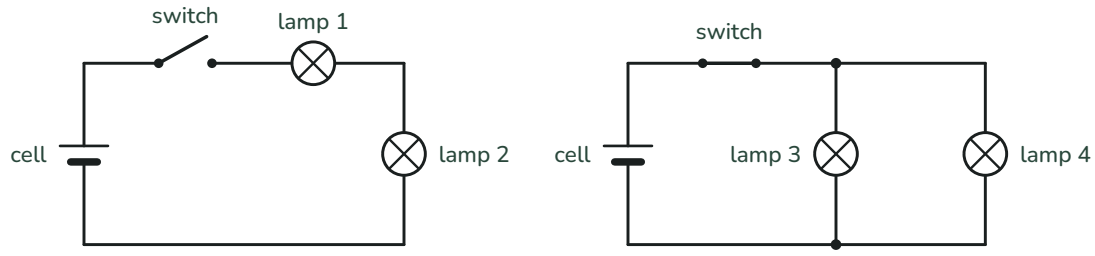
Electric Circuits: Loops and Branches

Grades 6-8

Name _____ Date _____

Directions: Study Circuit K and Circuit M. Both use the same kind of cell, and all four lamps are identical. Answer in a few words or one sentence. No calculations are needed.



1. Look at the switch in Circuit K as it is drawn. Are lamp 1 and lamp 2 glowing? Say what in the drawing tells you.

2. Suppose both lamps in Circuit K are glowing. Then the thin wire inside lamp 1 snaps. What does lamp 2 do, and why?

3. In Circuit M both lamps are glowing. Lamp 3 is twisted out of its holder. What does lamp 4 do, and why?

4. Both switches are closed and no lamp is removed. Which circuit has the brighter lamps, K or M? Explain with the idea of one shared path or separate paths.

5. Rosa bridges a gap in a working lamp circuit with each object in turn. Write **C** (conductor, lamp lights) or **I** (insulator, lamp stays dark): steel spoon ____ gold ring ____ strip of dry cardboard ____ piece of copper pipe ____ plastic drinking straw ____ dry cotton shoelace ____

6. Lamp 3 is out of its holder in Circuit M again. If current still flows, list in order the parts it passes through, starting at the cell. If no current flows, write none.

7. A new toy robot will not turn on. Its batteries are fresh, but a paper tab sits between one battery and its metal contact. Explain why the robot stays off.

8. One headlight on a truck burns out, yet the second headlight keeps shining. Are the two headlights wired like Circuit K or like Circuit M? Give your evidence.

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Answer key

One point per item for the answer and one more for the reason on items 1, 2, 3, 4, 7 and 8 (14 points). Item 5: all six letters correct for the point.

1. **No, both lamps are dark. The switch is open, so the loop has a gap and no current flows anywhere in it.**
   Accept "the circuit is open", "the path is broken" or "not a complete loop".

2. **Lamp 2 goes dark too. The broken lamp is a gap in the only path, so current stops all around the loop.**
   Circuit K is a series circuit: one path through both lamps.

3. **Lamp 4 stays lit, about as bright as before. It still has its own complete path from the cell and back.**
   Circuit M is a parallel circuit: taking out one branch leaves the other branch a closed loop.

4. **Circuit M. Each of its lamps is connected straight across the cell on a separate path, so each gets the cell's full push. In Circuit K the two lamps share one path and one push, so each glows dimmer.**
   A qualitative answer is enough. Do not expect numbers.

5. **steel spoon: C; gold ring: C; strip of dry cardboard: I; piece of copper pipe: C; plastic drinking straw: I; dry cotton shoelace: I**
   Metals let charge move through them easily. Dry cardboard, plastic and dry cotton do not.

6. **Current still flows: cell, switch, lamp 4, and back to the cell.**
   The reverse order (cell, lamp 4, switch, cell) is also correct, and wires may be listed or left out. Lamp 3 must not be on the list: its branch is open.

7. **Paper is an insulator, so the tab keeps the circuit open: charge cannot cross from the battery to the contact. Pull the tab out so metal touches metal and the loop is complete.**
   Look for "insulator" (or "does not conduct") and "open circuit" (or "gap", "incomplete loop").

8. **Like Circuit M (parallel). If they shared one path as in Circuit K, a burned-out headlight would break the loop and both would go dark.**
   The evidence is that one lamp works without the other.