the motor.
4. The drawing should show a single cell. From the cell, the wire should split into two separate branches. Each branch should contain one switch and one bulb. The two branches should then join back together before returning to the other end of the cell.
5. The first bulb would become dimmer. When you add a second bulb in the same loop (a series circuit), the total resistance of the circuit increases. The battery's energy must now be shared between two bulbs, so each one receives less energy and shines less brightly.